

Special Town Council Meeting

November 13, 2018

5:30 PM - 10:00 PM

The Lodge at Jackson Hole Conference Center

located at 920 West Broadway

Chair: Pete Muldoon

NOTICE: This meeting will not be live streamed. Recorded audio will be posted to the Town's website as soon as possible.

PLEASE SILENCE ALL ELECTRONIC DEVICES DURING THE MEETING

I. CALL TO ORDER AND ROLL CALL

II. DISCUSSION/ACTION ITEMS

A. Snow King Resort Master Plan Base Area Amendments

III. ADJOURN

Please note that at any point during the meeting, the Chairman or Mayor may change the order of items listed on this agenda. In order to ensure that you are present at the time your item of interest is discussed, please join the meeting at the beginning to hear any changes to the schedule or agenda.



TOWN OF JACKSON TOWN COUNCIL AGENDA DOCUMENTATION

PREPARATION DATE: NOVEMBER 5, 2018
MEETING DATE: NOVEMBER 13, 2018

SUBMITTING DEPARTMENT: PLANNING
DEPARTMENT DIRECTOR: TYLER SINCLAIR
PRESENTER: TYLER SINCLAIR

SUBJECT: **ITEM P18-208:** A REQUEST FOR AN AMENDMENT TO THE SNOW KING
PLANNED RESORT DISTRICT MASTER PLAN

APPLICANT: SNOW KING RESORT MASTER ASSOCIATION - SKRMA
RYAN STANLEY

REQUESTED ACTION

Snow King Resort Master Association has applied to the Town of Jackson to amend its Resort Master Plan pursuant to Section 8.7.3 Planned Unit Development of the Town Land Development Regulations. Specifically including the following actions:

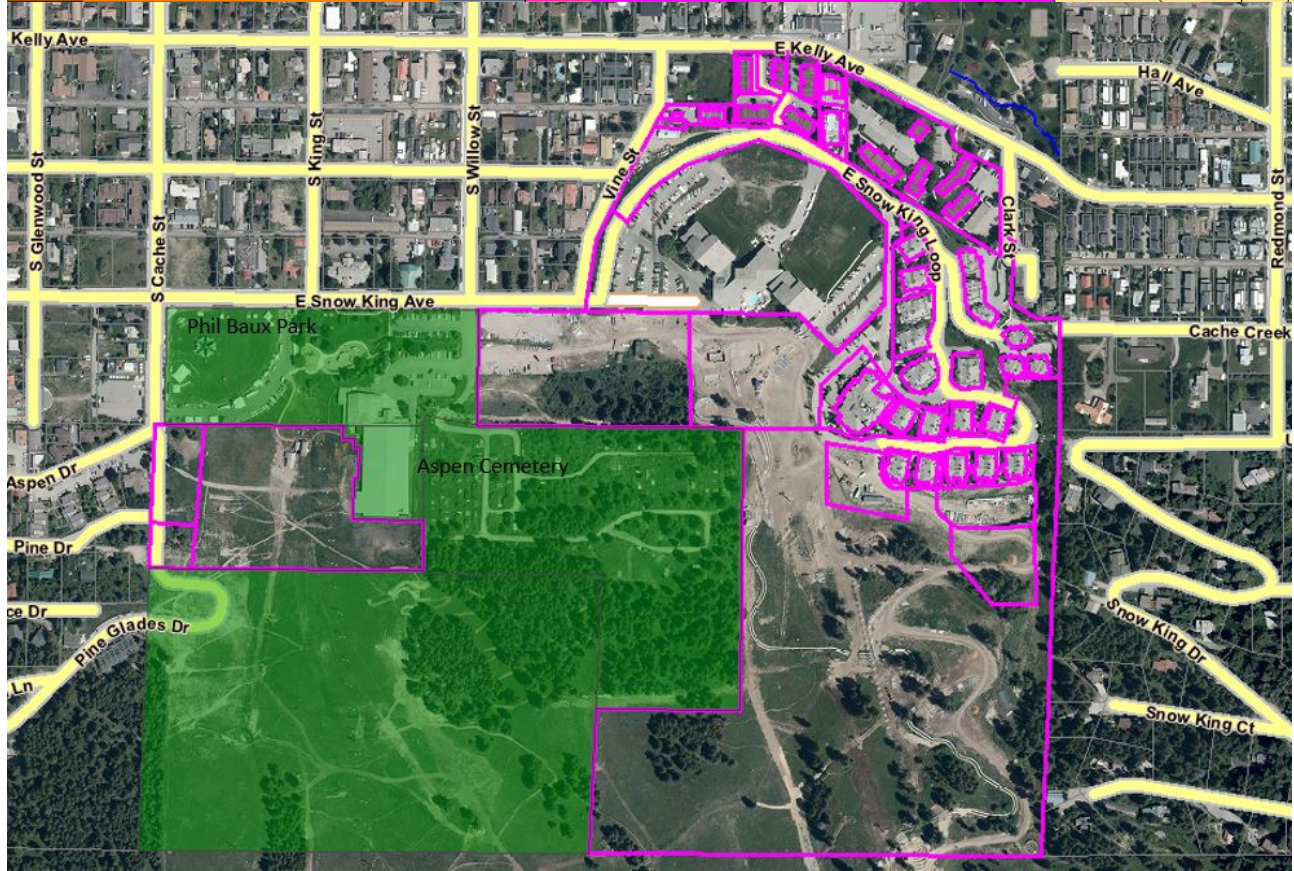
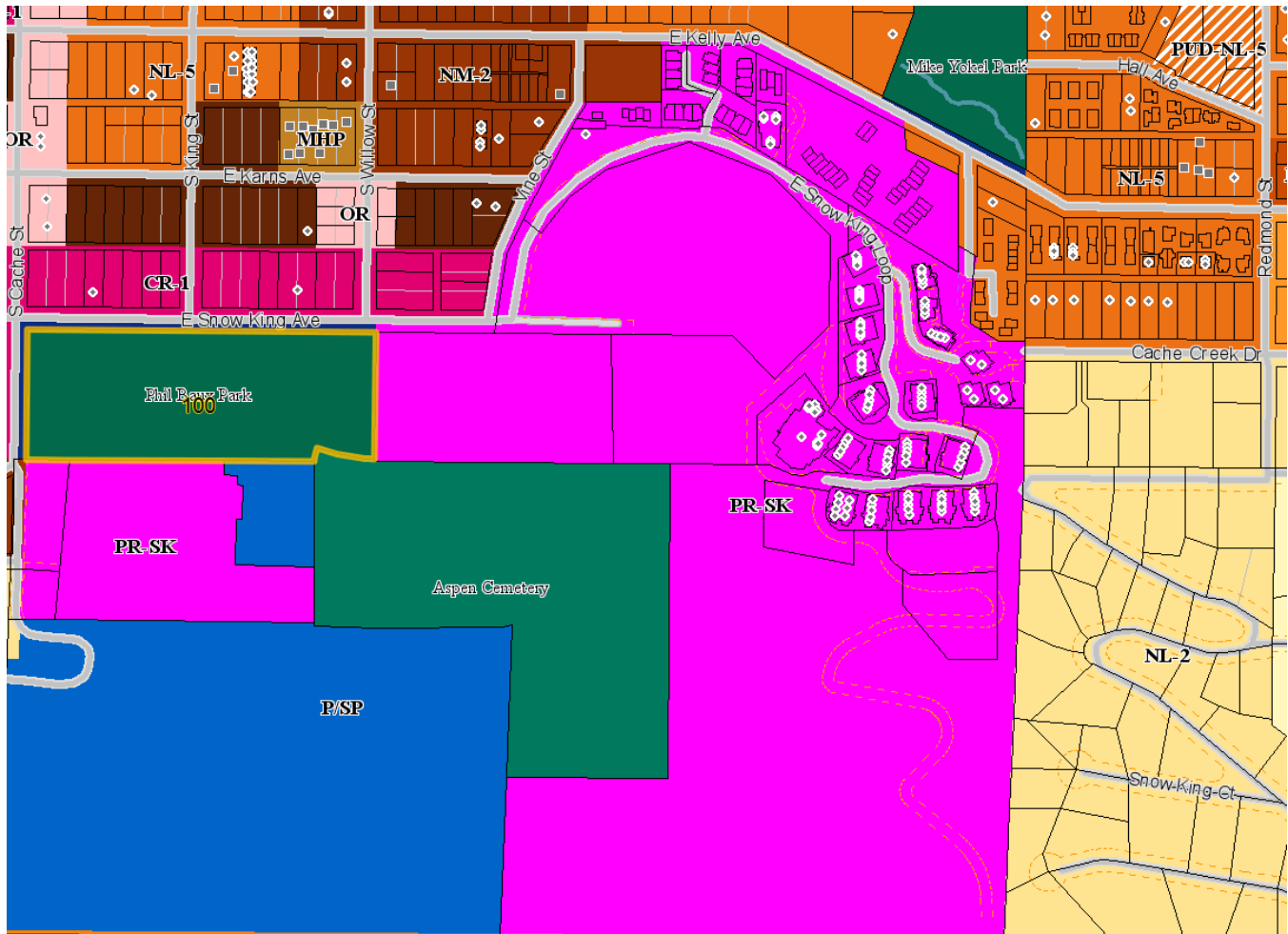
- A. Amendment to a Resort Master Plan pursuant to Section 8.7.3 Planned Unit Development
- B. Amendment to an associated Sketch Plan pursuant to Section 8.7.3 Planned Unit Development and Section 8.3.1 Sketch Plan.

APPLICABLE REGULATIONS

Section 8.7.3 Planned Unit Development
Section 4.3.1 All Planned Resort Zones
Section 4.3.2 Snow King
Section 8.7.1 LDR Text Amendment
Section 8.7.2 Zoning Map Amendment

LOCATION

Character District: 2: Town Commercial Core
Subarea: 2.1 - Snow King Resort
Zone: Planned Resort - Snow King (PR-SK) pink on below map
Overlay: N/A



BACKGROUND

The original Snow King Planned Resort District Master Plan was approved by the Town in December of 2000. During the months leading up to adoption the Town Planning Commission and Town Council had approximately 15 meetings to review and make changes to the plan prior to adoption. Subsequently the Town has approved two amendments to the Master Plan. The first included the removal of a ski lift that was to be located in the Clarke Knoll area, a decrease in the building setback along the eastern boundary from 100 to 70 feet and the relocation of some of the Love Ridge condominium buildings. The second amendment focused on changes to the Housing Chapter allowing individual projects to satisfy their housing requirements instead of housing being the overall responsibility of SKRMA. In addition, there have been numerous Development Plans approved at all levels (minor, intermediate and major) to allow development of the buildings and recreational improvements allowed under the plan including but not limited to:

- the Grandview and Love Ridge Condominiums (short term rentals),
- the Grandview Lodge (conference space, condominiums, office and unfinished second floor),
- One Town Hill Condominium project,
- the Rafferty Center Complex (two resort support buildings including ticketing, restaurant, and associated space)
- Mini golf course
- Mountain Coaster
- etc.

The original Master Plan allowed for a total of 915,000 square foot of total development and 2,208 guests measured by APO (average person occupancy) for lodging uses. In total approximately 351,662 square feet has been constructed to date and 1,113 guest APOs. Following is a more detailed breakdown:

Building Floor Areas (Above Ground) and APO's					
Used, Allocated and Available for Future Development					
		Building Floor Area		Lodging Capacity (APO)	
Existing Hotel		136,000	sf	408	Guests
Love Ridge Buildings 27 thru 36		81,354	sf	160	Guests
Grand View Buildings 48 thru 52		41,131	sf	80	Guests
Grand View Lodge and Spa (lot 55)		32,097	sf	32	Guests
One Town Hill - 680 S. Cache Street		61,080	sf	433	Guests
Total Used		351,662	sf	1113	Guests
Total allowed in the Snow King Resort Development		915,000	sf	2,208	Guests
Total Remaining		563,338	sf	1,095	Guests

Pursuant to the Master Plan and Land Development Regulations all projects within the Master Plan must first be reviewed and approved by the Snow King Resort Master Association prior to being submitted for review by the Town.

PROJECT DESCRIPTION

The following is a summary of the primary proposed amendments to the Snow King Planned Resort District Master Plan:

- Maps and associated text have been updated to reflect development that has occurred since the original Master Plan was created in 2000.
- Additional employee housing complex, mountain sports training facility, and maintenance shop proposed.
- Platted condominium/housing indicated for lots 53, 57, and 58.
- A second sheet of ice within the new/expanded ice rink.
- Expansion of the existing Lodge Room included for visual presentation only, recognizing that they fall outside the area governed by the Master Plan.
- A gondola, zip-line landing, and changes to parking proposed in the Phil Baux Park area. While, increased green space, a concert pavilion, public art, and landscaping improvements are also shown, these proposals fall outside the area governed by the Master Plan.
- Sub-Areas 6 & 7 are removed from Master Plan maps. Sub-areas were updated to be consistent with use within the sub area i.e. condo, hotel, recreation. Sub area 7 was removed from maps due to the limited part it plays in the Master Plan but remains referenced in text.
- Limited text updates were made to reflect general community developments and changes since 2000.
- References to a Mid-Mountain Lodge which was approved in the Master Plan have been deleted. This 25,000 square foot Lodge is proposed to be removed in exchange for support of a gondola and zip-line landing in the leased parking lot area of Phil Baux Park.

In addition, changes by Chapter are summarized below:

- I. Statement of Purpose and Existing Conditions
 - o Updated references to importance of conference business.
 - o Updated reference to Pine Lodge (now One Town Hill Condominiums).
 - o Updated references to Sub-Area 7.
 - o Updated maps to include satellite imagery of existing conditions and ownership changes since 2000.
 - o Updated ski area map and added map of accepted USFS Master Plan for the ski area.
- IV. Master Site Plans
 - o Updated Proposed Master Plan Map & Sub-Area Maps.
- V. Land Use Plan
 - o Updated references to a large daycare operation.
 - o Updated uses permitted within the recreation land use zone.
 - o Added a paragraph on uses not governed by this Master Plan.
- VI. Design Guidelines
 - o Changes to section on roof materials and design.
 - o Changes to reflect removal of sub-area 6 & 7 from maps.
- VII. Dimensional Limitations
 - o Added specific considerations for sub-areas 3, 4, and 5 with respect to dimensional limitations.
 - o Clarified FAR definition to reflect usage within the Master Plan.

- o Updated Sub-Area Maps.

VIII. Housing Element

- o Updated housing mitigation plan to change from a static mitigation rate to one that mirrors current Land Development Regulations.
- o Added reference to proposed employee housing complex on Vine St.
- o Updated housing requirements to be in-line with other ski resort housing requirements in Teton County.

IX. Transportation Elements

- o Updated section on street improvements to include reference to proposed improvements in the area of Phil Baux Park.
- o Added requirement for parking analysis associated with transportation demand monitoring requirement.

XI. Phasing and the Snow King Resort Master Association

- o Updated SKRMA requirements and role within the Resort District.

XII. Community Services Element

- o Added proposals for mountain sports training complex, support for a second sheet of ice, and Lodge Room enhancements.
- o Updated references to the community service elements that Snow King currently provides that were not noted on the prior Master Plan.
- o Added information on winter/summer uphill travel policies.
- o Updated trail system access support references.
- o Updated references to how Snow King directly supports and caters to community non-profits.

Staff notes that the applicant has also submitted amendments to their United States Forest Service Master Plan permit. Although those amendments are not directly part of this application they are interrelated. In addition, it should be noted that in order to implement portions of both the Town and Forest Service Master Plans, revised lease agreements with the Town for Town-owned property may be required (i.e. proposed plans for Phil Baux Park). Staff raises this issue of interrelated amendments only to inform the Council of the concurrent review/approval processes going on related to Snow King Mountain. Staff recommends that Council focus their comments primarily to the Town Master Plan amendment but not to be overly concerned about comments related to the Forest Service Master Plan or lease agreements. Staff will assist Council if it finds it important to consider improvements or commitments made outside the Town Master Plan that impact the amendments proposed.

STAFF ANALYSIS

Overview of New PUD Process

Pursuant the Section 4.3.1.C Legislative Act of the LDRs Planned Resorts shall be reviewed as follows:

Each Planned Resort Zone is subject to the legislative authority of the Town Council and to the findings and procedural standards outlined in Sec. 8.7.3. An approved Planned Resort Master Plan shall establish the development standards for that Planned Resort Zone.

While the Master Plan was previously reviewed as a development option approved as part of or “on top of” the property’s existing zoning, a PUD under the new LDRs is processed as a zone change (both map and text)

which is approved by ordinance, thus three (3) ordinance readings are required to officially adopt. It also has a requirement for a Master Plan that summarizes the primary development standards and uses required or allowed in the PUD for that particular property, creating individual development standards for each subarea. Under the LDRs a Sketch Plan review is also incorporated at this time. The Sketch Plan is a written and graphic representation of a development concept. The purpose of the Sketch Plan is to represent a proposed development at a preliminary, conceptual level of detail. Furthermore, it is the purpose of the Sketch Plan, through its preparation by the applicant and subsequent review by the Town, to identify development-related issues, which must be addressed in greater detail prior to or concurrently with the Development Plan to be submitted at a later date.

This site is located in a transitional area of Town slated for significant redevelopment by the Comprehensive Plan. As a Master Plan, many of the dimensional standards are project-specific and only can be determined by reference to the approved Master Plan. Future review of Development Plans is thus based primarily on determining consistency with the requirements of the approved Master Plan (not the LDRs, as is typical), which provides conceptual approval and direction for all future development of the site.

The applicant has submitted a track-change version, clean version and summary of changes to the Master Plan to show all proposed amendments to the Master Plan. Below staff will provide a summary of the changes and corresponding staff analysis by Chapter. In addition, certain issues identified by the Snow King Stakeholders Group that relate and/or affect the proposed amendment are also included.

Chapter 1: Statement of Purpose and Existing Conditions

Staff finds that the most significant change to the statement of purpose section relates to changes to the language regarding the convention center. The application proposes to remove the following statements:

The heart of our lodging business is meetings and conferences, and as such the proposed new Conference Center, is located in the center of our complex.

Jackson has long wanted a full service, year round convention center to complete its array of visitor services. This proposed Master Plan provides just such a convention center in a manner that will benefit the entire downtown area.

The deleted language would remove some of the current emphasis of the convention center as a key component to the overall purpose and vision of the Master Plan and role it was to play in the community. Staff notes that there is no proposed change to the location of the large convention facility located in Sub-area #2 at this time. However, the removal of this language may influence future discussion and direction as to the location and prominence of the convention center function in the Master Plan in the future. Staff has not proposed any specific changes to this section at this time but finds the Council should discuss the proposed changes and determine what level of importance the convention center should play in the Master Plan going forward. Discussion and clarification of this important theme of the Master Plan at this time will assist in any future changes to Sub-area #2 and the overall phasing plan.

In addition, staff finds that the proposed updates to the existing conditions, information, and maps are a significant benefit to the revised plan allowing the community to better understand what development has occurred and how it fits into future development. The revised maps also assist in considering amendments to building envelopes proposed in this amendment and in the future. The Existing Conditions Plus Approved Plan map on page 18, helps to illustrate the current location of proposed buildings primarily on the eastern edge of the Master Plan that are proposed to be amended in later Chapters. In addition, staff notes that the inclusion of the proposed 2014 Forest Service Master Development Plan - Upgrade Plan is appropriate for context and to

help consider its impacts on the private land at the base, however inclusion of the Plan should in no way imply approval of said plan by the Town. Comments on the Forest Service Master Plan will be provided by the Town separately, but review and discussion may occur during this review as the two are interrelated.

Chapter 2: Consistent with the Comprehensive Plan

The applicant has not proposed any changes to this Chapter. Staff notes that review of the Comprehensive Plan incorporated in the Chapter is against the 1994 Comprehensive Plan not the 2012 Plan. Although staff finds this acceptable as the Master Plan was based upon and remains rooted in the 1994 Comprehensive Plan, staff will be reviewing the proposed amendments for consistency with the 1994 and 2012 Comprehensive Plans in determining whether the required findings of approval can be made.

To provide context to the direction and vision for the Master Plan staff has added the following sections for Council consideration as you consider the proposed amendments.

The Snow King Resort is indicated on the Community Issues Map as having a unique role serving both the residents of the community and the visitor-based economy of the valley. The Resort is intended to be a "Community Resort" with unique access to residents. This access is exemplified by the public-private pathway and trail system, which is the integral fabric of the Resort.

Three important community character goals specially relate to Snow King: maintaining social and economic diversity, maintaining a balance between visitation and the community and to enhance this economic center through redevelopment. The proposed plan will maintain and enhance the social and economic diversity by offering a variety of potential uses internally within the resort. New commercial, office and retail space in facilities such as rooms, condominiums and conference areas will provide a balance of services for both guests and residents.

Chapter 3: Compliance with the Land Development Regulations

The applicant has proposed no changes to this Chapter. Staff notes that the Master Plan and associated LDRs set the maximum amount of development at 915,000 square feet and the maximum lodging capacity of 2,460 guests. This Chapter also outlines the required findings of approval required of the original Master Plan. One item that staff has identified to address not only in this Chapter but throughout the Master Plan is updating referenced LDR sections to the applicable current LDRs when appropriate and retaining the previous LDRs and associated standards when appropriate. Staff does not find that this will have any effect on the content of the Master Plan or on the appropriate review standards and findings.

Chapter 4: Master Site Plans

The applicant has revised the master site plans to reflect buildings and improvements that have been completed to date, new Sub-area locations and amenities and the relocation of some buildings within proposed Sub-area #3. The applicant has proposed to reduce the total number of Sub-areas from 7 to 5. Specifically, the applicant has removed previous Sub-area #7 which contained development that had occurred prior to the adoption of this Master Plan and consolidated two other Sub-areas into a new Sub-area #3 which includes similar condominium style of development. Staff is recommending one change that Sub-area #1 be amended to include all of the Grandview Lodge building. The included trails and sidewalk plans have remained unchanged.

Chapter 5: Land Use Plan

The purpose of the Land Use Plan Chapter is to primarily establish the allowed uses within the Master Plan. The Chapter divides this topic into two specific areas: 1) Uses Permitted within Building Envelopes and 2) Uses Permitted within the Recreation Land Use Zone. Within the Building Envelope areas staff notes the only significant change is the removal of discussion regarding a planned Day Care facility. The applicant has proposed changes/clarification to the allowed uses in the Recreation Land Use zone primarily to incorporate uses such as ziplines, yurts, splash pads and water features, mountain coasters, mazes, ropes courses, outdoor food and beverage facilities, and pathways not specifically called out before (see page 46). In addition, the applicant has proposed these uses by right, which is a change from the Limited Use status they currently hold in the Master Plan. Staff is recommending that all Outdoor Amusement/recreation and Commercial Amusement uses be allowed only through application for a Conditional Use Permit. Staff finds that the level of interest from the public on these types of amenities in the past has been significant and the ability of the public and Town to review specific proposals for neighborhood compatibility will be important moving forward. Staff also notes that the Council may want to consider if any of the proposed amenities should not be allowed to be proposed. The final page of this Chapter provides an Example Development chart. Although the purpose of this chart was not to bind the applicant to the square footages and uses indicated in it, it was helpful to illustrate a possible development example of how the total amount of square footage could generally be allocated throughout the Master Plan. Staff is recommending that the applicant revise the Example Development chart to reflect the new proposed Sub-areas and associated uses and square footages to reflect what has been built to date and what is anticipated in the future. Staff notes that square footage allotments are not prescribed in the Master Plan by Sub-area or building envelopes although private transactions serving this purpose may have taken place. The actual amount of square footage and allowed uses are only determined at time of Development Plan approval. This Chapter refers to improvements on Town property and Forest Service Property, discussion of this topic is provided below.

Chapter 6: Design Guidelines

The only significant change to this Chapter is related to the type of roof materials that may be used. Staff has no concerns with the proposal. Staff is recommending that all buildings be reviewed by the Town Design Review Committee (DRC). The DRC review would be limited to review against the Master Plan Design Guidelines only. Staff is recommending this amendment to better assist staff and the community to ensure the design vision and guidelines outlined in the Master Plan are upheld by trained professionals. Staff notes at the time of adoption of the original Master Plan the Town did not have a DRC to assist in this type of review.

Chapter 7: Dimensional Limitations Plan

The Master Plan amendments proposed call for amendments to the Building Envelopes and allowed uses within Sub-areas 3, 4 and 5.

Sub-Area 3

Sub-area #3 proposes revised or new building envelopes related to 3 platted lots created in this area after adoption of the Master Plan in 2000. The 3 lots do not neatly correspond to any of the existing building envelopes in the current Master Plan. The proposed amendments would relocate and/or create new building envelopes associated with the existing platted lots. See below an illustration of the current building envelopes in this area and the proposed revised locations.



Current



Proposed

The proposed amendments including the two building envelopes (Lots 53 & 58) on the eastern edge of the Sub-area continue the style, and bulk and scale of the existing Love Ridge and Grandview developments further up the hillside. The third building envelope (Lot 57) located to the west of the previous two is located in an area where development was not previously contemplated. All proposed building envelopes would allow three (3) story structures in a single or multiple building. Currently structures in this area are allowed to be two (2) stories in height and are broken into multiple smaller buildings. Staff is generally comfortable with the proposal for Lots 53 and 58 with the exception that additional language should be added to ensure compatibility with the neighborhood to the east including but not limited to stepping down the building height, additional landscape screening, etc. Staff does have some concern over the possible location and size of the proposed building on Lot 57 specifically its impact on the adjacent ski area. Staff is recommending language be added to the plan to specifically address this issue at time of Development Plan review, including but not limited to shifting the building to the east, reducing the footprint of the building, breaking it up into multiple buildings, etc.

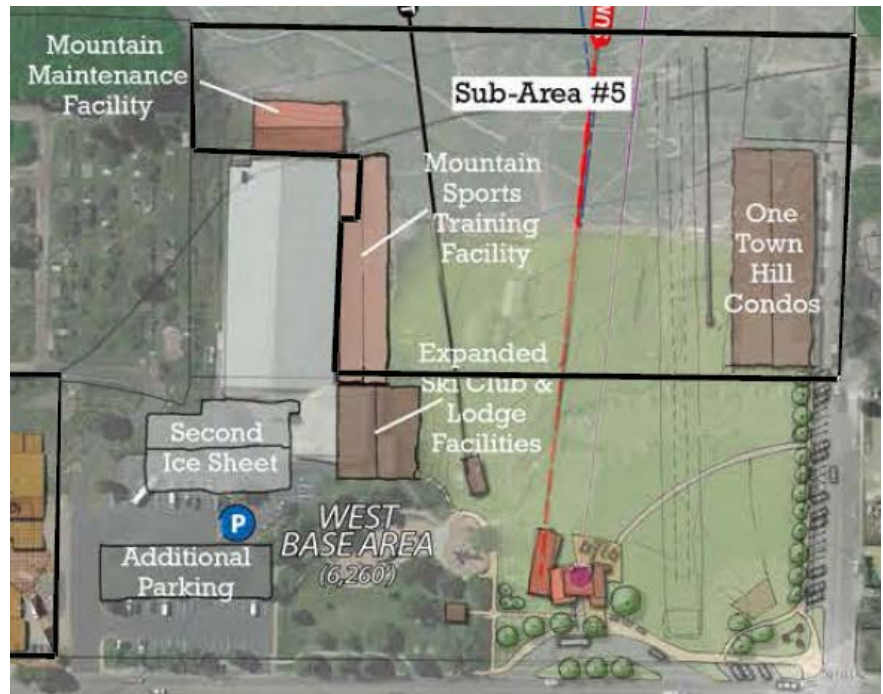
Sub-area #4

The most significant changes in Sub-area #4 are the removal of the Mid-Mountain Lodge and replacement of the maintenance facility along Vine Street with a mountain maintenance storage and employee housing building.

Staff has some concern over the compatibility of the mix of uses proposed on the Vine Street site. Combining employee housing with primarily a light industrial use may be difficult to ensure the safety and enjoyment for all. Staff is recommending further detail be provided on the storage proposed and the possible removal of this use from the location. As an alternative the applicant may consider separating the two proposed uses into multiple building on the site. Staff also has some concern regarding the bulk and scale of the proposed building due to the size of the proposed building envelope, and proposed height of 42-46 feet. In considering height the applicant shall provide information regarding the elevation to the rear of the property and consider the height of the surrounding zoning districts. Staff is also not supportive of approving at this time no parking on site, especially for the employee housing. Staff has recommended an amendment to reduce the proposed building envelope, reduce the proposed height, to remove the discussion of parking from the Master Plan, and thorough review and consideration of the proposed uses through a Conditional Use Permit.

Sub-area #5

The applicant has proposed to add two additional building envelopes in this Sub-area, one for a maintenance facility and one for a mountain sports training facility. Staff is generally supportive of the location, bulk and scale and uses proposed being compatible with those existing. Additional facilities included in this area on Town-owned property will be discussed below. Staff has added an amendment to ensure that all development in this area but especially the proposed mountain maintenance facility meet all LDR hillside development requirements in place at the time of Development Plan.



Chapter 8: Housing Element

Staff is very supportive of the applicant's proposal to amend the Master Plan to require all future development to meet the requirements of the then-current Town Land Development Regulations. This change places development within the resort at the same mitigation rate of all other property owners in Town. In addition, staff is very supportive of the inclusion of the proposed seasonal employee housing along Vine Street. Staff notes that these units under the new regulations would not be able to be utilized to meet future housing requirements as housing for seasonal employees no longer qualifies as mitigation and so housing seasonal workers is now the responsibility of each property owner. By taking the proactive approach to provide needed seasonal housing, (even though it is not required), while still meeting the need for housing full time year around employees generated by future development, the amendments are perfectly in line with the recent amendments to the Town's housing requirements. Staff has suggested an amendment to remove the proposed language regarding banking of credits as this is taken care of in the new housing regulations and is not needed in the Master Plan.

Chapter 9: Transportation Element

The Transportation Chapter of the Master Plan is divided primarily into two sections: 1) Transportation Demand Management and 2) Shared Parking. The most significant comment related to this Chapter from staff, including Planning, Pathways, START and Engineering, is the need to update it to incorporate the most current data and transportation improvements that have been made. All Town departments listed above have provided substantial comment on this application that should be reviewed and considered by the Council (see attached). Below staff has provided more general comments and proposed amendments based upon Planning review and review of comments by other Departments. All of the proposed departmental conditions are attached. The Council may want to recommend additional amendments to this Chapter.

Transportation Demand Management

Based upon required traffic monitoring every three years since adoption of the Master Plan, the applicant has largely been successful in meeting the transportation and mode shift goals outlined in the Master Plan. With

that being said staff finds that much more focused consideration related to the Transportation Demand Management (TDM) plan could be incorporated into the plan at this time to ensure the identified goals continue to be met into the future. Specifically, START has recommended that the applicant be required to better integrate and utilize the START system as an alternative means of accessing the resort by employees, guests and visitors. Specifically, START would have the following be requirements of the TDM program moving forward:

- o Provide free or reduced-level bus passes to all employees
- o Provide free or reduced-level bus/bike passes to guests
- o Require off-site parking for employees
- o Provide START Bikes and promote alternative modes of travel for employee and guests
- o Promote transit usage in marketing and website promotional material

Parking

Much time and energy was put into the overall shared parking approach incorporated into the existing Master Plan. With a few exceptions (special events, holiday weekends) staff finds that the shared parking approach adopted in the plan has largely been successful in balancing the need to provide new surface parking concurrent with new development and the ability to share largely existing and some new parking with new amenities without a significant increase in parking. Staff also notes that parking in this area certainly must be viewed not only from the demand created by the resort but also from the public uses surrounding it including: Ice Rink, Phil Baux Park, etc. Staff also finds that both on-street and off-street parking must be considered when discussing parking in the area. Staff notes that the specific pick up and drop areas and parking shown on Town right of way and property are not being considered or approved as part of this plan. Staff finds that this specific area will need to be cooperatively addressed moving forward to develop the best approach to accommodating the diversity of needs in the area. The pathway coordinator also notes that over parking in the area will be counterproductive to meeting the alternative transportation goals of the plan. The proposed amendments to the Forest Service Master Plan including significant increases in skier days and overall recreational amenities of the resort will need to be considered. At this time staff is recommending that the applicant be required to pave and maintain the availability of the surface parking lots in Sub-area #2 for use by all patrons to the area to address the current demand and future demand of the resort within the Forest Service Master Plan and surrounding land uses. As specific uses and developments are added to the area the resort and surrounding land owners will need to work cooperatively to address future parking and TDM needs going forward.

Chapter 10: Capital Improvement Plan

The Town Engineering Department have provided substantial comments based upon review of the Capital Improvement Plan (see attached). The primary comments and conditions are that the applicant revise the infrastructure information provided in the current plan to include improvements that have been done since that time and include new proposed amenities and buildings in the analysis. In addition, Engineering has asked that the applicant verify that previous conditions of approval have been satisfied and if so to delete those conditions from the Master Plan.

Chapter 11: Phasing and the Snow King Resort Master Association

The applicant has proposed amendments to this Chapter to clarify to role and responsibilities of the Snow King Resort Master Association (SKRMA) going forward. The proposed amendments do not include significant updates to the limited phasing plan in the current Master Plan. Staff finds that significant additional detail must be provided regarding the SKRMA responsibilities going forward and to identify the related action that will be

taken if the defined responsibilities are not met. Specially, the Chapter could include areas identified during the Snow King Stakeholder engagement process which are as follows:

- Ensure SKRMA is a functioning entity as described in the year 2000 Resort Master Plan agreement, which is the current agreement with TOJ.
- Present the SKRMA “entity structure” to the TOJ council to agree on “mutual” compliance.
- Clearly define SKRMA’s responsibilities and members to avoid future “open to interpretation” issues
- Develop an agreement on commitments that functions in perpetuity that is transferable to any/all new owners
- Clarify and separate where appropriate SKRMA commitments from Snow King Mountain commitments
- Clarify where the SKRMA and Snow King Mountain commitments overlap and are connected.
- Require a financial commitment from all SKRMA members consistent with the current SKRMA/TOJ agreement.
- Ensure adequate parking; develop transportation demand management (TDM) plan
- Clarify maintenance expectations and requirements, including snow removal
- Contribute some percentage of fees/dues to support recreation (community center, ice rink, grant funding, etc.)
- Re-visit and confirm funding requirements per the 2000 Resort Master Plan with TOJ. (Or propose a new mechanism to TOJ.)

In addition, it is important to clearly define the role of SKRMA separate from the role and responsibilities of Snow King Mountain. Specially, the Chapter should include areas identified during the Snow King Stakeholder engagement process which are as follows:

- Maintain clear and negotiated hours of lift operations (current hours desired but acknowledgment that needs may change in the future)
- Develop procedural agreement with Town of Jackson regarding how/when to allow closures for conditions (summit and ski hill)
- Ensure / negotiate affordable rates for locals with Town of Jackson (Details TBD; different definitions of “affordable” and “local” make it tricky.)
- Maintain access for current user groups

In addition, staff finds that significant additional detail must be provided on a proposed phasing plan. Staff finds that specific information related to public benefit and improvements as required by the Master Plan need to be clearly laid out and understood. Staff finds that much of the confusion and frustration with the current Master Plan shared by the public, applicant and staff is that items such as SKRMA and Snow King Mountain responsibilities and a detailed phasing plan establishing when and how the public portions of this plan are integrated into the private development aspects are not clear.

Chapter 12: Community Services Element

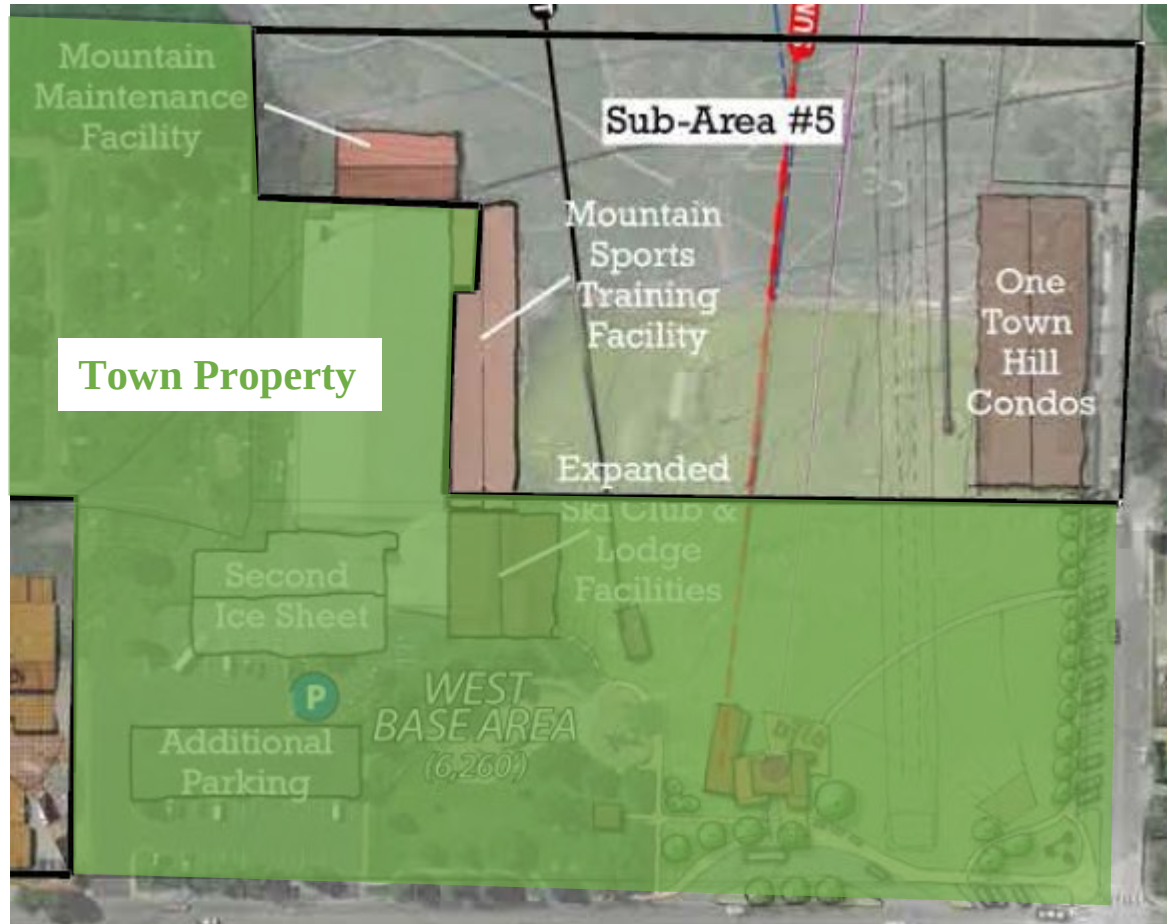
The applicant has provided amendments and updated this Chapter to better reflect the Community Services/Benefit that has been provided to the community since the adoption of the Master Plan and ideas and proposals on how this will work moving forward. Most significantly the applicant mentions inclusion of a Mountain Sports Center, support for the Ski and Snowboard Club with an expansion and improvements to their

existing facilities, many on mountain improvements, including a new gondola, summit facility and observatory, and other community benefits.

Staff's comment similar to the last Chapter is that significantly more detail and an associated phasing plan/timeline must be developed to support the many good ideas and benefits described herein. Again as stated above much of the confusion and frustration with the current plan is the lack of clarity around what is to be expected from SKRMA as it relates to this Chapter and what happens if it is not provided. Staff acknowledges that the specifics of this Chapter are in some ways directly related to proposals by the applicant on adjacent Town property and to the United States Forest Service related to activities on the mountain. Staff would have the Town Council consider what specific details and timelines should be associated with the Master Plan and other developments on adjacent property in order to approve this amendment.

Town Property

Staff finds it appropriate to provide the Town Council comment on the proposed gondola and zip line proposed on Town Property as it is interrelated to the Master Plan being considered. Staff will not provide additional comment at this time regarding the remainder of the applicant's proposal to the United States Forest Service, but has provided a summary of this proposal as an attachment to this report.



Staff is generally supportive of the proposed gondola on Town property if it is able to be located in such a way to maximize its continued use as a multi-use outdoor area, allow continued connectivity for all modes between all portions of Phil Baux Park and not interfere with the historic and ongoing public use of this area for special events, recreation and unorganized play. Staff does not support the location of a proposed zip line in this area. Staff finds that a key component of the Master Plan is to concentrate private/commercial use of the mountain

to the eastern portion of the resort (east portal) currently the location of the alpine slide, mountain coaster, mini-golf, ropes course and maze. Staff finds that if a zip line is incorporated into the Master Plan this would be a preferred location. Staff finds that by grouping all these similar amenities in one location that the associated parking, restrooms, food and beverage, ticketing, etc., can be provided in one convenient spot. As a result the western portion of the resort (west portal) can be the more public/noncommercial side focused on outdoor pursuits including the park, biking and hiking in the summer and skiing/tubing in the winter. Please see detailed comments from the Parks and Recreation Director attached, along with minutes and a letter from the Parks and Recreation Board on this topic.

PLANNING COMMISSION SUMMARY AND RECOMMENDED AMENDMENTS

On September 19 and 20, 2018 the Town Planning Commission heard Item P18-208 an amendment to a Resort Master Plan pursuant to Section 8.7.3 Planned Unit Development and an amendment to an associated Sketch Plan pursuant to Section 8.3.1 Sketch Plan. The Commission received a presentation from staff and the applicant regarding the application, engaged in a question and answer session with the applicant and staff and received public comment. Upon the conclusion of the item on September 20, the Commission continued the item to the Regular Planning Commission meeting on October 3, 2018. The Commission directed staff to provide a summary of the discussion held by the Commission to date and revised amendments based upon the Commission's chapter by chapter review. At the October 3 meeting the Commission recommended approval of the application to Town Council with 27 suggested amendments. Below staff has summarized the Commission discussion and analysis of the application and provided their recommended amendments. Staff recommended amendments are the same as those of the Planning Commission at this time.

Chapter 1: Statement of Purpose and Existing Conditions

The Commission discussion focused on whether the proposed deletion of wording related to a convention center was appropriate at this time. The Commission discussed that it may be appropriate to remove this language if the desire of the community and intent of the applicant was to no longer provide this amenity as a key focus of the plan. In addition, the Commission discussed whether the community still desired such a focus with the associated job generation and shoulder season promotion as was approved in 2000. The Commission discussed that it would benefit the community to have the applicant identify what the new focus of the plan would be if no longer a convention center. The Commission wondered if the new vision should be more focused on the "Town Hill" recreational amenities and associated lodging with clarification that the existing conference space would meet future needs. The benefits of this would be to allow future Commissions and the community to have a clear understanding of the future vision for the Master Plan replacing the convention center focus. The Commission discussed that if the applicant was not prepared to do that at this time that the purpose statement could be revised to include language related to consistency with the vision in the Comprehensive Plan for this area. Specifically, the Commission stated that clarifying the future intent would assist in reviewing future amendments to Sub-area #2 if a convention center may no longer be desired as currently in the Plan. The Commission discussed but did not conclude whether they preferred to review revised language related to this topic or whether the final review and consideration could be by Town Council based upon the Commission discussion and direction.

At the October 3 meeting, the Commission discussed that the applicant's letter submitted since the previous meeting further addressed the issue and the Commission was comfortable with the recommended amendment to this chapter.

Planning Commission Recommended Amendments:

1. **Chapter 1:** The applicant shall revise the Master Plan to clearly define a modern vision for the Master Plan moving forward including what the role, function and location of the convention center will play

or not. If this is not possible the Plan should be amended to include a vision moving forward to better align with the 2012 Comprehensive Plan and community's goals today. The defined new vision would be used to review future land use changes in the Plan specifically but not limited to Sub-area #2.

Chapter 2: Consistent with the Comprehensive Plan

The Commission had a brief discussion regarding the applicability of both the 1994 and 2012 Comprehensive Plans and discussed that both Plans should be utilized in making the required findings for the application.

Planning Commission Recommended Amendments:

2. **Chapter 2:** Applicant shall revise Chapter II to include compliance with the 2012 Comprehensive Plan and the interrelatedness of the 1994 and 2012 Comprehensive Plans.

Chapter 3: Compliance with the Land Development Regulations

Staff clarified for the Commission that there were no content amendments proposed and that it was staff's intent with the recommended amendment to update the 2000 Master Plan to include 2018 LDR references only.

Planning Commission Recommended Amendments:

3. **Chapter 3:** Applicant shall work with staff to update references to the Land Development Regulations to incorporate the current Land Development Regulations as required.

Chapter 4: Master Site Plans

The Commission discussed that the building currently located in two sub-areas should be placed in which ever sub-area (1 or 3) that best matched the desired future character. In addition, it was clarified for the Commission that this item did not affect the total amount of floor area allowed in the Master Plan as that was capped at 915,000 square feet. The Commission recommended that the applicant may want to revise the sub-area map to provide better contrast between existing and proposed buildings prior to Town Council.

Planning Commission Recommended Amendments:

4. **Chapter 4:** Applicant shall revise Sub-area #1 or #3 to include all of the proposed building currently split between two sub-areas into one.

Chapter 5: Land Use Plan

The Commission discussed that adding new recreational uses was appropriate based upon new types of uses including splash pads and zip lines that were not known in 2000 when the Plan was originally approved. The Commission discussed at length whether a CUP should be required for all Outdoor Amusement/recreation and Commercial Amusement uses or whether there should be a threshold that would allow for staff level review. The Commission discussed that a CUP process provided transparency to the public and an opportunity for public comment on these types of uses in order to determine such characteristics as hours of operation, lighting, smell, noise, etc., on a case by case basis. The Commission had discussion on whether temporary uses should be allowed without a CUP and directed staff to come back with some ideas for the Commission to consider related to thresholds for temporary uses and how temporary uses would be defined.

At the October 3, 2017 meeting there was additional discussion regarding temporary uses. The Commission revised the amendment to address concerns about multiple temporary uses occurring over many years operating like a permanent use. In addition, the Commission added language to ensure that all improvements associated with the temporary use would have to be permanently removed upon expiration of the temporary use. The

Commission discussed examples, such as a horse riding stable or construction staging area, which should not be allowed for approval as temporary uses year after year as only a basic use permit.

Planning Commission Recommended Amendments:

5. **Chapter 5:** Applicant shall revise the proposed land use schedule to require a Conditional Use Permit for all permanent Outdoor Amusement/recreation and Commercial Amusement uses.
6. **Chapter 5:** Applicant shall revise the proposed land use schedule to require a basic use permit for a temporary Outdoor Amusement/recreation and Commercial Amusement uses. Temporary shall be defined as a use occurring for a period of less than 180 days per year. Upon expiration of the temporary use the operation of and all associated improvements shall be completely removed from the property. There shall be a limit of two basic use permits allowed per use thereafter the use shall be considered a permanent use and require a Conditional Use Permit.
7. **Chapter 5:** Applicant shall revise the Example Development chart (in all locations) to reflect the new proposed Sub-areas and associated uses and square footages to reflect what has been built to date and what is anticipated in the future.

Chapter 6: Design Guidelines

The Commission discussed the example of the One Town Hill not being required to present to the Town Design Review Committee and should it have? The Commission was supportive of staff's recommended amendment to require Design Review Committee review of Master Plan buildings going forward.

Planning Commission Recommended Amendments:

8. **Chapter 6:** Applicant shall revise the Chapter to include a requirement that all buildings be reviewed for compliance with the Master Plan Design Guidelines by the Town Design Review Committee.

Chapter 7: Dimensional Limitations Plan

Sub-Area 3

The Commission discussed that the use on these Lots (53, 57 & 58) was likely to be condominiums similar to what has been built already in the area and that the Commission was comfortable with that. The Commission discussed that at one time Lot 57 was intended to house the ski school and other mountain facilities. The Commission asked who owned the Lots and it was stated that there is a common owner for Lots 53 and 58 and a separate owner for lot 57. The Commission asked what the setback was on the eastern property boundary, staff responded that it was 70' and that the land included in the 70' setback is owned by a separate owner than the owner for Lots 53 and 58. The Commission discussed the bulk and scale of the buildings and how that would be controlled. Specifically, the Commission had concern with the height and associated bulk and scale of Lot 57 might be too large in comparison to that of Lots 53 and 58, especially if Lot 57 is developed with one large building instead of multiple buildings, and recommended additional language be included in the proposed amendment to address this concern. Staff clarified that the required employee housing would be included in the 3 story height limit. Staff reviewed for the Commission that there was previously a building approved and issued a building permit on Lot 53 although never built. The proposed building was outside the allowed building envelope.

Sub-area #4

The Commission was comfortable with the removal of the mid-mountain lodge and development of a similar facility at the summit. The Commission noted that the Town was proposing a very similar mixed-used building as proposed on Vine Street at the Parks and Recreation facility on Snow King Drive. The Commission discussed

what the proposed uses for the first floor of the proposed mixed use building were. The Commission discussed the worst case scenario of having light industrial uses like welding and automotive repair on the first floor with residential units above and across the street. A Commissioner noted that currently there is a lack of storage on the site with noise and uses not compatible with the adjacent neighborhood including ATVs and trash hauling. The applicant stated they were intending to use the facility primarily for storage to address neighborhood concerns. The current use of the facility for on mountain machines and repair would be relocated to behind the ice rink. The Commission was not comfortable addressing the parking now and found that should be addressed at time of Development Plan. The Commission found the CUP would allow the neighbors to weigh in on the specifics of the application at a later date. The Commission discussed the size of the existing building envelope and staff concerns with its size, and lack of setbacks. The Commission discussed the need for and lack of a sidewalk on Vine Street and noted that it was a START bus route. The Commission discussed the proposed height of the structure being 3 stories and 42-46 feet and whether it should be limited to 39'. Upon discussion of the need for employee housing and height of the hill behind the Commission was comfortable with the height as proposed. The Commission discussed not allowing light industrial uses in this Sub-area but concluded that it could be allowed through a CUP.

Sub-area #5 and Town Property

The Commission stated that they preferred to discuss Sub-area #5 and the adjacent Town owned property and proposed uses at one time. The Commission asked what the current lease arrangement of the Snow King Center was. The applicant stated that the ice rink is leased to Center Management Inc. and the Lodge Room, Ski Club Office, kitchen, etc., are leased to Snow King Mountain. The Commission discussed the location of the zip line and the impact of the noise associated with it. The Commission noted there was concern from the public regarding a zip line in general, and whether one should be allowed at all in the Master Plan. Commissioners spoke in favor of locating the zip line as proposed adjacent to the gondola on the west side of the resort and/or as recommended by staff on the eastern side of the resort. In conclusion the Commission was open to locating a zip line in the Master Plan, with some preference to locating it on the west opposed to the east side as proposed by the applicant.

A Commissioner asked, "what was the benefit to the Town to a private gondola being located on Town owned property". In response Commissioners stated that the proposed improvements to Phil Baux Park, opening up of the base area to reduce congestion and more contiguous and functional green/white space in the area were benefits to the community. The Commission discussed it was a fine line between using private funds to improve the area with maintaining or improving the public use of the area but agreed that Snow King should provide money to improve Phil Baux Park if public land was being used for private purposes. It was discussed that if the gondola was located on Town property it should be located as far south as possible but generally at the same elevation as the street for accessibility. The location of the gondola should be visible from the street to attract people to it. In addition, it was stated that the investment of private funds now might allow for private operation of the Mountain into the future without public funds being required. The Commission noted that much more detail and discussion would be needed to ensure circulation for vehicles and pedestrians was successfully incorporated into a redesign. Staff clarified that the Town is not recommending a specific location of the gondola now, just the parameters to which the Commission would consider a redesigned Phil Baux Park at a later date.

The Commission discussed that the current shared parking approach was working and that the Commission did not generally support the building of more parking, but areas could be reserved for parking if needed in the future (South Cache). Discussion was had between the different parking needs in the summer versus winter. The Commission also discussed the vision of the Comprehensive Plan to utilize alternative modes of transportation, balanced with the practical need for parking. The Commission discussed that pick up and drop off in the winter was more important than in the summer as guests have more gear. The Commission discussed

that parking needs in the area should be looked at as a whole (shared parking) between public and private uses (park and mountain) and locating parking on the periphery of the area was preferred compared to locating it within the site so as to not divide the proposed open space and allow circulation without interruption by surface parking Lots.

At the October 3 meeting there has additional discussion regarding the location of the proposed gondola in Phil Baux Park. The Commission clarified that their desire was not to have the gondola located next to the Snow King Avenue curb, but to the south clustered near the existing lift and other improvements. The Commission reiterated that it was their intent to accommodate as much open space as possible and not bifurcate the park. The Commission discussed that there may be other alternatives to accessing the proposed gondola then from the street for example from the parking lot adjacent to the ice rink. In addition, the Commission stated that the CUP will be the opportunity to determine the exact location of the gondola and that the proposed amendments were intended to provide the applicant direction prior to review of the CUP.

Planning Commission Recommended Amendments:

9. **Chapter 7:** Applicant shall include language in Sub-area #3 for Lots 53 and 58 to ensure compatibility with the neighborhood to the east including but not limited to consideration at time of Development Plan of stepping down the building height, additional landscape screening, etc.
10. **Chapter 7:** Applicant shall include language in Sub-area #3 for Lot 57 to ensure compatibility with the recreational area to the west including but not limited to consideration at time of Development Plan to shifting the building to the east, reducing the footprint of the building, breaking it up into multiple buildings, etc. In addition, the applicant shall include language to address bulk and scale concerns with the proposed structure including stepping down the building height, reducing the building height to 2 stories, etc.
11. **Chapter 7:** Applicant shall revise the plan to include a requirement for alternative transportation mode improvements to connect the Master Plan to Cache Creek Drive including paving, bollards, signage, and other best practices.
12. **Chapter 7:** Applicant shall revise Sub-area #4 to reduce the proposed building envelope, to remove discussion of parking and to require a thorough review and consideration of the proposed uses through a Conditional Use Permit both onsite and with the surrounding neighborhood. The applicant shall revise the proposed building envelope on Vine Street to allow for a sidewalk and Complete Street cross section connecting the facility to the resort.
13. **Chapter 7:** The applicant shall revise the use table to allow light industrial uses in Sub-area #4 and #5.
14. **Chapter 7:** Applicant shall provide language in this Chapter to ensure that all development within the Master Plan shall meet the LDR hillside development requirements in place at the time of Development Plan.
15. **Chapter 7:** The applicant shall revise the language in the plan to require a CUP process to determine a final design of Phil Baux Park. The revised plans would allow the landing of the gondola on Town property in a location that does not divide the park. In addition, site circulation for all modes of transportation should be addressed including the location of parking, pick up and drop off, locker areas, START bus stops, etc. Buildings and improvements should be clustered together near existing improvements to obtain as much open space as possible. The detailed plan should locate improvements generally at the street level to address accessibility and ease of access during all seasons.

Chapter 8: Housing Element

The Commission asked about where the location of the required housing would be. Staff responded that the new Town regulations would require the applicant to provide the housing on site first and that it is anticipated that more than the currently required 30% on site would be provided.

Planning Commission Recommended Amendments:

16. **Chapter 8:** Applicant shall revise the Chapter to remove language regarding banking/credits for units.

Chapter 9: Transportation Element

The Commission asked questions regarding the current Transportation Demand Management plan. The Commission found that the current TDM covered this topic well and that additional changes in addition to those provided by staff were not required. There was discussion of when additional parking would be needed. The Commission agreed that the applicant should be required to include parking counts as part of its transportation monitoring requirement and that these counts would help determine when additional parking would be needed in the future. The Commission also found that the timing of paving the parking areas required in Sub-area #2 could be addressed in the applicant's phasing plan.

Planning Commission Recommended Amendments:

17. **Chapter 9:** Applicant shall revise the current TDM requirements to include the following additional measures:
- o Provide free or reduced-level bus passes to all employees
 - o Provide free or reduced-level bus/bike passes to guests
 - o Require off-site parking for employees
 - o Provide START Bikes and promote alternative modes of travel for employee and guests
 - o Promote transit usage in marketing and website promotional material
18. **Chapter 9:** Applicant shall revise the Chapter to incorporate the most current data and transportation improvements that have been made.
19. **Chapter 9:** Applicant shall be required to pave and maintain the availability of the surface parking lots in Sub-area #2 for use by all patrons to the area.
20. **Chapter 9:** Applicant agrees to participate in a TDM program development for the entire Snow King Base area with other surrounding property owners and users.
21. **Chapter 9:** Applicant shall provide parking counts for all surface parking lots over 10 spaces as part of the required transportation monitoring requirement.

Chapter 10: Capital Improvement Plan

The Commission concurred with the recommended amendments by staff. Staff confirmed that the Town was not committing to what the Snow King streetscape would be with this plan.

Planning Commission Recommended Amendments:

22. **Chapter 10:** Applicant shall address all conditions in the Town Engineer memorandum dated September 12, 2018.

Chapter 11: Phasing and the Snow King Resort Master Association

Staff reviewed the minimum commitments under the proposed Master Plan for the Snow King Resort Master Association (SKRMA), and Snow King Mountain that were provided by the applicant. The Commission asked questions regarding the makeup and funding ability of SKRMA. The applicant responded that SKRMA is essentially made up of three entities, Snow King Mountain, the Hotel (JMI) and the Condominium Associations. Essentially each of the three entities has one vote on items related to the Master Association. As this relates to funding of SKRMA expenses are split evenly 1/3 each for each entity, and that individual entities were then responsible for further dividing expenses however they would like within their individual entity. The applicant gave an example that the condominiums spread their expense responsibilities equally amongst the individual owners through annual fees or special assessments. The Commission discussed the ability of

SKRMA to use special assessments in addition to annual dues to meet the obligations under the Master Plan. The Commission discussed that the money-making portions of the Master Plan should be responsible at some level to ensure that the recreational amenities, primarily the Town Hill, be maintained. The Commission discussed that a minimum level of recreational amenity should be defined recognizing that it is hard to define what will be the right level of amenity and use in the future. The Commission discussed whether there should/could be some type of special service district required to tax the members of SKRMA to provide funding for recreational amenities. The Commission discussed that the benefit of having a viable recreational amenity is of greater benefit to the owners in the resort than the general public thus they should have a greater responsibility to maintain them. The Commission discussed free and open uphill access to the Mountain. There was acknowledgement of the expense and liability associated with uphill winter and summer access. Comparison was made to Jackson Hole Mountain Resort and controlled access to the public land in that area. The Commission made a decision not to include any requirements for uphill access in the Master Plan.

At the October 3, meeting the applicant provided clarification and comment on the proposed conditions related to SKRMA and Snow King Mountain commitments. The applicant discussed and gave examples of how the compliance measures currently proposed would not work for SKRMA. The applicant made it clear that they are committed to providing a phasing plan as part of this application, but not the timing of specific community improvements (gondola, mountain sports facility, Phil Baux Park improvements). They stated that SKRMA may be ok with setting such things as the order of improvements but not the specific timing and the issue of being out of compliance is critical to the SKRMA members and must be worked out. The applicant stated that it would be acceptable to come up with a list of requirements that all SKRMA members are responsible for and what requirements only individual members would be responsible for and what would happen should compliance not be maintained.

The applicant did not find it appropriate to have all members responsible for the responsibilities of individual members as it relates to required improvements/phasing and compliance. The applicant stated that this was not realistic for members to have no control of compliance of the Master Plan which could directly affect their development rights or ability to complete projects. The applicant also clarified that they have approval of SKRMA for what has been proposed but they would need to go back and discuss addition requirements placed on SKRMA as a result of this amendment process.

The applicant also discussed the Snow King Mountain commitments and found that closing procedures could be problematic with emergency situations and the need to be able to operate the mountain successfully. The applicant also stated that affordable ticket prices and hours of operation would be hard to define as this may vary dependent on future economic conditions and the ski industry in general.

Staff explained that where it gets difficult is that SKRMA started as essentially one entity and now is made up of multiple entities. What we are trying to determine is who is responsible for what in the phasing plan and what happens if the phasing plan does not proceed as planned.

The Commission reviewed what the applicant included in their application for SKRMA and Snow King Mountain commitments as a starting ground.

The applicant further addressed the SKRMA entity structure and what each entity was responsible for paying for and what they were not. The applicant stated that all SKRMA members are responsible for common area maintenance and infrastructure but that SKRMA dues do not go towards things such as recreation.

A commissioner asked if the Town Attorney had reviewed the Town's ability to impose financial commitments on SKRMA, Snow King Mountain and/or all property owners within the District. Staff responded that "no," that question has not been addressed up until now and that both parties have been

working in good faith over the past two years to work out the commitments of all parties moving forward. A commissioner discussed that lenders/banks may have a problem with entities being held responsible for items they have no control of.

The applicant confirmed that all the community services facilities would be the responsibility of Snow King Mountain and not SKRMA. The Commission discussed that there was no obligation of the owners other than Snow King Mountain to complete the community services. The Commission agreed that no financial obligation should be required of SKRMA for the commitments of Snow King Mountain, but that overall compliance of the Master Plan would tie all entities together and that should any portion of the Master Plan become noncompliant that the Master Plan would be suspended and SKRMA and the Town would need to decide how to proceed. The Commission recognized that the phasing plan was key to moving forward knowing when the community services elements would happen in relation to the development portions of the plan. The Commission acknowledged that the phasing plan would be centered around sequencing/order of entitlements rather than an actual timeline. The applicant stated that was consistent with their application in that they are most interested in defining how to move forward with development of lots 53, 57 and 58 and mountain improvements and that the Sub-areas 1 and 2 were not identified for development at this time.

Planning Commission Recommended Amendments:

23. **Chapter 11:** The applicant shall revise language in the Master Plan to outline the following minimum requirements of Snow King Resort Master Association (SKRMA):

- o Define the SKRMA “entity structure” as generally made up of three entities, Snow King Mountain, the Hotel (JMI) and the Condominium Associations with the associated voting structure to be clarified by the applicant prior to final approval.
- o SKRMA shall provide to the Town by January 1 of each year an annual report including how each requirement and obligation under the Master Plan is being satisfied and current financial information for SKRMA to ensure there is adequate ongoing funding. SKRMA will include in the annual report the composition of the board and status of the organization.
- o Prior to final approval of the Master Plan the Town and SKRMA shall develop an agreement including all the requirements and obligations under the Master Plan that functions in perpetuity that is transferable to any/all new owners.
- o SKRMA agrees that all future development shall meet current housing requirements.
- o Ensure SKRMA is responsible for all requirements of the agreed upon parking and transportation demand management (TDM) plan. Clarify maintenance expectations and requirements, including snow removal for private roads, private infrastructure including but not limited to private sewer, water, storm sewer and all other infrastructure.
- o Define in the Master Plan that should compliance with any of the Master Plan commitments (including the approved phasing plan) cease, all ~~future-further~~ development that has not received a building permit under the Master Plan shall be suspended until ~~consideration-resolution~~ by the applicant and the Town.

24. **Chapter 11:** The applicant shall revise language in the Master Plan to outline the following minimum requirements of Snow King Mountain (SKMR):

- o Maintain clear and negotiated hours of lift operations (current hours desired but acknowledgment that needs may change in the future)
- o Develop procedural agreement with Town of Jackson regarding how/when to allow closures for conditions (summit and ski hill)
- o Ensure / negotiate affordable rates for locals with Town of Jackson
- o Maintain access for current user groups, to be defined prior to finalization of the Master Plan

- o The provision of the following improvements pursuant to the phasing plan for the entire Master Plan:
 - Mountain Sports Facility
 - Gondola
 - Phil Baux Park improvements as defined by a future CUP process
25. **Chapter 11:** Applicant shall revise this Chapter to provide specific details on the roles and responsibilities of SKRMA and Snow King Mountain and penalties for non-compliance and a detailed phasing plan articulating when and how the public benefit and private development portions of the plan shall be sequenced.

Chapter 12: Community Services Element

The Commission and staff discussed the need to clearly define what is required to meet the minimum requirements of this Chapter. Those items recommended as requirements moving forward are provided in the recommended amendment below. The following items were discussed but not included as a requirement of this Chapter because they are on public land:

- Ski and Snowboard Club expansion
- Summit improvements
- Second Sheet of Ice

Staff and the Commission confirmed that based upon the discussion and recommended changes the community services element would be the financial obligation of Snow King Mountain and not SKRMA or any other entity within the Master Plan. However, should Snow King Mountain become noncompliant with the community service element phasing plan that all development within the Master Plan would be suspended until such time that the Town and applicant determined how best to proceed. In addition, it was acknowledged that commitments in Chapters 11 and 12 will be combined into one phasing plan and that compliance with the phasing plan shall be required otherwise the Master Plan shall be suspended and the Town and applicant will determine how best to proceed. The Commission was comfortable that the detailed phasing plan would need to be provided prior to Council consideration of the item.

Planning Commission Recommended Amendments:

26. **Chapter 12:** Applicant shall revise this Chapter to ensure that the following improvements be provided consistent with the approved phasing plan:
- o Mountain Sports Facility
 - o Gondola
 - o Phil Baux Park improvements as defined by a future CUP process
 - o Maintain clear and negotiated hours of lift operations (current hours desired but acknowledgment that needs may change in the future)
27. **Chapter 12:** Applicant shall provide a specific phasing plan associated with providing the community services element of this Plan prior to final approval. The phasing plan shall articulate when and how the public benefit and private development portions of the plan shall be sequenced.

Applicant Response to Planning Commission Recommendation

The applicant has provided a letter dated November 8, 2018, responding to the amendments of the Town Planning Commission for consideration by Council (see attached).

Public Comment

There has been extensive public comment related to the future of Snow King over the past many years. Staff has attached all public comment received since the submission of this application. In addition, staff has provided the summary documents developed as part of the Snow King Stakeholders public engagement process. Furthermore, staff has provided a link to where all documents and comment received during the Snow King Stakeholders public engagement process can be found.

Teton County Review

The Teton County Planning Commissioners discussed this item at their September 10, 2018 meeting. Commissioner Esnard questioned the applicant on the long-term strategy for the resort. The applicant responded that it was to have a self-sustaining business that includes zip line, gondola, etc. and that the resort hopes to capture people who are already here for a day or more at Snow King. In addition, Commissioner Esnard questioned what elements will drive the greatest revenue. The applicant responded that additional ski runs, food and beverage, zip lines and mountain bike trails will, and that diversification is key to sustaining the business.

Commissioner Gill thanked the applicant for investing in keeping the hill alive and for listening to the public. Commissioner Fodor question why is there a need for another road up the mountain. The applicant responded to serve beginner terrain on top of mountain in the sun. In addition, Commissioner Fodor, questioned whether the gondola landing area was defined yet. The applicant responded that they had listened to public, and town officials and they had shifted the gondola closer to Cougar lift in the park.

Public comment was provided by Jeff Golightly with Snow King Mountain who stated that they understand Snow King is not going to be a big draw for tourism that they are striving to be a better option for teaching kids, for locals, and to provide better terrain for racing. Shane Rothman, a neighbor and town resident, stated he agrees with preserving green space, and disagrees with the proposed zip line.

During Commission discussion Commissioner Gill stated that it was important to keep Phil Baux Park accessible to the community and that the zip line is not her favorite part of plan but that she can be somewhat supportive if it makes Snow King financially viable. She was supportive of the second sheet of ice and the hockey program. Commissioner Esnard stated that it was important to keep the park and parking available for the community in the proposed gondola design. Commissioner Fodor stated in summary, that the Commission agreed that keeping the park and parking accessible to the community was important.

The Teton Board of County Commissioners reviewed this item on two occasions and submitted a letter dated October 29, 2018 providing their input (see attached). In summary the Board provided the following comments related to the application:

- The Board is generally supportive of the comments made by the Town Planning Commission regarding the recommendation to outline minimum requirements of the Snow King Resort Master Association (SKRMA) such as defining the entity structure and ensuring adequate funding.
- The Board encourages participation in a Transportation Demand Management (TDM) program.
- The Board would like to see the gondola base located so it does not impact existing improvements in Phil Baux Park.
- The Board concurs with the Town Planning Commission that proposed development should meet the Hillside Development Standards.
- The Board concurs with the Town Planning Commission's recommendations pertaining to phasing.

Jackson/Teton County Parks and Recreation Review

The Jackson/Teton County Parks and Recreation Board reviewed this item submitted a letter dated October 18, 2018 providing their input (see attached). In summary the Board provided the following comments related to the application:

Teton County Park & Recreation Board has concluded that the following points should be taken into consideration regarding the Snow King Master Plan as it relates to Town park property at the base of Snow King:

- As Phil Baux Park forms the end point of the Snow King – Maple Way connector (Comprehensive Plan) having a community focused node at this location is vital. Any development should be to encourage its use as a front country gateway to the National Forest. Public use and access should take precedence over redevelopment by a private entity.
- The continued use of this large flexible space that can accommodate community events such as concerts, farmers markets, and youth sports practice areas should be preserved.
- The park should not be divided. There should be good East-West flow.
- Any new lifts, including a gondola, should be located on the footprint of the current lifts and must allow safe, clear and accessible pedestrian and biking movement North to South and East to West from Snow King Ave to the National Forest trails
- The park needs to maintain its public identity and character and commercialization should be kept to a minimum.
- The Board does not support locating a zipline within the park.

LEGAL REVIEW

Complete, as to procedure and initial review of the application, see Legal Department Review Comments. The Legal Department review is ongoing dependent on direction by Town Council.

STAFF FINDINGS

Item A: Pursuant to Section 8.7.3.D Planned Unit Development (PUD) of the Land Development Regulations, the following findings shall be made for the approval of a Planned Unit Development:

1. ***The proposed PUD enhances the implementation of the desired future character for the land of the proposal beyond what could be achieved by base zoning.***

Complies. Staff finds that the proposed PUD is able to achieve the desired future character for this area as well as, if not better than, the base zoning. The desired future character envisions a vibrant mixed use resort complex, including a multi-faceted conference/convention center and community facility that contributes to the economy of Downtown and also serves as a permeable border between the Town and Snow King Mountain. The PUD tool allows for flexibility in development such as setbacks and allowed stories, in addition to allowing a higher Floor Area Ratio compared to the base zoning. A development of this type can only be achieved through the use of the PUD tool due to the interrelatedness and mixed use nature of the Master Plan.

The proposed Master Plan is located within District 2 Town Commercial Core and within Subarea 2.3 Downtown of the 2012 Comprehensive Plan. Policy objectives for Subarea 2.1 Snow King Resort follow:

This TRANSITIONAL Subarea is currently subject to the Snow King Resort Master Plan. The plan seeks to create a vibrant mixed use resort complex, including a multi-faceted conference/convention center and community facility that contributes to the economy of Downtown and also serves as a permeable border between the Town and Snow King Mountain. The resort has long been an integral part of the community, playing the role of the "Town Hill", providing a host of winter and summer recreational amenities. In the future, the subarea will complement Downtown (Subarea 2.3) lodging and tourist amenities. Lodging will be provided in a variety of types and forms from hotel rooms to condominiums, in order to support the local tourism-based economy. The size and scale of structures will often be larger than those typically allowed in other subareas of Town, as resorts typically require a larger critical mass necessary to support visitor functions. Though buildings will tend to be larger than in other districts, the subarea will maintain an abundance of open space in relation to the built environment as a key to a successful resort experience. Consistent with the Master Plan, Snow King Avenue will be developed into a mixed use corridor that includes a variety of commercial uses while still serving as a major transportation corridor in the community. Along with this it will be important to create a more visible and attractive base to attract residents and visitors to the many amenities and recreational opportunities found there.

Complies. Staff finds that the proposed amendments comply with the 2012 Teton/Jackson Comprehensive Plan.

2. The findings for a PUD option found in Article 4 must be made.

Section 4.3.1. D. Findings for Approval

All Planned Resort Zones shall be approved only if all of the following findings are made.

1. Consistency with Comprehensive Plan.

The Planned Resort Master Plan is consistent with the goals and objectives of the Jackson/Teton County Comprehensive Plan.

Complies. See PUD finding #1.

2. Consistency with Purpose and Intent.

The Planned Resort Master Plan is substantially consistent with the purpose and intent of this Section, as set forth in 4.3.1.A.

Complies as conditioned.

3. Affordable Workforce Housing.

The Planned Resort Master Plan ensures a supply of affordable workforce housing that is in accordance with the requirements for housing created by development within the Planned Resort.

Complies as conditioned.

4. Design Guidelines.

The Planned Resort Master Plan contains design guidelines that

- a. establish standards for buildings, spaces, signs, and lighting within the Planned Resort;*
- b. promote the design concepts set forth in F.7.; and*

c. establish a method for consistent implementation of the guidelines.

Complies as conditioned.

5. Transportation Element.

The Planned Resort Master Plan contains a traffic impact analysis and transportation demand management plan that:

- a. promote multimodal forms of transportation that are consistent with the transportation goals of the Jackson/Teton County Comprehensive Plan;*
- b. manage the generation of resort related traffic to avoid undermining community character and endangering the public health, safety, and welfare; and*
- c. identify an equitable cost sharing plan for transportation facilities and services.*

Complies as conditioned.

6. Capital Improvements Plan.

The Planned Resort Master Plan contains a capital improvements plan that ensures infrastructure and essential services will be provided in an efficient and timely manner to accommodate projected resort demands.

Complies as conditioned.

7. Land Use Element.

The Planned Resort Master Plan promotes land uses that support and maintain the character of the resort as specified in Sec. 4.3.2.

Complies as conditioned.

8. Phasing Plan.

The Planned Resort Master Plan contains a phasing plan that ensures:

- a. development of the resort, its amenities, and public facilities necessary to serve the resort, occur in logical sequence, and*
- b. an adequate monitoring program is established for determining accomplishment of proposed remedies and mitigation measures for projected impacts on the community.*

Complies as conditioned.

9. Character Element.

The Planned Resort Master Plan ensures the resort's development will be in keeping with the community's character and the planned character for the vicinity of the resort.

Complies as conditioned.

3. *The findings for the amendment of an existing PUD or other special project found in Section 8.2.13.D must be made.*

Complies as conditioned.

4. *The findings for Section 8.7.1.C LDR Text Amendment must be made.*

Pursuant to Section 8.7.3.D Planned Unit Development (PUD) of the Land Development Regulations, the findings for a LDR Text Amendment found in Section 8.7.1.C must be made:

1. *The proposed project is consistent with the purposes and organization of the LDRs.*

Complies, as conditioned, staff finds the proposed project to be consistent with the purpose and intent of the LDRs.

2. *The proposed project improves the consistency of the LDRs with other provisions of the LDRs.*

Complies, as conditioned, staff finds the proposed project improves consistency with the LDRs as it meets all applicable provisions laid out in the LDRs for a Planned Unit Development.

3. *The proposed project provides flexibility for landowners within standards that clearly define desired character.*

Complies. Staff finds that the proposed project provides flexibility that does not undermine the defined future character of this area.

4. *The proposed project is necessary to address changing conditions, public necessity, and/or state or federal legislation.*

Complies. Staff finds that the proposed project is necessary to address changing conditions since adoption of the original Master Plan in 2000.

5. *The proposed project improves implementation of the Comprehensive Plan.*

Complies. Staff finds the proposed project improves implementation of the Comprehensive Plan by providing a development that is consistent with the purpose and intent for Subarea 2.1.Snow King Resort. See the above PUD, finding #1.

6. *The proposed project is consistent with other adopted Town Ordinances.*

Complies. Staff finds that the proposed project is consistent with all other Town Ordinances.

5. *The findings for Section 8.7.2.C Zoning Map Amendment must be made.*

Pursuant to Section 8.7.3.D Planned Unit Development (PUD) of the Land Development Regulations, the findings for a Zoning Map Amendment found in Section 8.7.2.C must be made:

1. *The proposed project is consistent with the purposes and organization of the LDRs.*

Complies as conditioned, staff finds the proposed project to be consistent with the purpose and intent of the LDRs.

2. *The proposed project improves implementation of the desired future character defined in the Illustration of Our Vision chapter of the Comprehensive Plan.*

Complies, as conditioned, staff finds the proposed project improves consistency with the LDRs as it meets all applicable provisions laid out in the LDRs for a Planned Unit Development.

3. *The proposed project is necessary to address changing conditions or a public necessity.*

Complies. Staff finds that the proposed project is necessary to address changing conditions since adoption of the original Master Plan in 2000.

4. *The proposed project is consistent with other adopted Town Ordinances.*

Complies. Staff finds that the proposed project is consistent with all other Town Ordinances.

Item B: Sketch Plan. All Sketch Plan proposals may be approved only if all of the following findings are made:

1. *The proposed project is consistent with the desired future character described for the site in the Jackson/Teton County Comprehensive Plan.*

The proposed Master Plan is located within District 2 Town Commercial Core and within Subarea 2.3 Downtown of the 2012 Comprehensive Plan. Policy objectives for Subarea 2.1 Snow King Resort follow:

This TRANSITIONAL Subarea is currently subject to the Snow King Resort Master Plan. The plan seeks to create a vibrant mixed use resort complex, including a multi-faceted conference/convention center and community facility that contributes to the economy of Downtown and also serves as a permeable border between the Town and Snow King Mountain. The resort has long been an integral part of the community, playing the role of the "Town Hill", providing a host of winter and summer recreational amenities. In the future, the subarea will complement Downtown (Subarea 2.3) lodging and tourist amenities. Lodging will be provided in a variety of types and forms from hotel rooms to condominiums, in order to support the local tourism-based economy. The size and scale of structures will often be larger than those typically allowed in other subareas of Town, as resorts typically require a larger critical mass necessary to support visitor functions. Though buildings will tend to be larger than in other districts, the subarea will maintain an abundance of open space in relation to the built environment as a key to a successful resort experience. Consistent with the Master Plan, Snow King Avenue will be developed into a mixed use corridor that includes a variety of commercial uses while still serving as a major transportation corridor in the community. Along with this it will be important to create a more visible and attractive base to attract residents and visitors to the many amenities and recreational opportunities found there.

Complies. Staff finds that the proposed amendments comply with the 2012 Teton/Jackson Comprehensive Plan.

Common Value 1: Ecosystem Stewardship

N/A

Common Value 2: Growth Management

4.1.b: *Emphasize a variety of housing types, including deed-restricted housing.* The Master Plan allows a variety of housing types including deed restricted housing.

4.1.d: Maintain Jackson as the economic center of the region. One of the key goals of the Master Plan is to compliment Downtown and play a significant role of maintaining Jackson as the economic center of the region.

4.2.c: Create vibrant walkable mixed use subareas. The Master Plan is centered on creating a walkable mixed use resort district.

4.2.d: Create a Downtown Retail Shopping District. Not applicable.

4.2.f: Maintain lodging as a key component in the downtown. The Master Plan's primary use is lodging in a variety of forms.

4.4.b: Enhance Jackson gateways. Not applicable.

4.4.d: Enhance natural features in the built environment. The Master Plan's goal is to create balance between the built environment and the natural surrounding landscape.

Common Value 3: Quality of Life

5.2.d: Encourage deed-restricted rental units. The Master Plan will allow and encourage restricted housing through flexible dimensional limitations.

6.2.b: Support businesses located in the community because of our lifestyle. The Master Plan will provide the uses and amenities to support this goal.

6.2.c: Encourage local entrepreneurial opportunities. The Master Plan will provide the uses and amenities to support this goal.

6.3.a: Ensure year-round economic viability. The Master Plan will provide the uses and amenities to support this goal. One basis of the Plan is to provide an economic engine for our shoulder seasons.

7.1.c: Increase the capacity for use of alternative transportation modes. The Master Plan's Transportation Chapter outlines the strategies and requirements for an integrated Transportation Demand Management program developed to meet the mode shift goals of the Plan.

In conclusion, Staff finds that the proposed Master Plan amendment is consistent with the 2012 Comprehensive Plan and continues to be consistent with the 1994 Comprehensive Plan, subject to Staff's recommended conditions of approval provided below.

2. *The proposed project achieves the standards and objective of the Natural Resource Overlay (NRO) and Scenic Resources Overlay (SRO).*

N/A

3. *The proposed project does not have a have a significant impact on public facilities and services, including transportation, portable water and wastewater facilities, parks, schools, police, fire, and EMS facilities.*

Complies. As conditioned, staff finds that the proposed project will not have significant impacts on public facilities and infrastructure.

4. *The proposed project complies with all relevant standards of these LDRs and other Town Ordinances as can be determined by the level of detail of a sketch plan.*

Complies. Staff finds that the application meets the base standards of the PUD section as well as all required standards of the LDRs.

5. *The proposed project is in substantial conformance with all standards or conditions of any prior applicable permits or approvals.*

Complies. Staff finds that the application is in conformance with all standards and conditions subject to the recommended conditions of approval.

ATTACHMENTS

Applicant response to Town Planning Commission conditions, November 8, 2018

Departmental Reviews

Teton County Commissioners letter dated October 29, 2018

Jackson/Teton County Parks and Recreation Board letter dated October 18, 2018

United States Forest Service, letter dated August 3, 2018

Snow King Mountain Stakeholder Group, Staff and Consultant Summary of Outcomes and the Process, May 17, 2018

Snow King Vision Stakeholder Group Final Vision Scenarios - May 17, 2018

Public Comment

Applicant Submittal (separate attachment)

RECOMMENDATIONS/ CONDITIONS OF APPROVAL

The following recommendations and associated amendments combine those of the Planning Director and Planning Commission. Staff notes that one change shown in tracked changes has been made since formal recommendation by the Planning Commission for clarity.

Item A: The Planning Director and Planning Commission recommend **approval** of a Planned Unit Development to allow amendments to the Snow King Planned Resort District Master Plan subject to the department reviews with the following amendments being made to the Master Plan:

1. **Chapter 1:** The applicant shall revise the Master Plan to clearly define a modern vision for the Master Plan moving forward including what the role, function and location of the convention center will play or not. If this is not possible the Plan should be amended to include a vision moving forward to better align with the 2012 Comprehensive Plan and community's goals today. The defined new vision would be used to review future land use changes in the Plan specifically but not limited to Sub-area #2.
2. **Chapter 2:** Applicant shall revise Chapter II to include compliance with the 2012 Comprehensive Plan and the interrelatedness of the 1994 and 2012 Comprehensive Plans.
3. **Chapter 3:** Applicant shall work with staff to update references to the Land Development Regulations to incorporate the current Land Development Regulations as required.
4. **Chapter 4:** Applicant shall revise Sub-area #1 or #3 to include all of the proposed building currently split between two sub-areas into one.
5. **Chapter 5:** Applicant shall revise the proposed land use schedule to require a Conditional Use Permit for all permanent Outdoor Amusement/recreation and Commercial Amusement uses.

6. **Chapter 5:** Applicant shall revise the proposed land use schedule to require a basic use permit for a temporary Outdoor Amusement/recreation and Commercial Amusement uses. Temporary shall be defined as a use occurring for a period of less than 180 days per year. Upon expiration of the temporary use the operation of and all associated improvements shall be completely removed from the property. There shall be a limit of two basic use permits allowed per use thereafter the use shall be considered a permanent use and require a Conditional Use Permit.
7. **Chapter 5:** Applicant shall revise the Example Development chart (in all locations) to reflect the new proposed Sub-areas and associated uses and square footages to reflect what has been built to date and what is anticipated in the future.
8. **Chapter 6:** Applicant shall revise the Chapter to include a requirement that all buildings be reviewed for compliance with the Master Plan Design Guidelines by the Town Design Review Committee.
9. **Chapter 7:** Applicant shall include language in Sub-area #3 for Lots 53 and 58 to ensure compatibility with the neighborhood to the east including but not limited to consideration at time of Development Plan of stepping down the building height, additional landscape screening, etc.
10. **Chapter 7:** Applicant shall include language in Sub-area #3 for Lot 57 to ensure compatibility with the recreational area to the west including but not limited to consideration at time of Development Plan to shifting the building to the east, reducing the footprint of the building, breaking it up into multiple buildings, etc. In addition, the applicant shall include language to address bulk and scale concerns with the proposed structure including stepping down the building height, reducing the building height to 2 stories, etc.
11. **Chapter 7:** Applicant shall revise the plan to include a requirement for alternative transportation mode improvements to connect the Master Plan to Cache Creek Drive including paving, bollards, signage, and other best practices.
12. **Chapter 7:** Applicant shall revise Sub-area #4 to reduce the proposed building envelope, to remove discussion of parking and to require a thorough review and consideration of the proposed uses through a Conditional Use Permit both onsite and with the surrounding neighborhood. The applicant shall revise the proposed building envelope on Vine Street to allow for a sidewalk and Complete Street cross section connecting the facility to the resort.
13. **Chapter 7:** The applicant shall revise the use table to allow light industrial uses in Sub-area #4 and #5.
14. **Chapter 7:** Applicant shall provide language in this Chapter to ensure that all development within the Master Plan shall meet the LDR hillside development requirements in place at the time of Development Plan.
15. **Chapter 7:** The applicant shall revise the language in the plan to require a CUP process to determine a final design of Phil Baux Park. The revised plans would allow the landing of the gondola on Town property in a location that does not divide the park. In addition, site circulation for all modes of transportation should be addressed including the location of parking, pick up and drop off, locker areas, START bus stops, etc. Buildings and improvements should be clustered together near existing improvements to obtain as much open space as possible. The detailed plan should locate improvements generally at the street level to address accessibility and ease of access during all seasons.
16. **Chapter 8:** Applicant shall revise the Chapter to remove language regarding banking/credits for units.
17. **Chapter 9:** Applicant shall revise the current TDM requirements to include the following additional measures:
 - o Provide free or reduced-level bus passes to all employees
 - o Provide free or reduced-level bus/bike passes to guests
 - o Require off-site parking for employees
 - o Provide START Bikes and promote alternative modes of travel for employee and guests
 - o Promote transit usage in marketing and website promotional material
18. **Chapter 9:** Applicant shall revise the Chapter to incorporate the most current data and transportation improvements that have been made.

19. **Chapter 9:** Applicant shall be required to pave and maintain the availability of the surface parking lots in Sub-area #2 for use by all patrons to the area.
20. **Chapter 9:** Applicant agrees to participate in a TDM program development for the entire Snow King Base area with other surrounding property owners and users.
21. **Chapter 9:** Applicant shall provide parking counts for all surface parking lots over 10 spaces as part of the required transportation monitoring requirement.
22. **Chapter 10:** Applicant shall address all conditions in the Town Engineer memorandum dated September 12, 2018.
23. **Chapter 11:** The applicant shall revise language in the Master Plan to outline the following minimum requirements of Snow King Resort Master Association (SKRMA):
 - o Define the SKRMA “entity structure” as generally made up of three entities, Snow King Mountain, the Hotel (JMI) and the Condominium Associations with the associated voting structure to be clarified by the applicant prior to final approval.
 - o SKRMA shall provide to the Town by January 1 of each year an annual report including how each requirement and obligation under the Master Plan is being satisfied and current financial information for SKRMA to ensure there is adequate ongoing funding. SKRMA will include in the annual report the composition of the board and status of the organization.
 - o Prior to final approval of the Master Plan the Town and SKRMA shall develop an agreement including all the requirements and obligations under the Master Plan that functions in perpetuity that is transferable to any/all new owners.
 - o SKRMA agrees that all future development shall meet current housing requirements.
 - o Ensure SKRMA is responsible for all requirements of the agreed upon parking and transportation demand management (TDM) plan. Clarify maintenance expectations and requirements, including snow removal for private roads, private infrastructure including but not limited to private sewer, water, storm sewer and all other infrastructure.
 - o Define in the Master Plan that should compliance with any of the Master Plan commitments (including the approved phasing plan) cease, all ~~future-further~~ development that has not received a building permit under the Master Plan shall be suspended until ~~consideration-resolution~~ by the applicant and the Town.
24. **Chapter 11:** The applicant shall revise language in the Master Plan to outline the following minimum requirements of Snow King Mountain (SKMR):
 - o Maintain clear and negotiated hours of lift operations (current hours desired but acknowledgment that needs may change in the future)
 - o Develop procedural agreement with Town of Jackson regarding how/when to allow closures for conditions (summit and ski hill)
 - o Ensure / negotiate affordable rates for locals with Town of Jackson
 - o Maintain access for current user groups, to be defined prior to finalization of the Master Plan
 - o The provision of the following improvements pursuant to the phasing plan for the entire Master Plan:
 - Mountain Sports Facility
 - Gondola
 - Phil Baux Park improvements as defined by a future CUP process
25. **Chapter 11:** Applicant shall revise this Chapter to provide specific details on the roles and responsibilities of SKRMA and Snow King Mountain and penalties for non-compliance and a detailed phasing plan articulating when and how the public benefit and private development portions of the plan shall be sequenced.
26. **Chapter 12:** Applicant shall revise this Chapter to ensure that the following improvements be provided consistent with the approved phasing plan:

- o Mountain Sports Facility
 - o Gondola
 - o Phil Baux Park improvements as defined by a future CUP process
 - o Maintain clear and negotiated hours of lift operations (current hours desired but acknowledgment that needs may change in the future)
27. **Chapter 12:** Applicant shall provide a specific phasing plan associated with providing the community services element of this Plan prior to final approval. The phasing plan shall articulate when and how the public benefit and private development portions of the plan shall be sequenced.
28. The applicant shall work with staff to make all the approved amendments and other necessary edits to the satisfaction of the Planning Director and Town Attorney prior to final approval by Town Council.

Item B: The Planning Director and Planning Commission recommend **approval** of a Sketch Plan for the Snow King Planned Resort District Master Plan subject to the department reviews and any conditions deemed necessary by staff to conform with the language approved in the Planned Unit Development amendment in Item A.

SUGGESTED MOTIONS

Item A: Based upon the findings for a Planned Unit Development as presented in the staff report and by the applicant for Item P18-208 I move to make findings 1-5 set forth in Section 8.7.3 related to 1) Enhances future desire character; 2) PUD Option findings in Article 4; 3) Amendment to PUD findings in Section 8.2.12.D; 4) LDR Text Amendment finding in Section 8.7.1.C; 5) Zoning Map Amendment findings in Section 8.7.2.C to **approve** a Planned Unit Development to allow amendments to the Snow King Planned Resort District Master Plan subject to the department reviews with the following amendments:

1. **Chapter 1:** The applicant shall revise the Master Plan to clearly define a modern vision for the Master Plan moving forward including what the role, function and location of the convention center will play or not. If this is not possible the Plan should be amended to include a vision moving forward to better align with the 2012 Comprehensive Plan and community's goals today. The defined new vision would be used to review future land use changes in the Plan specifically but not limited to Sub-area #2.
2. **Chapter 2:** Applicant shall revise Chapter II to include compliance with the 2012 Comprehensive Plan and the interrelatedness of the 1994 and 2012 Comprehensive Plans.
3. **Chapter 3:** Applicant shall work with staff to update references to the Land Development Regulations to incorporate the current Land Development Regulations as required.
4. **Chapter 4:** Applicant shall revise Sub-area #1 or #3 to include all of the proposed building currently split between two sub-areas into one.
5. **Chapter 5:** Applicant shall revise the proposed land use schedule to require a Conditional Use Permit for all permanent Outdoor Amusement/recreation and Commercial Amusement uses.
6. **Chapter 5:** Applicant shall revise the proposed land use schedule to require a basic use permit for a temporary Outdoor Amusement/recreation and Commercial Amusement uses. Temporary shall be defined as a use occurring for a period of less than 180 days per year. Upon expiration of the temporary use the operation of and all associated improvements shall be completely removed from the property. There shall be a limit of two basic use permits allowed per use thereafter the use shall be considered a permanent use and require a Conditional Use Permit.
7. **Chapter 5:** Applicant shall revise the Example Development chart (in all locations) to reflect the new proposed Sub-areas and associated uses and square footages to reflect what has been built to date and what is anticipated in the future.
8. **Chapter 6:** Applicant shall revise the Chapter to include a requirement that all buildings be reviewed for compliance with the Master Plan Design Guidelines by the Town Design Review Committee.

9. **Chapter 7:** Applicant shall include language in Sub-area #3 for Lots 53 and 58 to ensure compatibility with the neighborhood to the east including but not limited to consideration at time of Development Plan of stepping down the building height, additional landscape screening, etc.
10. **Chapter 7:** Applicant shall include language in Sub-area #3 for Lot 57 to ensure compatibility with the recreational area to the west including but not limited to consideration at time of Development Plan to shifting the building to the east, reducing the footprint of the building, breaking it up into multiple buildings, etc. In addition, the applicant shall include language to address bulk and scale concerns with the proposed structure including stepping down the building height, reducing the building height to 2 stories, etc.
11. **Chapter 7:** Applicant shall revise the plan to include a requirement for alternative transportation mode improvements to connect the Master Plan to Cache Creek Drive including paving, bollards, signage, and other best practices.
12. **Chapter 7:** Applicant shall revise Sub-area #4 to reduce the proposed building envelope, to remove discussion of parking and to require a thorough review and consideration of the proposed uses through a Conditional Use Permit both onsite and with the surrounding neighborhood. The applicant shall revise the proposed building envelope on Vine Street to allow for a sidewalk and Complete Street cross section connecting the facility to the resort.
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14. **Chapter 7:** Applicant shall provide language in this Chapter to ensure that all development within the Master Plan shall meet the LDR hillside development requirements in place at the time of Development Plan.
15. **Chapter 7:** The applicant shall revise the language in the plan to require a CUP process to determine a final design of Phil Baux Park. The revised plans would allow the landing of the gondola on Town property in a location that does not divide the park. In addition, site circulation for all modes of transportation should be addressed including the location of parking, pick up and drop off, locker areas, START bus stops, etc. Buildings and improvements should be clustered together near existing improvements to obtain as much open space as possible. The detailed plan should locate improvements generally at the street level to address accessibility and ease of access during all seasons.
16. **Chapter 8:** Applicant shall revise the Chapter to remove language regarding banking/credits for units.
17. **Chapter 9:** Applicant shall revise the current TDM requirements to include the following additional measures:
 - o Provide free or reduced-level bus passes to all employees
 - o Provide free or reduced-level bus/bike passes to guests
 - o Require off-site parking for employees
 - o Provide START Bikes and promote alternative modes of travel for employee and guests
 - o Promote transit usage in marketing and website promotional material
18. **Chapter 9:** Applicant shall revise the Chapter to incorporate the most current data and transportation improvements that have been made.
19. **Chapter 9:** Applicant shall be required to pave and maintain the availability of the surface parking lots in Sub-area #2 for use by all patrons to the area.
20. **Chapter 9:** Applicant agrees to participate in a TDM program development for the entire Snow King Base area with other surrounding property owners and users.
21. **Chapter 9:** Applicant shall provide parking counts for all surface parking lots over 10 spaces as part of the required transportation monitoring requirement.
22. **Chapter 10:** Applicant shall address all conditions in the Town Engineer memorandum dated September 12, 2018.
23. **Chapter 11:** The applicant shall revise language in the Master Plan to outline the following minimum requirements of Snow King Resort Master Association (SKRMA):

- o Define the SKRMA “entity structure” as generally made up of three entities, Snow King Mountain, the Hotel (JMI) and the Condominium Associations with the associated voting structure to be clarified by the applicant prior to final approval.
 - o SKRMA shall provide to the Town by January 1 of each year an annual report including how each requirement and obligation under the Master Plan is being satisfied and current financial information for SKRMA to ensure there is adequate ongoing funding. SKRMA will include in the annual report the composition of the board and status of the organization.
 - o Prior to final approval of the Master Plan the Town and SKRMA shall develop an agreement including all the requirements and obligations under the Master Plan that functions in perpetuity that is transferable to any/all new owners.
 - o SKRMA agrees that all future development shall meet current housing requirements.
 - o Ensure SKRMA is responsible for all requirements of the agreed upon parking and transportation demand management (TDM) plan. Clarify maintenance expectations and requirements, including snow removal for private roads, private infrastructure including but not limited to private sewer, water, storm sewer and all other infrastructure.
 - o Define in the Master Plan that should compliance with any of the Master Plan commitments (including the approved phasing plan) cease, all ~~future further~~ development that has not received a building permit under the Master Plan shall be suspended until ~~consideration resolution~~ by the applicant and the Town.
24. **Chapter 11:** The applicant shall revise language in the Master Plan to outline the following minimum requirements of Snow King Mountain (SKMR):
- o Maintain clear and negotiated hours of lift operations (current hours desired but acknowledgment that needs may change in the future)
 - o Develop procedural agreement with Town of Jackson regarding how/when to allow closures for conditions (summit and ski hill)
 - o Ensure / negotiate affordable rates for locals with Town of Jackson
 - o Maintain access for current user groups, to be defined prior to finalization of the Master Plan
 - o The provision of the following improvements pursuant to the phasing plan for the entire Master Plan:
 - Mountain Sports Facility
 - Gondola
 - Phil Baux Park improvements as defined by a future CUP process
25. **Chapter 11:** Applicant shall revise this Chapter to provide specific details on the roles and responsibilities of SKRMA and Snow King Mountain and penalties for non-compliance and a detailed phasing plan articulating when and how the public benefit and private development portions of the plan shall be sequenced.
26. **Chapter 12:** Applicant shall revise this Chapter to ensure that the following improvements be provided consistent with the approved phasing plan:
- o Mountain Sports Facility
 - o Gondola
 - o Phil Baux Park improvements as defined by a future CUP process
 - o Maintain clear and negotiated hours of lift operations (current hours desired but acknowledgment that needs may change in the future)
27. **Chapter 12:** Applicant shall provide a specific phasing plan associated with providing the community services element of this Plan prior to final approval. The phasing plan shall articulate when and how the public benefit and private development portions of the plan shall be sequenced.
28. The applicant shall work with staff to make all the approved amendments and other necessary edits to the satisfaction of the Planning Director and Town Attorney prior to final approval by Town Council.

Item B: Based upon the findings as presented in the staff report and by the applicant related to Item P18-208, I move to make findings in Section 8.3.1 Sketch Plan related to 1) Consistency with the Comprehensive Plan; 2) Achieves purpose of NRO & SRO overlays; 3) Impact of public facilities & services; 4) Compliance with LDRs & Town Ordinances; 5) Conformance with past permits & approvals of a Sketch Plan for the Snow King Planned Resort District Master Plan subject to the department reviews and any conditions deemed necessary by staff to conform with the language approved in the Planned Unit Development amendment in Item A.



November 8, 2018

Ryan Stanley
Vice President & General Manager
Snow King Mountain Resort

Tyler Sinclair
Town of Jackson Planning Director
PO Box 1687
Jackson, WY 83001

Dear Tyler,

In anticipation of the forthcoming Town Council meetings regarding the Snow King Resort Master Plan Amendment we would like to provide some additional information as requested by Town staff and the Town Planning Commission. The primary topics we would like to address are requested changes by the Planning Commission, the proposed locations of a gondola and zip-line, and the connection between the United States Forest Service Plan and the proposed Master Plan.

The proposed Town of Jackson Resort District master plan amendment and the associated USFS proposals have now been subject to nearly four years of public review, commentary, and multiple rounds of substantial changes. During this period, we have amended the proposed USFS master plan twice in response to public input, and are discussing below substantial revisions to the Resort District Master Plan based upon planning staff and commission review. Ultimately, we must consider these changes in context of both the short and long-term viability of the resort district and its members interests. Therefore, any and all substantial changes to the proposed amendment must be looked at holistically and in conjunction with proposed projects on USFS lands. If certain concessions are made below and ultimately others are requested it may be necessary to evaluate the changes that have been accepted to date.

Planning Commission Recommendations

Many of the planning commission recommendations are entirely acceptable and we could be willing to incorporate them into the master plan amendment as it is currently proposed. The changes we could be willing to directly incorporate into the amendment are listed below by chapter. In the case of suggested changes to discuss further, our comments follow the suggested change in bold italics.

1. Chapter 1

The applicant shall revise the Master Plan to clearly define a modern vision for the Master Plan moving forward including what the role, function and location of the convention center will play or not. If this is not possible the Plan should be amended to include a vision moving forward to better align with the 2012 Comprehensive Plan and

community's goals today. The defined new vision would be used to review future land use changes in the Plan specifically but not limited to Sub-area #2.

The applicant engaged in a memorandum of understanding with the Town of Jackson to not make changes to sub areas #1 & #2 as part of this proposed master plan amendment. As such, we believe that changing this section is outside the scope of this amendment as it has yet to be determined if a focus on conference space is still desired by Snow King and the community or not. However, if the desire of the Council is to change this vision we would be willing to change this section to align the vision with that of the Teton County Comprehensive Plan, which calls for targeting commercial development in district 2, if it was desired, in conjunction with an increased focus on recreation.

2. Chapter 2

Applicant shall revise Chapter II to include compliance with the 2012 Comprehensive Plan and the interrelatedness of the 1994 and 2012 Comprehensive Plans.

Snow King will adopt this recommendation.

3. Chapter 3

Applicant shall work with staff to update references to the Land Development Regulations to incorporate the current Land Development Regulations as required.

Snow King will adopt this recommendation.

4. Chapter 4

Applicant shall revise Sub-area #1 or #3 to include all of the proposed building currently split between two sub-areas into one.

Snow King will adopt this recommendation.

5. Chapter 5

Applicant shall revise the proposed land use schedule to require a Conditional Use Permit for all permanent Outdoor Amusement/recreation and Commercial Amusement uses.

Snow King would be willing to accept this change under the current holistic proposal for any permanent structures apart from those outdoor activities which are part of the current USFS proposal.

6. Chapter 5

Applicant shall revise the proposed land use schedule to require a basic use permit for a temporary Outdoor Amusement/recreation and Commercial Amusement uses. Temporary shall be defined as a use occurring for a period of less than 180 days per year. Upon expiration of the temporary use the operation of and all associated improvements shall be completely removed from the property. There shall be a limit of two basic use



permits allowed per use thereafter the use shall be considered a permanent use and require a Conditional Use Permit.

For seamless operation of a ski resort, hotel and conference center, the ability to host a variety of events within the district is an important function. Many of these events may necessitate a variety of tents, structures, or other temporary constructions. As such, the applicant would like to propose that for temporary uses that occur for less than 6 months and have a size of under 2000 square feet is approved within the resort district. Anything over this size or remaining for longer than 6 months will require a conditional use permit.

7. Chapter 5

Applicant shall revise the Example Development chart (in all locations) to reflect the new proposed Sub-areas and associated uses and square footages to reflect what has been built to date and what is anticipated in the future.

Snow King is willing to make this update.

8. Chapter 6

Applicant shall revise the Chapter to include a requirement that all buildings be reviewed for compliance with the Master Plan Design Guidelines by the Town Design Review Committee.

Snow King would be willing to accept this change under the current holistic proposal.

9. Chapter 7

Applicant shall include language in Sub-area #3 for Lots 53 and 58 to ensure compatibility with the neighborhood to the east including but not limited to consideration at time of Development Plan of stepping down the building height, additional landscape screening, etc.

Snow King Mountain wants to clarify that additional landscape screening for lots 53 and 58 can occur within the buffer zone between neighbors to the east of proposed developments on lot 59 and that any development on the lot could be configured in one or multiple buildings based on the best design for the location.

10. Chapter 7

Applicant shall include language in Sub-area #3 for Lot 57 to ensure compatibility with the recreational area to the west including but not limited to consideration at time of Development Plan to shifting the building to the east, reducing the footprint of the building, breaking it up into multiple buildings, etc. In addition, the applicant shall include language to address bulk and scale concerns with the proposed structure including stepping down the building height, reducing the building height to 2 stories, etc.

Snow King Mountain would like to clarify that any development on the lot will not impact the recreational area to the west.

11. Chapter 7

Applicant shall revise the plan to include a requirement for alternative transportation mode improvements to connect the Master Plan to Cache Creek Drive including paving, bollards, signage, and other best practices.

Snow King would propose that this improvement is conditioned upon the development of any future projects on lots 53, 57, or 58 and is willing to accept the change under the current holistic proposal.

12. Chapter 7

Applicant shall revise Sub-area #4 to reduce the proposed building envelope, to remove discussion of parking and to require a thorough review and consideration of the proposed uses through a Conditional Use Permit both onsite and with the surrounding neighborhood. The applicant shall revise the proposed building envelope on Vine Street to allow for a sidewalk and Complete Street cross section connecting the facility to the resort.

The applicant would like to propose a maximum height of 42 feet for the building proposed in Sub-area 4 to better blend in with zoning across the street, where part of the zoning is 46 feet maximum height and the other zoning is 39 feet. Snow King will revise the building envelope to incorporate a sidewalk and complete street cross section connecting the facility to the resort.

13. Chapter 7

The applicant shall revise the use table to allow light industrial uses in Sub-area #4 and #5.

Snow King is willing to accept this change.

14. Chapter 7

Applicant shall provide language in this Chapter to ensure that all development within the Master Plan shall meet the LDR hillside development requirements in place at the time of Development Plan.

Snow King is willing to accept this change.

15. Chapter 7

The applicant shall revise the language in the plan to require a CUP process to determine a final design of Phil Baux Park. The revised plans would allow the landing of the gondola on Town property in a location that does not divide the park. In addition, site circulation for all modes of transportation should be addressed including the location of parking, pick up and drop off, locker areas, START bus stops, etc. Buildings and improvements should be clustered together near existing improvements to obtain as much open space as possible. The detailed plan should locate improvements generally at the street level to address accessibility and ease of access during all seasons.

Snow King is willing to accept this change, see below for discussion of Phil Baux Park.

16. Chapter 8

Applicant shall revise the Chapter to remove language regarding banking/credits for units.

The applicant believes maintaining the proposed language within the amendment provides clarity regardless of the fact that it is duplicative language within the existing LDRs.

17. Chapter 9

Applicant shall revise the current TDM requirements to include the following additional measures:

- a. Provide free or reduced-level bus passes to all employees
- b. Provide free or reduced-level bus/bike passes to guests
- c. Require off-site parking for employees
- d. Provide START Bikes and promote alternative modes of travel for employee and guests
- e. Promote transit usage in marketing and website promotional material

Applicant is willing to add all additional measures listed above to the existing list of transportation demand management strategies within the master plan and increase the number of strategies required to be implemented from 2 to 5.

18. Chapter 9

Applicant shall revise the Chapter to incorporate the most current data and transportation improvements that have been made.

Snow King is willing to make this update.

19. Chapter 9

Applicant shall be required to pave and maintain the availability of the surface parking lots in Sub-area #2 for use by all patrons to the area.

Snow King Mountain could be willing to pave surface parking lots in sub-area 2 as a temporary use of the sub-area prior to additional development and would request that the Town contribute to snow plowing of these lots as they are heavily used by patrons of the Snow King ice rink in winter. Snow King would request that the ice rink lessee contribute to this paving effort as their users are the direct beneficiaries.

20. Chapter 9

Applicant agrees to participate in a TDM program development for the entire Snow King Base area with other surrounding property owners and users.

Snow King would be willing to accept this change under the current holistic proposal.

21. Chapter 9

Applicant shall provide parking counts for all surface parking lots over 10 spaces as part of the required transportation monitoring requirement.

Snow King would be willing to accept this change under the current holistic proposal.

22. Chapter 10

Applicant shall address all conditions in the Town Engineer memorandum dated September 12, 2018.

Snow King Mountain will address any conditions in the Town Engineer memorandum related to on mountain development prior to any further development within the district.

23. Chapter 11

The applicant shall revise language in the Master Plan to outline the following minimum requirements of Snow King Resort Master Association (SKRMA):

- a. Define the SKRMA “entity structure” as generally made up of three entities, Snow King Mountain, the Hotel and the Condominium Associations with the associated voting structure to be clarified by the applicant prior to final approval.
- b. Prior to final approval of the Master Plan the Town and SKRMA shall develop an agreement including all the requirements and obligations under the Master Plan that functions in perpetuity that is transferable to any/all new owners.
- c. SKRMA agrees that all future development shall meet current housing requirements.
- d. Ensure SKRMA is responsible for all requirements of the agreed upon parking and transportation demand management (TDM) plan. Clarify maintenance expectations and requirements, including snow removal for private roads, private infrastructure including but not limited to private sewer, water, storm sewer and all other infrastructure.
- e. Define in the Master Plan that should compliance with any of the Master Plan commitments (including the approved phasing plan) cease, all future development under the Master Plan shall be suspended until consideration by the applicant and the Town.
- f. SKRMA shall provide to the Town by January 1 of each year an annual report including how each requirement and obligation under the Master Plan is being satisfied and current financial information for SKRMA to ensure there is adequate ongoing funding. SKRMA will include in the annual report the composition of the board and status of the organization.

SKRMA shall provide upon request to the Town of Jackson proof of compliance with all obligations of the resort district, no more than every two years, along with the TDM report, or prior to any development approvals within the district.

24. Chapter 11

The applicant shall revise language in the Master Plan to outline the following minimum requirements of Snow King Mountain (SKMR):

- a. Maintain clear and negotiated hours of lift operations (current hours desired but acknowledgment that needs may change in the future)

Snow King Mountain would guarantee a minimum of 49 hours of operation per week (equal to JHMR currently) if amendment is accepted as proposed with full support for USFS proposals. Changes to proposal will necessitate a business re-evaluation of the minimum hours of operation.

- b. Develop procedural agreement with Town of Jackson regarding how/when to allow closures for conditions (summit and ski hill)

Snow King Mountain is willing to abide by the minimum number of hours of operation per week above in winter with the exception of closures for safety concerns or repairs and maintenance.

- c. Ensure / negotiate affordable rates for locals with Town of Jackson

Snow King mountain will endeavor to be the most affordable ski area in the region and market forces will generally ensure this is the case.

- d. Maintain access for current user groups, to be defined prior to finalization of the Master Plan

Snow King will guaranty access for current user groups under the current holistic proposal.

- e. The provision of the following improvements pursuant to the phasing plan for the entire Master Plan:
 - i) Mountain Sports Facility
 - ii) Gondola
 - iii) Phil Baux Park improvements as defined by a future CUP process

See proposed Phasing Plan below.

25. Chapter 11

Applicant shall revise this Chapter to provide specific details on the roles and responsibilities of SKRMA and Snow King Mountain and penalties for non-compliance and a detailed phasing plan articulating when and how the public benefit and private development portions of the plan shall be sequenced.

The applicant is willing to accept the provision requested above that should compliance with any of the Master Plan commitments cease, all future development under the Master Plan shall be suspended until consideration by the applicant and the Town. See below for Phasing Plan.

26. Chapter 12

1. Applicant shall revise this Chapter to ensure that the following improvements be provided consistent with the approved phasing plan:
 - a. Mountain Sports Facility
 - b. Gondola
 - c. Phil Baux Park improvements as defined by a future CUP process
 - d. Maintain clear and negotiated hours of lift operations (current hours desired but acknowledgment that needs may change in the future)

See above for discussion of minimum hours of operation and below for phasing plan.

27. Chapter 12

Applicant shall provide a specific phasing plan associated with providing the community services element of this Plan prior to final approval. The phasing plan shall articulate when and how the public benefit and private development portions of the plan shall be sequenced.

Phasing Plan

In order to provide a clear understanding of the sequence of proposed improvements associated with the master plan amendment, and their relation to the USFS proposed projects, the following phasing plan is proposed for consideration. This phasing plan will allow for the provision of community benefits associated with proposed projects in conjunction with development within the resort district.

Upon Final Approval of 2018 Master Plan Amendment:

- ***Snow King adopts current employee housing mitigation standards***
- ***Snow King Mountain guarantees minimum of 49 hours of operation per week (equal to JHMR) if amendment is accepted as proposed with full support for USFS proposals. Changes to proposal will necessitate a business re-evaluation of the minimum hours of operation.***
- ***Snow King will clarify and provide requested information on SKRMA board***
- ***Lots 53, 57, and 58 are clearly defined***

- *Town of Jackson provides letter of support for all USFS proposals contingent upon environmental review*
- *Town of Jackson agrees to new lease terms contingent upon USFS NEPA review and location of gondola and zip-line*

Upon completion of USFS NEPA Review:

- *Snow King Mountain adopts new lease terms for use of Town land*
- *Snow King makes required capital contribution or provides letter of credit for redesign of Phil Baux Park*
- *Snow King is approved for construction of Gondola in Park & zip-line construction*
- *Snow King begins with approved projects on USFS lands including lodge at summit, observatory, planetarium and other improvements.*
- *Prior to the construction of a new development within the district all engineering requirements for the specific development will be met.*

Gondola and Zip-line Discussion

The proposed amendment to the master plan contains a map showing a gondola terminating in Phil Baux park adjacent to Snow King Avenue with a small ticket sales building and zip-line terminating on top of the building. Based upon feedback from the Parks and Recreation staff and board, as well as Planning staff and commission, we believe that the best location for this complex is around the area of the Cougar lift. This location will allow for better circulation in Phil Baux park, eliminate any impacts on the baseball field area, and potentially leave the existing parking lot area undisturbed. By locating the gondola in this location, it will help to open up the base of the ski area for summer/winter uphill and downhill circulation and better encourage the parks use as a front country gateway to the national forest. In addition, the location will allow for easy ADA access to the gondola from street level.

We believe locating a new gondola in the vicinity of the Cougar lift will be the best long-term location for a new aerial tramway that can serve Snow King Mountain and the community for decades to come. In exchange for locating the gondola in this location we would be willing to contribute financially to the redevelopment of Phil Baux park should the Town seek to do so. However, should the Town conclude this location is undesirable, or if the cost for ongoing rent under new leases associated with locating the gondola on Town land is unsustainable for the business, we are comfortable replacing the lift further South on private property. This location on private property will make the construction of an additional building on the West side of the ice rink for the conceptualized mountain sports training facility less desirable due to the increased constriction at the base of the mountain. In addition, by changing the proposal to this location, some of the other concessions that have been generally agreed to above must be reconsidered.

The zip-line proposed adjacent to the gondola in the master plan amendment map submitted is an integral piece of the business plan associated with the construction of a new gondola and other improvements on the mountain. Town staff, the Snow King stakeholder group, the general public, and the Town Planning Commission have all had a variety of opinions on this



component of the proposal. Town staff has recommended terminating the proposed zip-line at the East Portal adjacent to the Coaster, the stakeholder group and general public had mixed opinions, and the Town Planning commission was more supportive of terminating it on the West Portal adjacent to the gondola. From the business and operational perspective, we sincerely believe that locating a zip-line adjacent to the gondola will be by far the most successful in the long-term creating additional cash flow that can ultimately sustain the ski area operations long into the future and justify more substantial investment into mountain improvements, particularly things such as a mountain sports center or other community-oriented benefits. For these reasons we proposed the zip-line terminating at the West Portal in the master plan amendment submittal. While we do believe that it is feasible to terminate a zip-line experience on the East Portal, it may necessitate the need to modify other components of the amendment as proposed if we make this change to our plans.

United States Forest Service Proposed Projects

The Town of Jackson has encouraged a comprehensive review of development on USFS land as well as within the Snow King Resort District as part of the public review and stakeholder process for evaluating proposed improvements. As such, we believe the review and approval of the resort district master plan amendment must be tied to proposed projects on USFS land, contingent upon environmental review. This can be achieved as part of the resort district master plan review at the conclusion through a letter of support for proposed projects as they have been presented on USFS land and through continued support as a cooperating agency as part of the review process. This is a critical piece of the review process due to the interconnected nature of the proposed improvements to the mountain.

We greatly appreciate your support and efforts helping to build a successful, sustainable, Snow King Mountain and thriving Snow King Resort that can continue to serve the community for decades to come.

Sincerely,

Ryan Stanley

Town of Jackson Project Reviews

Project Number	P18-208	Applied	6/29/2018	STOL
Project Name	Master Plan Amend. - SKRMA	Approved		
Type	MASTER PLAN	Closed		
Subtype	AMENDMENT	Expired		
Status	STAFF REVIEW	Status		
Applicant		Owner	SNOW KING MOUNTIAN RESORT, LLC	
Site Address		City	State	Zip
10 E SNOW KING AVENUE	JACKSON	WY	83001	
Subdivision	Parcel No			
	22411634300003			

Type of Review	Dates				Page 1 of 10
Notes	Status	Sent	Due	Received	Remarks

Legal	APPROVED W/COND	6/29/2018	7/20/2018	8/8/2018	see notes
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(8/8/2018 6:00 PM AC)

The current Snow King Planned Resort District Master Plan was approved under the commonly referred to 1994 Land Development Regulations (LDRs), specifically Division 2500 Planned Resort (PR) District. Section 2540.B Amendment of Master Plan which states as follows:

B. Amendment of master plan. Any amendment to the Planned Resort master plan shall be reviewed and acted upon pursuant to the procedures set forth in this Division for review and action on the original master plan. The amendment shall be subject to all applicable standards of this Division and these Land Development Regulations that are in effect at the time of review of the amendment. Notwithstanding, minor deviations from a Planned Resort master plan may be approved by the Planning Director, pursuant to Section 51200.J, Minor deviations.

Based upon the above, the current Master Plan amendment shall be reviewed pursuant to the Land Development Regulations that are in effect at the time of review of the amendment, or the current LDRs now in effect.

Pursuant the Section 4.3.1.C Legislative Act of the current LDRs Planned Resorts shall be reviewed as follows:

Each Planned Resort Zone is subject to the legislative authority of the Town Council and to the findings and procedural standards outlined in Sec. 8.7.3. An approved Planned Resort master plan shall establish the development standards for that Planned Resort Zone.

In addition pursuant to Section 4.3.1.E Procedure:

A Planned Resort master plan shall be reviewed pursuant to the standard procedures set forth for review of a PUD in Sec. 8.7.3.

Furthermore, Section 4.3.1.8.a Amendment of Master Plan states:

Any landowner within a Planned Resort District may apply for amendment to the Planned Resort master plan. The amendment shall be reviewed and acted upon pursuant to the procedures set forth in Sec. 8.2.13. Minor deviations from a Planned Resort master plan may be approved by the Planning Director, pursuant to Sec. 8.2.13.

Based upon the above requirements, the proposed amendment shall be reviewed and approved pursuant to Section 8.7.3 Planned Unit Development. Specifically Section 8.7.3.D Findings for Approval shall be considered. As the findings include a LDR Text Amendment and Zoning Map Amendment, the approval shall require three (3) ordinance readings and publishing in a newspaper of general circulation before taking effect.

Parks and Rec	APPROVED W/COND	6/29/2018	7/20/2018	7/26/2018	
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Type of Review Notes	Status	Dates			Remarks
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(7/26/2018 4:37 PM STOL)

Snowking Master Plan Amendment Review

July 24, 2018

Consistency with Strategic Plan:

Special Event/Community Gathering Parks-

Special Consideration for Community Events Infrastructure

The Department currently offers multiple special events throughout the system ranging from racing series to farmer's markets, and as well, supports numerous community events hosted by organizations such as the Chamber of Commerce. As part of creating a community hub within the Town, many special events and festivals happen at Town Square Park, creating large maintenance impacts and traffic congestion in town.

These opportunities are a growing trend because festivals and other special events are popular activities that provide family-oriented entertainment, generate economic activity, and serve to celebrate community identity. They are also viewed as a means of introducing people to the community's public parks and recreation system. When developing opportunities for community gathering spaces (new events space, home for farmers market, amphitheater, etc.) the Department should consider:

Flexible use spaces, such as open unprogrammed turf areas, can accommodate community events and be used for other activities such as youth sports practice space at other times.

These areas should be within town limits, but smaller events that cater to communities of Wilson and even Teton Village could be held at the community parks in these areas.

Walkability is important, and parking for larger events should be considered. Passive parks and gateway parks are not typically ideal for these events, because they either do not have the space to accommodate them, or they already have heavy use/traffic from visitors.

Some events such as the farmers market are better situated on paved or gravel surfaces and could benefit from covered pavilions/shelters.

Gateway Parks-

Gateway Parks should strengthen the sense of arrival into the community. Enhancing Jackson Gateways (Policy 4.4.b) is a focus in the Comprehensive Plan and parkland can play a role in this.

North Park is an obvious gateway, as it sits at the northern extent of town adjacent to the Visitor Center. Though in the center of Jackson, Town Square functions as a gateway of sorts, as it is often one of the first outdoor places in town that tourists will visit. The future park in Teton Village will play the role of Gateway Park. Phil Baux Park is a gateway in a different sense, as it is the gateway from town to the mountains and forest.

Phil Baux Park Re-development-

Because of its geographic location and Snow King resort improvement plans, Phil Baux Park figures prominently in the discussion of parkland's role in the community. There are several policies in the Comprehensive Plan that highlight the importance of this site. Phil Baux Park is the end point of the Snow King – Maple Way connector and as such is a key piece of a Complete Neighborhood (Policy 2.2.a). The site can continue to serve as an access point to Bridger-Teton NF enhancing natural features in the built environment (Policy 3.2.f) and also serve as a different type of gateway (Policy 4.4.b), a front country gateway to the mountains.

The park is a valuable community gathering site and contains a grass area that can be used for a sports practice field. These roles may not necessarily be incompatible with Snow King's future plans for the site, but the community must a) understand the importance of this site and b) if not undergo a full redesign of the western portion of the site then at least establish some requirements and compensation criteria for any resort-related development on the property.

Additionally, a re-development at Phil Baux Park should include consideration of the need for, and the design for, special events within the community, an activity identified by multiple users and one of the most requested activities on a national level. Currently, most of the special events provided or hosted by the Department occur within the Town center, but there is concern of over use and traffic in the park.

Developing a space at Phil Baux Park provides the Department with a supplemental site for events, while retaining the "Town core" concept from the Comprehensive Plan. It should be noted that events do currently occur in Phil Baux Park, but it is not specifically designed to support this type of activity.

Options for re-developing Phil Baux Park

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Type of Review Notes	Status	Dates			Remarks
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? Phil Baux Park should be developed to encourage its use as a front country gateway to the National Forest. Public use and access should take precedence over redevelopment by a private entity . ? As Phil Baux Park forms the end point of the Snow King – Maple Way connector (Comprehensive Plan) having a community focused node at this location is vital. ? A large flexible space can accommodate community events such as concerts, farmers markets, and youth sports practice areas. ? Building off themes of “front country” exploration and the bouldering wall in this park may also be a good location for a natural play area and interpretive signage related to forest ecology, wildlife, etc. ? Consideration could be given to an X game or extreme sports theme, and/or could include a skatepark.					

Recommendations for re-developing Phil Baux Park- Medium priority (2-5 years)-

? Creating connections to the National Forest trail system.

? Developing a special event space to accommodate outdoor concerts/amphitheater, community gatherings and festivals.

? Incorporating outdoor alternative sports/opportunities:

o Climbing

o Skateboarding

o Broomball

o Inline skating

o Nature play areas.

Staff Comments: (Phil Baux Park)

Upon review of the proposed west portal master plan, staff believes that the intent of the applicant is in general concert with the strategic plan. The master plan supports outdoor mountain and alternative sports, provides a gateway to the National Forest, and accommodates openspace for special events.

Staff’s comments are primarily based upon April to November use. The park as generally served the winter resort operations in the winter, and the general park public in the summer. The success and public compatibility of the plan rests in maintaining safe, free and accessible use of the public’s property for the entire community for non-ski season. This includes both residents and guests. To meet the criteria of a gateway park to the National Forest, the public would need to maintain free uphill hiking and biking access to the greater Snowking trail system. Additionally, the park needs to maintain its public identity and character, and commercialization should be kept at a minimum. The location of a gondola/summit lift on the Town property supports the gateway element by providing a public/private alternative means to reach the National Forest. Siting of this amenity should meet the following conditions:

? Place the gondola no further north than the south half of the existing playground;

? Allow for safe and unencumbered user access from the east park facilities to the west park facilities;

? Allow minimum commercialization, advertising and vendor activity to maintain public park feel;

? Place gondola so to allow safe, clear and accessible biking and pedestrian movement north to south from Snow King Ave. to the National Forest trail access points;

? Provide consideration to the public for use of public land through partnership and use of the resort property for extended turf uphill (south). The turf access further emphasizes the gateway connection and helps draw the public up the mountain. Staff is less supportive of locating a zipline within the park. The amenity has commercial character by use, noise, and visual effect. Staff’s believes that this amenity greatly alters the public park character, and recommends that such a feature be located on privately owned property or adjacent to like features such as the coaster.

As indicated in the strategic plan, Phil Baux Park plays a key role in public alternative and mountain sports. Shared use of the property needs to support other sport/recreation opportunities. A key amenity that has been identified as ideal for Phil Baux Park is a new skatepark facility. As the X-games continues to grow, along with the introduction of skateboarding as an Olympic sport, the activity continues to increase in demand. The most successful skatepark facilities are prominatly located in parks, with good visual and amenity access. This further supports the identity and character of the park and resort, and further places an emphasis on serving our community’s youth.

The other critical element of the park as identified by the strategic plan is special events and concerts. The park continues to grow in

Type of Review Notes	Status	Dates			Remarks
		Sent	Due	Received	

popularity for such activities, and site design will be critical to ensure successful use in the future. The master plan amendment supports this use by recommending large open multi-use turf. Again, for this to be successful, it is critical to maintain an open and clear east to west public connection through the entirety of the park. The plan amendment illustrates an amphitheater for further supporting concerts, theater events, etc. Staff agrees that this is an ideal amenity for the park, and a strong anchor to the Cache Street corridor. Location of the amphitheater needs to maintain the following site conditions:

? Centrally locate in the middle of the park from east to west to maximize the uphill topography for ideal viewing;

? Locate from the middle to the south of the park to allow clear, safe and unrestricted movement in the park from east to west.

The plan amendment has identified on-street parking on south Cache, and drop off access from Snow King Ave. Staff does not support either of these elements. Although the stakeholders recommended minimal parking on site, most of this conversation was based around the commercial use of the site, and the commercial operator providing alternative transportation to the park. In order for the park to maintain its public character, accessibility and functionality, reasonable parking on site is required. Staff recommends that parking be placed on-site within the park but on the north and west perimeters. Parking should be sufficient in scale to not negatively impact neighbors, accommodate standard park and recreation standards, and also serve as a programmable hardscape for community events, festivals and markets. Staff does not support large loading/offloading at the front of the park. This considerably changes the character of the park from public recreation to commercial operations. Tour buses, taxis, and shuttles should be directed to the resort district and hotel. Additionally, a current Start bus shelter and pull-out is located on the east edge of the park. Staff recommends providing increased bicycle parking, bicycle maintenance amenities, and increase Start bike opportunities.

Staff Comments- (Community Recreation outside Phil Baux Park)

The strategic plan has identified an on-going community recreation need for indoor climbing. Colocating this amenity with the Snow King Center can greatly fill this need. The facility is currently under a private/public partnership, and continuing this model could be ideal for the community. During staff's earlier discussions with a like partnership at the Recreation Center, we concluded that clear expectations of community access, affordability and transparency of the operator is imperative. In order to utilize public land and facilities for commercial operations, the public must be provided with long-term use and assurances of asset maintenance and management.

Over the past twelve years the department has conducted three community surveys to better understand the public's recreational needs and how those needs are being met. Access to our immediate public lands through walking, running and biking trails consistently remains a high priority. Opportunities to expand and improve this access would be supported by the department's community outreach. On the flip side, data does not support the expansion of additional ice facilities for public need. In 2015 33% of the community had a need for indoor ice, of which 82% of the community need was primarily met. In contrast, 38% of the community had a need for indoor climbing, of which only 14% of the community need was being met.

*** In addition to staff comments... Please see below the recommendations from the Teton County/Jackson Parks and Recreation Department Advisory Board

Teton County/Jackson Parks and Recreation Department
Advisory Board Minutes

Thursday, August 9, 2018

5:00 PM – Town Council Chambers

Board Members Present: Dave Ellerstein, Shawn Meisl, Missy Falcey, Linore Wallace, Jim Clouse, Stephanie Thomas and Frank Lane

Staff in Attendance: Steve Ashworth, Andy Erskine, Phil Moya and Christina Ramos

1. Call to Order: Meeting was called to order at 5:00pm.
 - a. Additions/Deletions to the agenda - none
2. Approval of the July 12, 2018 meeting minutes: Frank motioned to approve the July minutes, seconded by Shawn. All in favor.
3. New Staff Introductions- None

Type of Review Notes	Status	Dates			Remarks
		Sent	Due	Received	
4. Public Correspondence- None					
5. Upcoming Volunteer and Participation Opportunities - Andy Fleck/Phil Moya: None at this time.					
6. Citizen Input to the Board for items not on the agenda: None at this time.					
7. Action Items					
a. George Washington Memorial Park, War Memorial Replacement- Don Perkins (30 Minutes)					
The Mayor and Vice-Mayor requested the Parks & Rec Advisory Board to review the proposal and provide recommendations prior to being presented to Town Council. There is currently not a policy regarding memorials, monuments and public art on public land/space. Steve recommends asking Town Council that the Parks & Rec Advisory Board partner with the Public Art Task Force to develop a policy for public spaces. Site illustrations were provide by Carla from Nelson Engineering.					
Cliff Poindexter and Greg McCoy presented. Cliff shared that the masonry on current monument is deteriorating so they are looking at a new material. There are currently 544 names on the monument. The proposal is to remove the masonry and plaques then build a steel frame. On the frame put polished granite that would be laser etched with pictures and names. The planters would be removable and the benches are solar which would provide the lighting at the bottom and top of the monument. The 100th anniversary of the Jackson Hole Legion is 2019; would like to unveil on Memorial Day. Greg added that there will be space, at the bottom of the monument, for the Town to add representation.					
Stephanie motioned that the Advisory Board recommends moving forward with the project's size and scope implications on the Parks Department with the recommendation that the design be reviewed by the appropriate design review committee. Frank seconded. All in favor.					
Shawn motioned that the Parks & Rec Advisory Board partners with the Public Arts Task Force to develop a memorial/monument policy for public areas. Linore seconded. All in favor.					
b. Snow King Resort Master Plan Amendment- Ryan Stanley/Jeff Golightly (45 Minutes)					
Steve referenced the staff report which included staff comments and recommendations. The Advisory Board would be providing a recommendation to the Town Council, on this project, as it affects Parks & Recreation.					
Jeff provided background on the project and recent changes of the landing location of the gondola; moving it further south, near the Cougar Lift. Jeff and Ryan answered questions from the board. Public comment was received from 13 individuals of the community. Linore motioned that the TCPR Advisory Board make a recommendation to the Town of Jackson Council not to support the amendment to the Snow King Master Plan that includes the landing of the proposed gondola and zip line on the Town of Jackson property known as Phil Baux Park and Ball Field as illustrated on the map included in the amended plan. (Map A) Missy seconded. All in favor.					
8. Information/Discussion Items – none at this time					
9. Directors Report – Steve added that the first public engagement meeting for BLM Parcel 9 & 10 is on Tuesday, Aug. 15th, at 5:00pm – 7:00pm at the Old Wilson School. The purpose of the meeting is to ask the public what they would like to see done on this land.					
Question was asked about the improvements at the Wilson Boat Ramp. Steve answered; 14 truckloads of gravel were extracted yesterday which improved conditions. A week from Monday, Aug. 27th, at 3:30pm; Steve will be in a workshop with Board of County Commissioners on visioning the goals for long term maintenance and operation level of service.					
10. Comments/Matter from the Board					
a. Board Goals					
i. Marketing and Communications (Andrew Fleck & Phil Moya)					
ii. Community Dog Off-Leash Facility (Andrew Erskine)					
iii. Future Specific Purpose Excise Tax [SPET] (Steve Ashworth)					
b. Community Communication – The Board has received public comments on our agenda and minutes not up to date on the Parks & Rec website.					
Pathways	APPROVED	6/29/2018	7/20/2018	8/30/2018	

Type of Review Notes	Status	Dates			Remarks
		Sent	Due	Received	
(9/3/2018 8:05 AM STOL) P18-208 –Snow King Master Association Resort Master Plan Amendment Comments from Teton County/TOJ Pathways Department Status: approved - Comments at this phase are quite general in nature. As the applicant develops more detailed plans, comments will also be more detailed. Some of the comments below may encompass a broader reach than is specifically covered in the specific Master Plan Amendment, but the comments are nonetheless relevant to the role that Snow King plays in the Town of Jackson and reflect the fact that Snow King’s reach and impact extend well beyond the immediate boundaries of the resort itself. - An overarching goal reflected in all comments is that access to and from the resort by transit, biking, or walking should be exceptionally convenient, comfortable, and desirable—more so even than arriving by car. If this is achieved, then concerns over traffic impacts will be substantially mitigated. - Connectivity - Connectivity for bicyclists, pedestrians, and other non-motorized forms of mobility should take a high priority for a resort property. This is applicable to both internal connectivity with the resort area itself as well as external connectivity to surrounding streets, public parks, transit access, trailheads, and downtown. - Specifically, the street design on Snow King Ave. should prioritize safe and comfortable bicycle and pedestrian facilities connecting to the Town Square and further west along Snow King. Snow King provides bicycle rental services for out of town guests that often have limited riding experience and are unfamiliar with the area. Similarly, Snow King is also a frequent destination for families and children of all ages going to destinations such as the Ski Club, hockey rink, Phil Baux Park, and Snow King trail system via bicycle. Given these conditions, and the fact that Snow King is also the primary east-west corridor for bicycle traffic in town, the Town and the applicant should explore protectedbike lanes along Snow King Ave. - Pedestrian access along Snow King Ave. should be enhanced. The connection from the hotel to Cache St. (at least) should be a high-quality pedestrian experience that will entice visitors to walk from the hotel to downtown. The corridor should provide comfortable access for people with mobility issues to the event center, Phil Baux Park, and other destinations. The potential to redesign the Snow King Ave. streetscape represents an opportunity to provide an outstanding pedestrian experience and seamless connection to the resort facilities and the natural resources available on Snow King Mountain. - Provide public access to Cache Creek via the route shown in the Town of Jackson 2012 Bicycle Improvement Plan (Map 3 – Recommended Bicycle Improvement Corridors). - Continue to provide access to the Forest Service trails. - Transportation Demand Management - Snow King should explore TDM strategies to reduce car trips for the full range of visitors to the resort area. These include guests staying at the resort, visitors to Jackson who are not staying at the resort but are using services at the resort, and locals accessing services or other features at the resort. - The Town of Jackson and Teton County should assist Snow King in developing TDM strategies and goals. - Generally, transit, bicycle, and pedestrian access should be integrated so that all three modes can be used seamlessly. - Parking - Overall parking demand and the provision of on-street and off-street parking for the resort should be carefully considered. If future development is over-parked (i.e. if too much space is allocated to parking), this will undermine TDM efforts to reduce car trips to and from the resort, and people will in essence be encouraged to drive personal vehicles to the resort. Snow King and the Town of Jackson should work closely together to reduce the need for parking to the maximum extent possible. - When it comes time to design the details for vehicular access to destinations such as the base area, Phil Baux Park, gondola access, the events center, etc., extra care must be used to ensure that these areas are not degraded by making them essentially into vehicle dropoff zones where a continuous stream of idling cars makes the whole area inhospitable for all other users. These spaces should be prioritized for the people actually using them, not for the convenience of the car drivers trying to access them. (A good example of how not to do this is the existing entrance to the event center/hockey arena—it’s a junk show that forces anyone trying to enter the arena on foot to have to walk through a gauntlet of idling vehicles). - Ample bicycle parking should be provided throughout the resort area at all destinations. Additionally, simple amenities for bicyclists (fix-it stands, benches, etc.) should be incorporated. - Additional Elements - Resort features and enhancements for bicyclists, such as a pump track-style bike park available to riders of all ages and abilities, would be broadly supported. - Thank you for the opportunity to comment on the plan amendment. I would be happy to coordinate with the applicant on any of the comments provided, and I look forward to any opportunity to assist the applicant in incorporating improvements for bicyclists and pedestrians into future plans.					
Public Works	APPROVED W/COND	6/29/2018	7/20/2018	9/21/2018	

Type of Review Notes	Status	Dates			Remarks
		Sent	Due	Received	

(9/21/2018 4:14 PM BTL)

Master Plan Amendment – Approved with Conditions

P18-208

Snow King Resort Master Association; c/o Ryan Stanley, Snow King Mountain Resort
10 E Snow King Ave

September 12, 2018

Brian Lenz, 307 733-3079

We have reviewed the proposed amendment to the Snow King Planned Resort District Master Plan (the “Plan”) with cover letters dated June 28, 2018.

PRIOR TO FINAL CONSIDERATION BY THE TOWN COUNCIL THE APPLICANT SHALL ADDRESS THE FOLLOWING OUTSTANDING ITEMS FOR REVIEW BY THE TOWN ENGINEER:

GENERAL

1. It appears that the Transportation Elements (VIII) and Capital Improvements (IX) sections of the Plan have not been updated to reflect the current state of development.
 - a. Applicant shall update these sections to reflect changes to this information that have been submitted with amendments to the Plan and developments developed under the plan.
 - b. Applicant shall update the maps of the existing and proposed infrastructure to reflect the current conditions and proposed improvements on and off site.
 - c. Please provide maps that are legible in digital PDF format.
2. Additional information requested includes but are not limited to:
 - a. The proposed summit restaurant and activity center. While outside the District, the demands and waste volumes from this facility will be served by the development.
 - b. The proposed gondola base station and activity center. While outside the District, the demands and waste volumes from this facility will be served by the development.
 - c. Existing and Expanded snow making demands and water sources.
 - d. New development including condos, hotels, conference centers, employee housing, etc.
3. Capital Improvements (IX.F) contains Additional Conditions (shown below in *italics*) of approval for the original Plan. Please provide documentation on how the additional conditions have been satisfied throughout the years.

At the time of approval of this Master Plan, the following conditions were included as part of the approval:

Prior to the submittal of the first Snow King Resort Final Development Plan, additional analysis and information shall be submitted for the storm water collection and discharge systems to be installed at the resort. The additional storm water analysis shall include but not be limited to: the preliminary design layout of all onsite collection and discharge systems, a preliminary grading plan, a capacity analysis of the existing Kelly Avenue storm drainage system, a review of the impacts which may be created to adjacent offsite areas and a plan layout which indicates the sub-basin areas and the impervious surfaces to be installed in each. This additional analysis shall be completed to comply with all existing Town standards.

The applicant shall be responsible to complete offsite storm drainage improvements necessary to convey storm water flows from the site to the Kelly Avenue drainage system and, if warranted based on the provided engineering analysis, complete improvements to the Kelly Avenue drainage system that are a consequence of the development within the Snow King Master Plan.

To facilitate the conveyance of storm water flows between the Kelly Avenue storm drainage system and Snow King Estates, the applicant shall provide the Town with a storm drainage easement in the easterly area of the site. The easement location and language shall be mutually agreed to by the Town and the applicant.

An additional water system analysis and information shall be provided and approved by the Town Engineer. The additional information shall be provided with and without the Town's system supplying snow making water and shall include but not be limited to a comprehensive Town water system hydraulic model which indicates the adequacy of the existing Town system at the estimated build out date of the development, a review of available fire flow capacities in the area of the resort at build out, a review of the water velocities produced in transmission pipes which are 8 inches in diameter and less, an analysis of the existing Town storage capacity, a summary of the installation of the proposed high pressure zone, calculations indicating the size of the proposed storage tank

Type of Review Notes	Status	Dates			Remarks
		Sent	Due	Received	
preliminary pump sizing calculations and an implementation plan for onsite systems.					
The applicant shall be responsible to ensure that under, the additional water demands created from the developments build out, the Town's system shall remain in compliance with DEQ water system regulations and Town ordinances.					
The applicant shall insure that the Town's right to inspect onsite water systems is maintained.					
Prior to occupancy of the first Final Development Plan building, the applicant shall be required to complete the installation of an 8" inch (minimum) watermain from the development to Kelly Avenue. The new watermain shall be completed per Town standards and shall be installed in the Cache Creek Drive and Redmond Street Right-of-ways.					
A sanitary sewer system report shall be provided to and approved by the Town. The sanitary sewer plan shall include a preliminary onsite sanitary system design.					
Sanitary sewer systems completed shall be constructed, tested and maintained in accordance with DEQ and Town standards.					
The applicant shall insure that the Town's right to inspect onsite sewer systems is maintained					
The applicant shall be required to provide the Town with financial mitigation fees for the completion of the Cache and Willow Street corridors (from Snow King Avenue to Broadway Avenue) and the intersection of Snow King/Willow.					
The amount collected shall be based on the calculated increased levels of traffic and pedestrian impacts created from the development together with the estimated project completion costs for roadway, curb, pedestrian and landscaping improvements. The improvements required shall be based on the preliminary design as completed in the year 2000 charette process. The mitigation feeto be provided to the Town shall be based on the estimated project costs required to complete the corridor work at the time the fee is due. Any improvements to the Willow Street corridor that are completed by others prior to reaching the levels of new development described below are not to be included in the calculations of mitigation fees. The mitigation fees shall be provided to the Town in cash at the time the levels of development are reached and prior to issuance of building perm its.					
The total new square footage allowed under the proposed resort master plan is estimated to be approximately 700,000 SF. This new square footage does not include the existing hotel building or the Love Ridge development. As such the mitigation fees shall be forwarded to the Town as follows:					
At 200,000 SF of new development: The applicant shall be required to provide 100% of the project costs associated with the completion of improvements to the Snow King/Willow Street intersection. Improvements shall be completed to satisfy the Town standard Level of Service (LOS) requirements for the traffic anticipated at the build out of the development.					
The applicant shall also provide a mitigation fee in the amount of 15 % of the total estimated project cost required to complete the Willow and Cache Street corridors.					
At 400,000 SF of new development: The applicant shall provide an additional mitigation fee in the amount of 15% of the total estimated project cost required to complete the Willow and Cache Street corridors.					
At 600,000 SF of new development: The applicant shall provide an additional mitigation fee in the amount of 15% of the total estimated project cost required to complete the Willow and Cache Street corridors.					
4. Provide details of and a summary of any mitigation fees paid to date.					
5. Provide a documentation of the number of square feet of development to date by subarea. Specifically identify the area of development that make up the existing hotel and Love Ridge developments.					
6. Any offsite water, sewer, stormwater, grading, and pedestrian improvements required as a result of the proposed employee housing on Vine Street shall be the responsibility of the applicant. The housing shall connect to Snow King Ave. and Kelly Ave. with sidewalks and other facilities to accommodate pedestrian and bike users.					
7. The Applicant shall provide digital plans in formats acceptable to the Town Engineer for updating GIS and records resources.					

WATER

1. Clarify which subareas and structures correspond with the proposed facilities used in the demand estimates. For example, a plan identifying the subareas and structures identified by names or codes that are reflected in the estimate calculations.

Type of Review Notes		Dates			Remarks
		Sent	Due	Received	
2. Conduct a study of estimated demands to metered use for existing facilities to confirm values used for estimates.					
3. The plan reference plans for snow making from 2000 with upgrades supplied from Flat Creek. The master plan does not provide the existing and proposed water demands for snow making. The plan calls for a significant increase in the snow making area.					
4. Confirm with the Fire Marshall that the references to the Uniform Fire Code are still compliant with the adopted International Fire Code and Wildland-Urban Interface Code.					
5. Provide the size of the water storage tank facilities that have been constructed.					

SEWER

- Clarify which subareas and structures correspond with the proposed facilities used in the wastewater volume estimates. For example, a plan identifying the subareas and structures identified by names or codes that are reflected in the estimate calculations.
- Conduct a study to measure wastewater volumes from the existing facilities to confirm the values used for estimates that can be integrated into the Town's sewer system model.
- At the least, the west portion, at the connection to Cache St., of the sewer main that serves the ice arena and ski lodge is old clay pipe in need of being reconstructed.
- Currently Phil Baux park and the proposed base of gondola facility are not served by a sewer main. Any future development shall consider and provide these areas with sewer connections. Considering that the existing parking lot may be converted into a park, a new sewer main that is routed within Snow King Avenue is likely the preferred Town option, if elevations allow.

STORMWATER

- Provide a map showing the six stormwater basins modeled and their respective pervious and impervious areas.
- Provide maps that show areas modeled outside of the District when determining the capacity of stormwater infrastructure.
- Conduct a study to measure stormwater volumes from the existing facilities to confirm the values used for estimates.
- It is not clear how stormwater from Sub-Area #2 will be handled. Provide information on this runoff and information on which stormwater system is best suited to convey it, e.g. extension of the storm line at the intersection of Cache St and Snow King Ave. within Snow King Ave. to the base of the development.

TRANSPORTATION

- The Plan should be amended to identify the traffic and parking studies that have been completed to date and their pertinent data.
- Figure C-9 shows a detail "bubble" that calls out, "See Figure C-12 for proposed sidewalks." However, there is no figure C-12. If Figure C-12 exists please provide this detail. Please provide information on how the proposed improvements correlate or complement the existing Complete Streets Plan.
- Provide any information regarding the winter season traffic and parking considerations or differences from the summer season.

PRIOR TO FUTURE DEVELOPMENT PLAN APPROVALS, THE FOLLOWING ITEMS SHALL BE ADDRESSED:

GENERAL

- Prior to any additional permits being issued for the District, detailed information concerning the site grading, utility installations and sizing, stormwater system design, roadway construction and construction phasing shall be provided to the Town Public Works Department for review and approval.

WATER

- The water system capacity analysis shall be updated to reflect the existing developments.
- Plans and models shall be updated to reflect the existing conditions at the time of application.

SEWER

- The sewer analysis shall be updated to reflect the existing developments.
- Plans and models shall be updated to reflect the existing conditions at the time of application.

STORMWATER

- The stormwater analysis shall be updated to reflect the existing developments.
- Plans and models shall be updated to reflect the existing conditions at the time of application.

TRANSPORTATION

- Update the square foot of development tabulation relative to the allowed 700,000 square feet. Provide any mitigation fees if triggered by condition.

ADDITIONAL COMMENTS:

Type of Review Notes	Status	Dates			Remarks
		Sent	Due	Received	
Providing a date on the cover and pages of the documents to help distinguish versions of the Plan would be helpful for future submittals.					
Providing larger format maps and scans that are legible in PDF format simplifies the review.					
START	APPROVED W/COND	6/29/2018	7/20/2018	9/12/2018	see attachment
(9/12/2018 9:20 AM STOL)					
On behalf of the START Board of Directors and staff, I offer the following comments (in no particular order) to the proposed revisions to the Snow King Resort Master Plan – Transportation Elements:					
1. Should Snow King Resort pay for traffic mitigation similar to the requirements Jackson Hole Mountain Resort and Teton Village Association are bound by in their Master Plan (Area 1 and 2) with Teton County?					
2. Traffic Volume/related figures need updated					
3. Pg. 300-01: START Schedules and passenger counts need updated from 1999					
4. Pg. 306: START would suggest the following items, some as listed under the strategies for Transportation Demand, be requirements:					
A. Provide free or reduced-level bus passes to all employees					
B. Provide free or reduced-level bus/bike passes to guests					
C. Require off-site parking for employees					
D. Provide START Bikes and promote alternative modes of travel for employee and guests					
E. Promote Transit Usage in Marketing and website promotional material					
With regards to TDM strategies, Snow King will need to work with START to suggest how employees get to/from Snow King (i.e., location of park and ride lots)					
5. Pg. 306: The strategy to provide parking at the resort to be used for downtown employee parking needs to be reconsidered					
6. Transit Station: A highly visible and concentrated bus stop/transit center should be considered at/near the base mountain.					
As the local transit system, START believes it should be an integral component of any future growth management and traffic mitigation for the Snow King Resort area. Reducing traffic congestion in the resort area should be a priority. We thank you for the opportunity to voice our recommendations.					
Darren R. Brugmann					
START Director					

TC Housing Authority	APPROVED W/COND	6/29/2018	7/20/2018	8/3/2018
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(8/3/2018 1:55 PM SAS)

The Housing Department agrees with using the LDRs in existence at the time of any development to calculate the housing mitigation requirement.

Chapter 8 of the Master Plan Amendment, second paragraph says twenty percent (30%) of employee housing will be required to be built within the resort. Later it states 30%. It should be clarified which percentage it is. The Housing Department would recommend 30% to reduce traffic to and from the resort.

The Housing Department will expect SKRMA to keep records of occupants of Employee Housing for two years. The Housing Department will expect to receive annual reports and documentation on the occupants of the units. Rental units may not be owner occupied.

The restrictions recorded on the Employee Housing units shall be the Housing Department's standard Employee Housing Restriction. They will also be regulated by the Housing Department Rules and Regulations.

Employee Housing units shall be built in accordance with the Housing Department's Livability Standards, which are Chapter 2 of the Housing Rules and Regulations.

The employee housing complex that will house between 50-100 seasonal employees in dorm style units that share common kitchen and living areas shall be in compliance with the Housing Department Livability Standards.

BOARD OF COMMISSIONERS



www.tetonwyo.org

October 29, 2018

Mayor Muldoon and the Jackson Town Council

Mark Newcomb, Chair
Natalia Macker, Vice-Chair
Greg Epstein
Smokey Rhea
Paul Vogelheim

Hand Delivered

RE: Proposed Amendments to the Snow King Resort District Master Plan
(PUD2018-0003)

PO Box 3594
200 South Willow Street
Jackson, Wyoming 83001

Dear Mayor and Town Council,

ph: 307.733.8094
fax: 307.733.4451

On September 28, 2018 and again on October 22, 2018, the Board had an opportunity to review the 2018 Snow King Master Plan Amendment proposal pursuant to Section 4.3.1.E.4 of the Town LDRs where each jurisdiction shall receive and consider recommendations from the other jurisdiction when a Planned Resort application is submitted for review or amendment. The purpose of the County's review of any Planned Resort in the Town's jurisdiction is to recognize the impact of resorts on neighboring jurisdictions and to provide an opportunity for cooperation in planning and mitigation of potential impacts.

The Teton County Board of County Commissioners offer the following comments regarding the proposed Snow King Resort District Master Plan Amendments:

- The Board is generally supportive of the comments made by the Town Planning Commission regarding the recommendation to outline minimum requirements of the Snow King Resort Master Association (SKRMA) such as defining the entity structure and ensuring adequate funding.
- The Board encourages participation in a Transportation Demand Management (TDM) program.
- The Board would like to see the gondola base located so it does not impact the existing ball field, boulder park, or playground in Phil Baux Park.
- The Board concurs with the Town Planning Commission that proposed development should meet the Hillside Development Standards.
- The Board concurs with the Town Planning Commission's recommendations pertaining to phasing.

BOARD OF COMMISSIONERS



www.tetonwyo.org

Thank you for the opportunity to provide input and for considering our comments as you move forward with this application.

Sincerely,

A handwritten signature in blue ink, appearing to read "Mark Newcomb", written over a horizontal line.

Mark Newcomb, Chair

A handwritten signature in blue ink, appearing to read "Smokey Rhea", written over a horizontal line.

Smokey Rhea

A handwritten signature in blue ink, appearing to read "Natalia D. Macker", written over a horizontal line.

Natalia D. Macker, Vice Chair

A handwritten signature in blue ink, appearing to read "Paul Vogelheim", written over a horizontal line.

Paul Vogelheim

A handwritten signature in blue ink, appearing to read "Greg Epstein", written over a horizontal line.

Greg Epstein

cc: Tyler Sinclair, Town of Jackson Planning Director

October 18, 2018

To: Jackson Town Council and Teton County Board Of Commissioners
From: Jackson/Teton County Parks and Recreation Advisory Board
Re: Snow King Redevelopment impacts on Phil Baux Park

Over the past twelve years the Teton County Parks & Recreation Department has conducted three community surveys to better understand the public's recreational needs and how those needs are being met. Access to our immediate public lands through walking, running and biking trails consistently remains a high priority. Because of its geographic location and Snow King resort improvement plans, Phil Baux Park figures prominently in the discussion of parkland's role in the community. Phil Baux Park is the end point of the Snow King – Maple Way connector and as such is a key piece of a Complete Neighborhood (Policy 2.2.a).

The park is a valuable community gathering site and contains a grassy area that is used for special events and as a sports practice field. Any re-development at Phil Baux Park should include consideration of the need for, and the design for, special events within the community, an activity identified by multiple users and one of the most requested activities on a national level.

The park has generally served the winter resort operations in the winter, and the general park public in the summer. The success and public compatibility of any development plan rests in maintaining safe, free and accessible use of the public's property for the entire community for the non-ski season. This includes both residents and guests.

The Teton County Park & Recreation Board has concluded that the following points should be taken into consideration regarding the Snow King Master Plan as it relates to Town park property at the base of Snow King:

- As Phil Baux Park forms the end point of the Snow King – Maple Way connector (Comprehensive Plan) having a community focused node at this location is vital. Any development should be to encourage its use as a front country gateway to the National Forest. Public use and access should take precedence over redevelopment by a private entity.
- The continued use of this large flexible space that can accommodate community events such as concerts, farmers markets, and youth sports practice areas should be preserved.
- The park should not be divided. There should be good East-West flow.
- Any new lifts, including a gondola, should be located on the footprint of the current lifts and must allow safe, clear and accessible pedestrian and biking movement North to South and East to West from Snow King Ave to the National Forest trails
- The park needs to maintain its public identity and character and commercialization should be kept to a minimum.
- The Board does not support locating a zipline within the park.
- Insure ample parking for park users.

Sincerely,

Parks and Recreation Advisory Board
David J. Ellerstein, Chairman



File Code: 2720; 1950
Date: August 3, 2018

Re: Snow King Mountain Resort On-mountain Improvements Project Proposal

Dear Interested Party:

On June 5, 2018, Snow King Mountain Resort (Snow King) submitted a proposal to the Bridger-Teton National Forest (Bridger-Teton) to initiate the environmental review process for improvements proposed in Snow King's master development plan on National Forest System lands. The Bridger-Teton accepted the proposal and is initiating a review in accordance with the National Environmental Policy Act (NEPA). We anticipate preparing an environmental impact statement (EIS) using a third party consultant.

The proposal was finalized by Snow King after a multi-year public input process that culminated in a facilitated community stakeholder group organized by the Town of Jackson. This group developed four scenarios of different combinations of improvements, and ultimately Snow King selected a combination of elements that the ski area believed best fit the needs of the resort and the community's desires.

The purpose of this letter is to invite public comment on the scope of the EIS – that is, on the issues and alternatives it will address. We invite you to inform us of any concerns you may have about potential environmental impacts of this project and any design features that might reduce those impacts. This scoping letter states the purpose and need of the proposed project, describes Snow King's proposed action in detail, and provides instructions for submitting comments.

The Forest Service's predecisional objection process (36 CFR 218) provides the opportunity for you to object to the draft decision that will be released following completion of the EIS. Only those who submit timely and specific written comments regarding the proposed project during a public comment period established by the responsible official are eligible to file an objection (see *How to Submit Comments* below). This scoping period will be your first opportunity to comment. To establish eligibility to object, comments must be submitted during the 30-day period beginning when the Notice of Intent to prepare an EIS is published in the *Federal Register* or during a subsequent designated opportunity to comment.

Our acceptance of Snow King's master development plan does not pre-dispose the agency to final approval of this project. I will decide whether to authorize any or all of the proposed elements, and with what conditions, based on analysis of the environmental effects and consistency with the 1990 Bridger-Teton National Forest Land and Resource Management Plan (Forest Plan) and other relevant laws, policy, and regulations. My decision will be documented in a Record of Decision. If my decision is to authorize Snow King's proposed project, in whole or in part, I would modify their existing special use permit.



As part of the Forest Service's predecisional objection process (36 CFR 218), I will issue a draft EIS for public comment, then a final EIS with a draft of the Record of Decision prior to signing my decision. This will allow us to work to resolve any objections before my decision is finalized. I anticipate release of the draft EIS in winter of 2019, a final EIS and draft decision in late summer of 2019, and a signed decision in fall of 2019.

PURPOSE AND NEED FOR ACTION:

In addition to the foundational direction provided in the Forest Plan, two emerging developments in the mountain resort industry underlie the purpose and need for the proposed action. First, extensive customer surveys conducted by the ski industry indicate that visitors are increasingly seeking a more diverse range of recreational activities, particularly for families, that includes year-round opportunities and activities that are more adventurous. The Forest Service response to this trend includes our 2012 introduction of the *Framework for Sustainable Recreation*, which sets goals for providing a diverse array of recreational opportunities aimed at connecting people with the outdoors and promoting healthy lifestyles, in partnership with other public and private recreation providers.

Second, passage of the *Ski Area Recreational Opportunity Enhancement Act of 2011* provides direction on the types of summer activities the Forest Service should consider authorizing to round out the range of opportunities provided to the public at permitted mountain resorts.

Specific to the Bridger Teton National Forest, the Forest Plan provides direction for the Forest to contribute to community prosperity and provide high-quality developed recreation facilities to serve Forest visitors (Goal 1.1 and Goal 2.2 pp. 112–114). Forest Plan Objective 1.1(f) is to "Provide areas for alpine skiing and commercial ski and snowmobile operations." Objective 2.2(a) is to "Retain, improve and add developed sites" and Objective 2.2(b) is to "Design facilities for people of all ages and abilities."

Reflecting these considerations, the purposes of the proposed Snow King Mountain Resort On-mountain Improvements Project are to:

- Maintain and improve the winter sport infrastructure on National Forest System lands at Snow King,
- Provide new and innovative forms of year-round outdoor recreation for residents and visitors to Jackson Hole, using the existing resort infrastructure as the hub, and
- Capitalize on the partnership between the Bridger-Teton and Snow King to connect visitors with the natural environment and support the quality of life and the economy of the local community.

The needs for action include:

- Improve and increase beginner and intermediate ski terrain, lifts, and facilities to serve as the primary ski resort in Jackson Hole to introduce and recruit new skiers to the sport.
- Expand snowmaking on the mountain to enable an early November opening for ski race training, provide coverage to the upper mountain, and aid in fire prevention.
- Introduce high-quality guest service facilities to attract and retain local and destination skiers, serve as an event venue, and provide an outdoor education center for Jackson residents and visitors.

- Provide access to a wide range of year-round activities catering to a variety of visitors passing through the Town of Jackson.

PROPOSED ACTION:

Snow King's proposed action includes the following elements to address the purpose and need. Each element and its rationale are described in more detail below and shown on the attached maps. A description of the proposed action is also available at <http://www.fs.usda.gov/project/?project=54201>.

- A new ski school/teaching center on the ridgeline west of the Snow King summit.
- Development of skiing in the natural bowl on the back side, south of the Snow King summit. This southernmost portion of the current special use permit area is suitable for development of low-intermediate and intermediate level ski terrain, complementing the summit teaching center.
- A 67-acre permit boundary adjustment on the front side, east of the existing permit area, to accommodate part of a summit access road/novice skiway, intermediate-level terrain lower on the slope (including groomed runs and tree and glade skiing), and a novice route down from Rafferty lift (via the access road/novice skiway).
- An 89-acre permit boundary adjustment on the front side west of the existing permit area to accommodate a summit teaching center, another part of the summit access road/novice skiway, and expert-level tree and glade skiing.
- New ski terrain totaling about 97.5 acres (groomed runs and teaching terrain).
- Upgrading the existing Summit lift to a gondola, and installation of one new chair lift, two teaching area conveyors, and one surface lift.
- On-mountain facilities (the summit restaurant/guest services building and ski patrol facility, a temporary ski patrol building at the top of Cougar, an observatory and planetarium at the summit, a wedding venue west of the summit building, and a year-round yurt camp at the southern point of the permit area).
- 147.1 acres of added snowmaking (with few exceptions, all existing and proposed runs).
- Improved and expanded lighting for night skiing.
- Front-side mountain bike trails and a back-side mountain bike zone.
- Hiking trails between the summit and the west base, west of Exhibition run.
- A zip line from the summit to the west base area, paralleling the Summit lift.

BOUNDARY ADJUSTMENTS

Snow King proposes adjustments to both their operating boundary and their special use permit boundary. The existing boundary includes 142.5 acres south of the Snow King ridgeline. The proposed action would expand winter and summer operations, including lifts, ski runs, and a mountain bike park (see details below), into to this currently permitted area.

The permit boundary adjustments would resolve the current lack of terrain for beginner, novice, and low intermediate skiers. Snow King currently offers 17.1 acres in these three categories, and as detailed below this proposal would add 37.7 acres. Attracting, accommodating, and advancing beginning skiers is critical not only to Snow King but also to the community. Local ski school programs, the Jackson Ski and Snowboard Club, and the Doug Coombs Foundation's effort to involve underprivileged children in mountain recreation would not be feasible without Snow

King, but they remain severely limited by this lack of low-ability-level terrain. To meet Snow King's desire in sustaining these programs and the desire to meet public recreational needs, a quality teaching center and appropriate terrain to support efficient, step-wise skier progression are essential.

From a planning standpoint, topography and past development preclude development of these terrain types within the existing operational boundary. Based on thorough analysis, development of terrain along the ridgeline west of the Snow King summit and on the back side is the only feasible option. The base area is already fully developed, and other than the ridgeline and back side, appropriate, low-angle terrain does not exist within or adjacent to the current permit boundary.

Development of the summit and back-side terrain would require, at a minimum, a beginner-friendly and downloadable lift accessing the summit, a skier-service and ski patrol building on the summit, an access road to build and maintain summit facilities, and a safe, "easy way down" to the base area in the event of lift failure.

As discussed in more detail below, the proposed teaching area and associated infrastructure would require new special use permit terrain both east and west of their existing front-side operations. Those additions, in turn, set the stage for other improvements not directly associated with the teaching center that are included in the proposed action and discussed below.

The eastern permit boundary adjustment would add approximately 67 acres. In addition to accommodating a segment of the required summit access road/novice skiway, this area would provide three new short intermediate runs, intermediate-level glade skiing between these runs, and a novice route down from the top of Rafferty lift via the summit access road/skiway.

The western boundary adjustment would add approximately 89 acres to Snow King's permit area, for a total adjustment of 156 acres. In addition to allowing development of the critical teaching center on the ridge, it would accommodate another segment of the summit access road/skiway. Glading would open the forested area between the westernmost access road/skiway switchbacks to expert tree skiing.

Snow King visitors increasingly venture into this currently unpatrolled and unmaintained western area. Including this area in the permit would allow Snow King to control and patrol it, making it safer for guests of Snow King and the Bridger-Teton. Together, these proposed boundary adjustments would expand the permit area from 338 to 495 acres.

TERRAIN DEVELOPMENT

Ski run development within the expanded ski area boundary (i.e., current and adjusted permit boundary and private land) would add the following acreage by ability level:

- Beginner – 3.9 acres
- Novice – 29.7 acres
- Low Intermediate – 4.1 acres
- Intermediate – 25.2 acres

- Advanced – 16.2 acres
- Expert – 18.4 acres

These new runs would total 97.5 acres. They would be cleared of trees and tall shrubs then graded to remove terrain irregularities and allow winter grooming. These additions would bring Snow King's total terrain distribution to slightly higher than the industry standard for beginner and novice terrain (6 and 25 percent, respectively, compared to industry standards of 5 and 15 percent), less for low intermediate and intermediate terrain (14 and 29 percent, respectively, compared to 25 and 35), about even for advanced terrain (13 compared to 15 percent), and higher than the standard for expert terrain (13 percent compared to 5).

Tree removal (both stands and individual trees) for safety, recreational, and forest health purposes would open new terrain to tree and glade skiing off the groomed runs. By reducing fuels, tree removal would also help reduce the spread of catastrophic wildfires at wildland/urban interface. Proposed terrain development is described in more detail below.

Teaching Center Terrain

Snow King has a deficit in beginner and novice terrain, and dedicated teaching terrain is insufficient. Currently, lower ability level skiers are limited to a small amount of suitable terrain around the base area, mostly on private land. This restricts Snow King's capability to introduce and recruit new skiers to the sport. The inability to visit Snow King's summit also limits beginner skiers' recreational experience and their exposure to National Forest System lands visible and accessible from the summit.

Development of the summit teaching center would add 3.9 acres of beginner terrain (Figure 1, Runs Lift-B and Lift-C) on the ridge, immediately west of the gondola terminal and summit building. Once beginners had the basic ability to move on their skis, they would have ready access to 29.7 acres of novice terrain from the summit. This includes Runs 16 and 23 on the back side and Runs 14 and 6, the access road/skiway providing an easy way down from the summit to the base area.

This terrain combined with gondola access and the proposed conveyor carpets (discussed below under Lifts), and with the nearby summit building providing guest services and housing the ski school (discussed below under Summit Building), would vastly improve the experience Snow King provides to beginner and novice skiers. The proposed development would benefit the learning progression and the instructors' teaching abilities, would maximize new skiers' recreational access and exposure to National Forest System resources, and would bolster visitors' connection to their public lands. Developing teaching terrain at the summit would extend the season for beginner and novice skiers and would keep them from dealing with ski soft and variable snow conditions at lower elevations late in the ski season. The proposed teaching terrain is effectively separated from higher ability level terrain, avoiding the potential problems of mixing skiers of differing ability levels.

Ski Runs

The next step is low intermediate terrain, and Runs 4, 5, and 7 would provide 4.1 addition acres in the eastern adjustment area, accessed from the summit or the top of Rafferty lift via the access road/skiway. About 25.2 acres of intermediate terrain would be developed, primarily in the back-side bowl (Runs 18, 19, 20, and 22). This would add to the terrain progression available from the summit learning area.

New advanced terrain would total about 16.2 acres, comprising Runs 17, 21, and 24 on the back side and Runs 3 and 8–13 on the front side between the summit ridge and proposed skiways accessing the base area.

A small amount of clearing (less than 0.1 acres) would take place on the uphill margin of the existing Old Man's Flats run.

Clearing and grading of 2.7 acres in four patches in the Summit pod would improve skier circulation and allow intermediate/advanced skiers access to portions of the Bear Cat, Bear Cat Glades, and Exhibition expert runs.

Gladed Ski Terrain and Forest Health Maintenance

Two factors converge in regard to use and management of forested portions of Snow King's special use permit area. First, the northern exposure of the front side and extensive forest cover result in excellent opportunities to develop intermediate-level to expert-level tree and glade skiing. This type of off-piste skiing is growing rapidly in popularity, and the proposed permit area adjustment, upgrade of the Summit lift, and development of back-side infrastructure create the potential to respond to that demand.

Second, maintaining a desirable vegetation mix and character within the permit area, consistent with preserving or enhancing recreational opportunities and experiences, is a Bridger-Teton management objective. To pursue that objective, Snow King worked with the Bridger-Teton to develop the 2015 *Snow King Mountain Resort Vegetation Management Plan* (Vegetation Management Plan). The plan's objectives specifically include development of increased tree and glade skiing, as well as tree removal to reduce hazard to visitors, reduce disease and pathogens, and reduce fire risk by breaking up fuel continuity.

Together, these factors set the stage for creation of glades in all forested areas within the permit boundary, particularly where skier access is practical and where forest health conditions indicate that active management action is required. This proposal includes glading on the back side (18.0 acres) and the east and west expansion areas on the front side (14.4 and 3.6 acres, respectively).

Glading prescriptions would be developed in conjunction with the Bridger-Teton and included in annual summer operations plans subject to Bridger-Teton approval prior to any additional glading. Glading prescriptions are discussed in the Vegetation Management Plan, and the general goal for gladed terrain is a spacing of 15 to 18 feet between trees. In many cases, this may not require much tree removal, but it would certainly involve brushing and limbing, as well as removal of any diseased or hazard trees.

Grading Existing Trails

In addition to the grading and leveling required for the development of the new runs, some grading of existing runs is needed to enhance ski race training lanes and decrease snowmaking requirements. The grading would occur on a total of 5.5 acres in nine areas:

- The top of Flying Squirrel would be graded to remove a prominent knob that impedes skier flow. This would involve 1.0 acres.
- The area between Grizzly and Kelly's Alley, where Karen's Way is located, would be regraded to eliminate the road and improve skier flow, involving 0.9 acres.
- An area at the top of the Lower Grizzly run would be regraded to improve the transition below a service road, involving 0.7 acres.
- Two areas would be regraded on the Old Man's Flats run. Material would be cut from the lower area and used to fill the upper area. This would involve 1.1 acres.
- A 0.9-acre area between the Lower Elk and Bison runs would be regraded to fill erosional depressions.
- Three areas near the confluence the Bison and Old Man's Flats runs would be regraded to remove a high spot and smooth the transition near a summer trail. This would involve a total of 0.9 acres, including 0.6 acres on National Forest System land.

SUMMIT ACCESS ROAD/NOVICE SKIWAY

Proposed development on the summit would require an access road for construction, operations, maintenance, and emergency services. As discussed above, a novice skiway from the summit to the base is essential to get beginner skiers from the summit to the base area in the event of a lift failure. This element of the proposal would meet both needs. In addition, it would provide an easy way down from the top of Rafferty lift, which does not currently exist.

As demonstrated in the master development plan, options considered during the planning process attempted to keep the access road/skiway within the existing permit area or in either the eastern or western permit boundary adjustment areas. However, the best solution to providing appropriate grades for both construction access and a novice skiway, and to minimize the amount of ground disturbance to achieve these goals, is the current proposed alignment.

The proposed alignment follows the gentle grades down the ridge west from the summit to a point near the western boundary of the adjusted permit area. From there it turns eastward, traversing across the front side of the mountain in one continuous span to the top of the Rafferty lift (Run 14), then continues on to near the eastern boundary of the adjusted permit area (Run 6). At that point, it would turn back to the northwest to tie into the existing road and run network near the northern boundary of the current permit area. This section would be bench cut to achieve a running surface width of 16 feet. Cut and fill areas would widen the area of disturbance to an average of about 90 feet.

This alignment significantly improves on-mountain safety and circulation, and creates minimal impact in terms of disturbance area, visual effects, and impacts on existing ski terrain, since it simply crosses the face without any switchbacks within the current permit boundary.

Several existing mountain access roads would be unnecessary once this access road/skiway was complete. These would be abandoned and restored.

LIFTS

Summit Gondola

As discussed above, a beginner-friendly and downloadable lift access to the summit is a requirement for developing the new teaching area. An upgraded lift would also help serve the added front-side ski terrain and provide summit access for non-skiing winter and summer activities (e.g., dining and events at the proposed summit building and proposed summer recreation and educational activities, including mountain biking). The top terminal would be incorporated into the summit building described below.

The Summit lift would be upgraded to a 1,500 person-per-hour (pph) gondola, which would: provide two-way summit access for beginner skiers and pedestrians year-round, including evenings; improve overall ski terrain access; and reduce waiting time in the lift line. With the installation of the gondola, the bottom terminal of the existing Summit lift would be removed, as would the pumphouse adjacent to it. The new lift would extend about 200 feet farther downhill to improve access to the terminal.

Lift A

As depicted on Figure 1, Lift A would service novice, intermediate, and advanced terrain on the back side. This top-drive, fixed-grip, four-person chairlift would have a slope length of approximately 3,015 feet and a capacity of 1,800 pph. From the top terminal, skiers would have access to one novice run, four intermediate runs, three advanced runs, and six expert runs. Utilities would be provided via connections from the summit building. There is existing road access to the bottom terminal. Some maintenance work on the road may be necessary.

Teaching Center Lifts (Lifts B and C)

Two conveyor carpets (Lift B and Lift C) at the summit would serve the new beginner terrain on the ridge west of the summit building. Lift B would be 363 feet in length and Lift C would be 506 feet in length. Each would have a capacity of 600 pph. These lifts would be located in close proximity to the proposed summit building. Power would be extended from the summit building.

Surface Tow D

Lift D would be a surface tow (e.g., a platter or T-bar type) to take skiers from the Lift A pod back to the summit building. Following Run 23, it would be 679 feet long, with a capacity of 300 pph. Power would come from the summit building.

BUILDINGS

Summit Building

Guest services (e.g., food/beverage service, restrooms, and basic retail sales), ski patrol functions, and ski school functions are proposed on the summit to support development of a quality learning area, and gondola access to the site would open a range of year-round recreational possibilities. The summit building is proposed as a state-of-the-art, LEED-certified, on-mountain resort facility to meet the changing desires and expectations of Snow King, community, and regional markets.

This facility would provide multiple functions, including: gondola terminal, gondola cabin storage, ski school, food service (dining/cafeteria/bar/lounge), restrooms, planetarium, ski patrol (headquarters, patient assessment space, warming area, and limited equipment storage), employee space/storage, and ticketing for summer activities. These functions are currently not provided on-mountain, and the proposed facility would take Snow King to a new level in terms of guest services and experience. To include all of these functions, the summit building would be 20,000 – 25,000 square feet in size. It would be a single story and not on the skyline, and it would be designed and built in accordance with the Forest Service's *Built Environment Image Guide* and its stipulations for the Rocky Mountain Province.

This development would also require a septic line to the summit area, which would be collocated with the buried snowmaking line running up Exhibition run. Snow King currently has water and power connections to the summit.

Observatory

An observatory building approximately 500 square feet in size would be located south of the summit building. It would be used year round for stargazing, research, and educational purposes.

Cougar Ski Patrol Facility

Until the new ski patrol facilities in the summit building were completed, a small, temporary, pre-built, pull-on structure would be installed at the top of the Cougar lift as a base for the ski patrol operations during night skiing. This would allow the patrol to station people at the top of the lift for rapid response when only the lower portion on the mountain was open. Some leveling may be done, but no foundation would be necessary. Power would come from the top of Cougar lift. It would be designed and built consistent with the *Built Environment Image Guide* stipulations and would be removed once the summit building was complete.

Saddleback Yurt Camp

A new Americans with Disabilities Act (ADA) compliant yurt camp would be constructed at the far south end of the existing permit boundary. A 1-mile ADA compliant trail connecting to the summit of Snow King would access this facility. The yurt camp would consist of approximately six yurts for sleeping and three multi-use cooking/dining/gathering yurts. These yurts would range in size from 20 to 30 feet in diameter with additional deck space. This year-round camp would serve backcountry skiers, hikers, bikers, and a wide range of groups. In winter, guided

backcountry skiing, snow safety courses, and snowshoe hikes would be offered out of the yurt camp in conjunction with the Snow King Mountain Sports School. This offering of a wilderness-like experience only a short walk/ski from civilization would attract a wide range of visitors seeking a unique activity during their visit to Jackson. This facility would be unique in the region due to the ease of access, spectacular setting in the National Forest, and number of activities offered.

Night Skiing

At present, Snow King offers night skiing on approximately 73.8 acres of night skiing on the lower two-thirds of the mountain, in the Rafferty and Cougar pods. This is primarily intermediate ability-level terrain, with some advanced and beginner terrain. Until recently, approximately 50 lights were mounted on a variety of structures including trees, lift towers, light poles, and buildings. Coverage was limited, and the technology was obsolete. This was a particular impediment to race training, which occurs in the evening after school hours. Good lighting is an important safety factor in race training. A general system upgrade was implemented in 2015 and remains underway, replacing lighting fixtures with more efficient models designed to increase lighting of the snow surface but reduce light pollution (glare and sky glow).

Under this proposal, Snow King would expand lighting coverage using this upgraded technology (see Figure 2). Additional lighting would be provided on the racing lanes in the Cougar pod, and lighting would be extended to the top of the Rafferty pod (Flying Squirrel and Moose runs), the top of Upper Elk run, and the proposed access road/skiway. Overall, this proposal would increase system coverage by 27.3 acres across all skier ability levels to meet demand for this unique experience and provide for safe and effective race training.

SNOWMAKING

Snow King's snowmaking system covers approximately 90.4 acres of the ski area, in the Rafferty and Cougar pods, as well as to the top of Elk run. This system is served by two 1,000-gallon-per-minute (GPM) pumps in the main pump house and is fed by domestic water provided by the Town of Jackson.

To provide more consistent, season-long snow coverage over a wider area, Snow King proposes to expand coverage on both existing and proposed runs (see Figure 3). Coverage would be added on all existing front-side runs except East and West S Chutes, and all proposed front-side and back-side runs, except Run 9. This would result in approximately 147.1 acres of additional snowmaking coverage.

Water lines would be installed on the upwind side of covered runs, in excavated trenches approximately 4 feet deep. Snowmaking hydrants would be plumbed in adjacent to these main snowmaking lines. Snowmaking guns or hose lines would be attached to these hydrants. All water would continue to be supplied by the Town of Jackson.

SUMMER ACTIVITIES

The Snow King master development plan documents the “activity zone” analysis completed as part of their planning process, in compliance with the Ski Area Recreational Opportunity Enhancement Act of 2011. The following proposed summer activities would not change or compromise existing winter snow sports, nor exceed the level of development required for snow sports, but are designed to integrate with and supplement the primary purposes of the ski area. Hiking and biking trails would generally not be collocated with ski runs but may intersect them. Year-round use of the summit building, observatory, and other support facilities would complement these activities. See Figure 4.

Zip Lines

Expanding on current summer operations, Snow King proposes a zip line from the proposed summit building to the base area, paralleling the Summit lift. This project is consistent with the 2013 Jackson Town Council amendment to Snow King’s land use lease to include “additional recreational uses related to ski areas such as zip lines, mountain bike trails and other outdoor amenities.” This would be an attractive amenity, as guests would quickly descend approximately 1,555 vertical feet, over a distance 3,900 linear feet, at a 48 percent grade to the base area. Guests would ride the new Summit gondola to reach the summit station of the proposed zip line and terminate at the west base area.

Mountain Bike Trails

Lift-served downhill mountain biking is arguably the fastest growing summer activity at mountain resorts in the U.S. and abroad. Not surprisingly, demand for this activity is particularly high in the Jackson area. To meet this demand, Snow King proposes to develop a system of lift-served trails on the front side and a more consolidated mountain bike park-type “mountain bike zone” on the back side.

The front-side trails would include an advanced and an intermediate trail angling down from near the top of the Summit lift to near the top of the Rafferty lift. These would be smooth, excavated trails with a 4-to-5-foot tread. Spurs of narrower hand-built, single-track trail with constructed terrain features would depart from the excavated trails and drop more directly down the slope. At about the elevation of the top of cougar lift, these upper-mountain trails would merge into a beginner and an intermediate-level excavated trail. These two trails would subsequently merge into a single beginner-level excavated trail crossing the toe of the slope down to the west base area.

The front-side bike trail system would total about 6.5 miles, including approximately 1.9 miles of advanced trail (all on National Forest System land), 2.6 miles of intermediate trail (2.4 miles on National Forest System land), and 2.0 miles of beginner trail (0.9 miles on National Forest System land).

On the back side, a skills park and a network of trails of differing types and ability levels would be developed within a roughly 110-acre mountain bike zone. This area would be accessed via the Summit lift, and uphill transit within it would be provided by the proposed Lift A.

These trail designs are conceptual. The exact locations of trails may change when developed to achieve desired grade and location with respect to existing, site-specific, terrain features.

Hiking Trails

Due to Snow King's close proximity to a fairly populated, residential area of the Town of Jackson, Snow King has observed a developing interest by local residents for an uphill hiking trail. To accommodate this interest on National Forest System lands, Snow King proposes to improve the Stairway Trail, including portions in the western permit boundary adjustment area. A direct ascent route to the summit would be created in the trees along Exhibition run to eliminate erosion problems associated with community trails that have been created in this corridor. This 0.6-mile trail (0.4 miles on National Forest System land) would cater to the many trails users who demand the toughest or most direct workout ascending the mountain. In the winter months, this route would serve as the designated direct boot-pack ascent route.

In addition, a new 1.5-mile uphill hiking trail would be developed just west of the Stairway Trail in the Bear Cat glades area, extending into the western permit expansion area near the top. With an approximate grade of 13 percent, it would create an improved experience for hikers seeking to ascend the mountain via a less direct route. This trail would route trail users off the face of the mountain where service roads provide access to the summit and create potential safety concerns. In winter months, this trail would serve as the primary designated uphill ski route. Taking uphill skiers off the main ski runs in winter would reduce conflicts between uphill and downhill skier traffic, as well as limit the interaction between uphill skiers and grooming operations at night.

Wedding Venue

In conjunction with the summit building, a wedding venue is planned to be constructed a few hundred feet west of the new building. This would be an in-ground facility, constructed with stone benches/tiers in a semi-circle around a raised platform.

IMPLEMENTATION:

Construction would begin in the construction season following authorization, anticipated to be summer of 2020. Completion of the proposed action is projected by October 2025.

HOW TO SUBMIT COMMENTS:

While comments will be accepted any time during the process, to be most useful in the preparation of the EIS and to establish eligibility to file an objection, comments must be provided during a designated opportunity for public comment. This scoping period, starting with the date of publication of the Notice of Intent in the Federal Register and continuing for 30 days, is the first designated opportunity to comment.

Comments should clearly articulate the reviewer's concerns about potential environmental impacts of this project and any alternatives or design features that might reduce those impacts. We will consider references provided by commenters if the cited articles are submitted with the

comment letter, and if the letter identifies the relevance of the findings to specific actions and effects of this particular project.

Comments received in response to this solicitation, including names and addresses of those who comment, will be part of the public record and available for public inspection. Comments submitted anonymously will be accepted and considered; however, anonymous comments will not allow the respondent to have standing in subsequent administrative or judicial reviews.

Individuals and organizations wishing to be eligible to object must meet the information requirements of 36 CFR 218 Subparts A and B. It is the responsibility of all individuals and organizations to ensure that their comments are received in a timely manner. Only those who submit timely and specific written comments regarding the proposed action during a public comment period established by the responsible official are eligible to file an objection under 36 CFR 218. Specific written comments, as defined by 36 CFR 218.2, should be within the scope of the proposed action, have a direct relationship to the proposed action, and must include supporting reasons for the responsible official to consider.

Written, facsimile, hand-delivered, and electronic comments concerning this action will be accepted for 30 calendar days following the publication of the Notice of Intent in the *Federal Register*, per the provisions of 36 CFR 218. The publication date in the *Federal Register* is the exclusive means for calculating the comment period for this analysis. Those wishing to comment should not rely upon dates or timeframe information provided by any other source.

In cases where no identifiable name is attached to a comment, a verification of identity will be required for objection eligibility. If using an electronic message, a scanned signature is one way to provide verification. For objection eligibility each individual or representative from each entity submitting timely and specific written comments regarding the proposed project must either sign the comments or verify identity upon request.

Please address any form of comments as attention: Snow King On-mountain Improvements Project. Electronic comments must be submitted in rich text format (.rtf) or Word (.doc) to comments-intermtn-bridger-teton-jackson@fs.fed.us. Written comments must be submitted to: Bridger-Teton National Forest - Jackson Ranger District, P.O. Box 1689, Jackson, WY 83001 – attention District Ranger Mary Moore. Comments may be hand-delivered to 340 N. Cache St. between 8:00 AM and 4:30 PM, Monday through Friday, excluding holidays.

An objection period, if required, will follow regulations found in 36 CFR 218.7. For objection eligibility (36 CFR 218.5), only those who have submitted timely, specific written comments during a designated opportunity for public comment may file an objection. Issues raised in future objections must be based on previously submitted specific written comments regarding the proposed project and attributed to the objector, unless the issue is based on new information that arose after a designated opportunity to comment (36 CFR 218.8(c)).

Additional information on this project is available on the project webpage: <http://www.fs.usda.gov/project/?project=54201> . If you would like more information or have questions relating to this project, please contact Mary Moore, Jackson District Ranger, by email at marvmoore@fs.fed.us, or by phone at 307-739-5410.

Please feel free to pass this letter on to others you think may have an interest or concern with this project.

Sincerely,



PATRICIA M O'CONNOR
Forest Supervisor

Enclosure: Snow King Area Maps

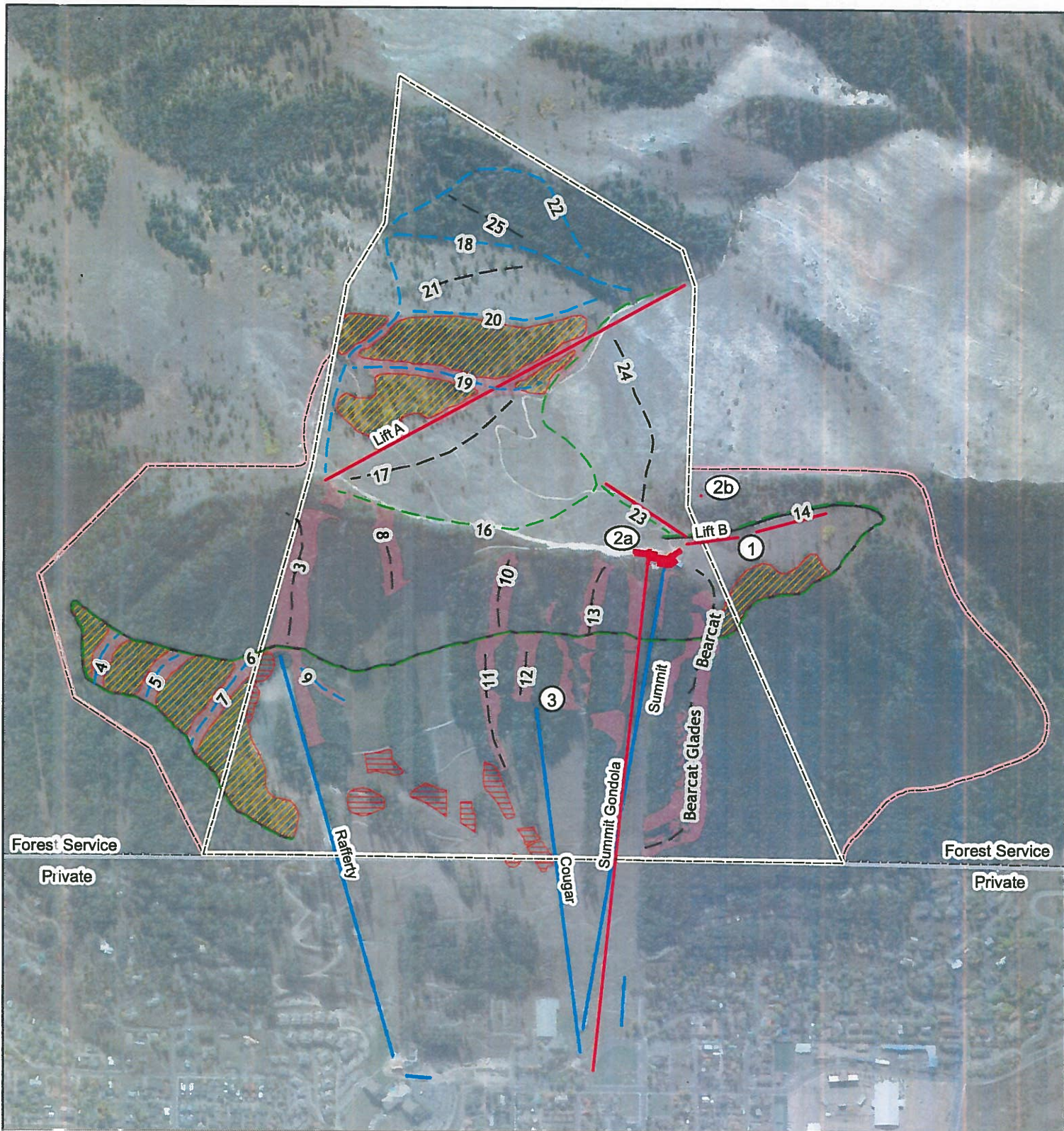
cc: Ryan Stanley, General Manager, Snow King Mountain Resort
Tyler Sinclair, Planning Director, Town of Jackson
Mark Newcomb, Chair, Teton County Board of Commissioners
Mary Moore, Jackson District Ranger
Derek Ibarguen, Deputy Forest Supervisor

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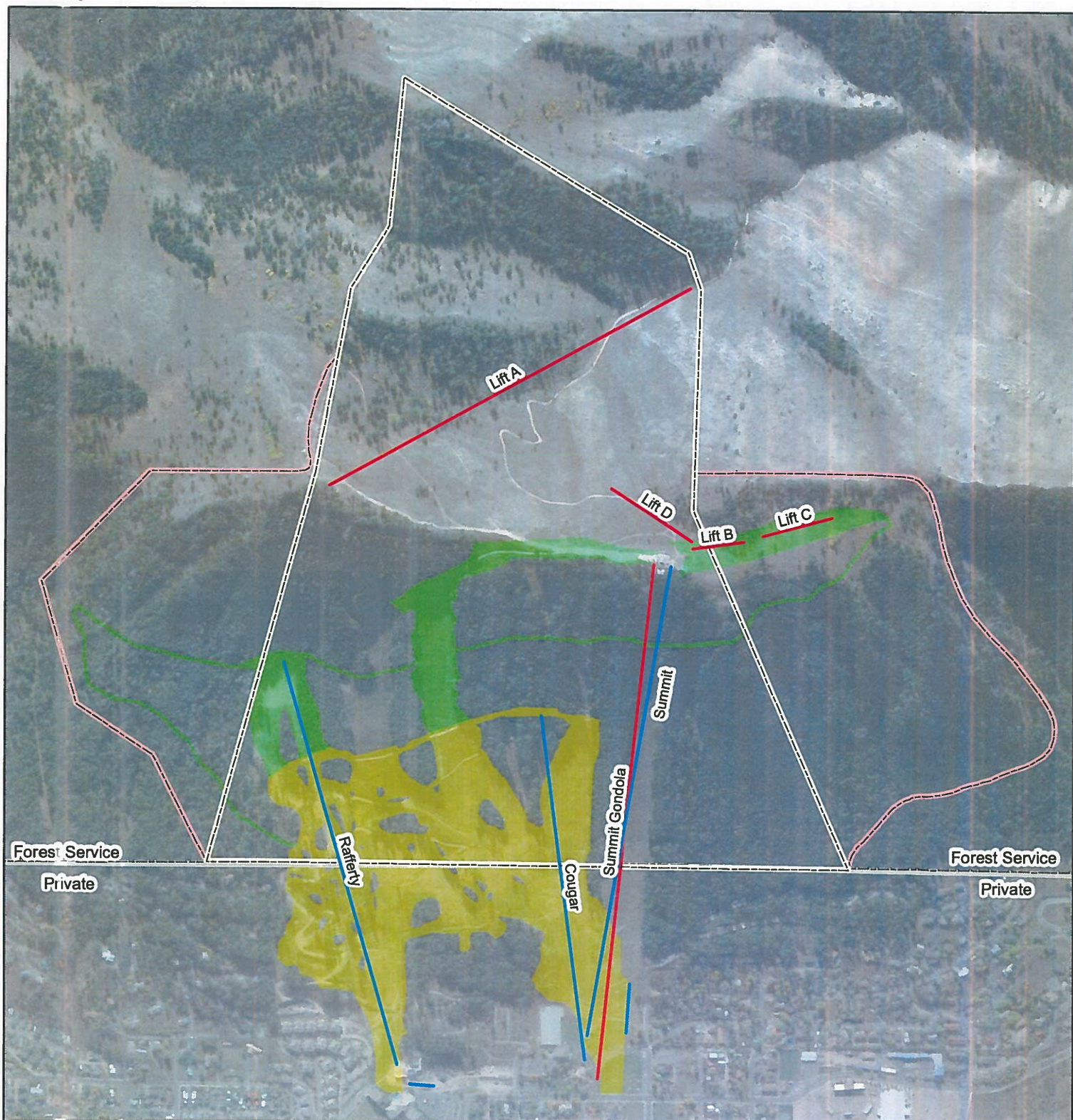
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Snow King Mountain Resort Improvements Project
Figure 1. Proposed Winter Projects



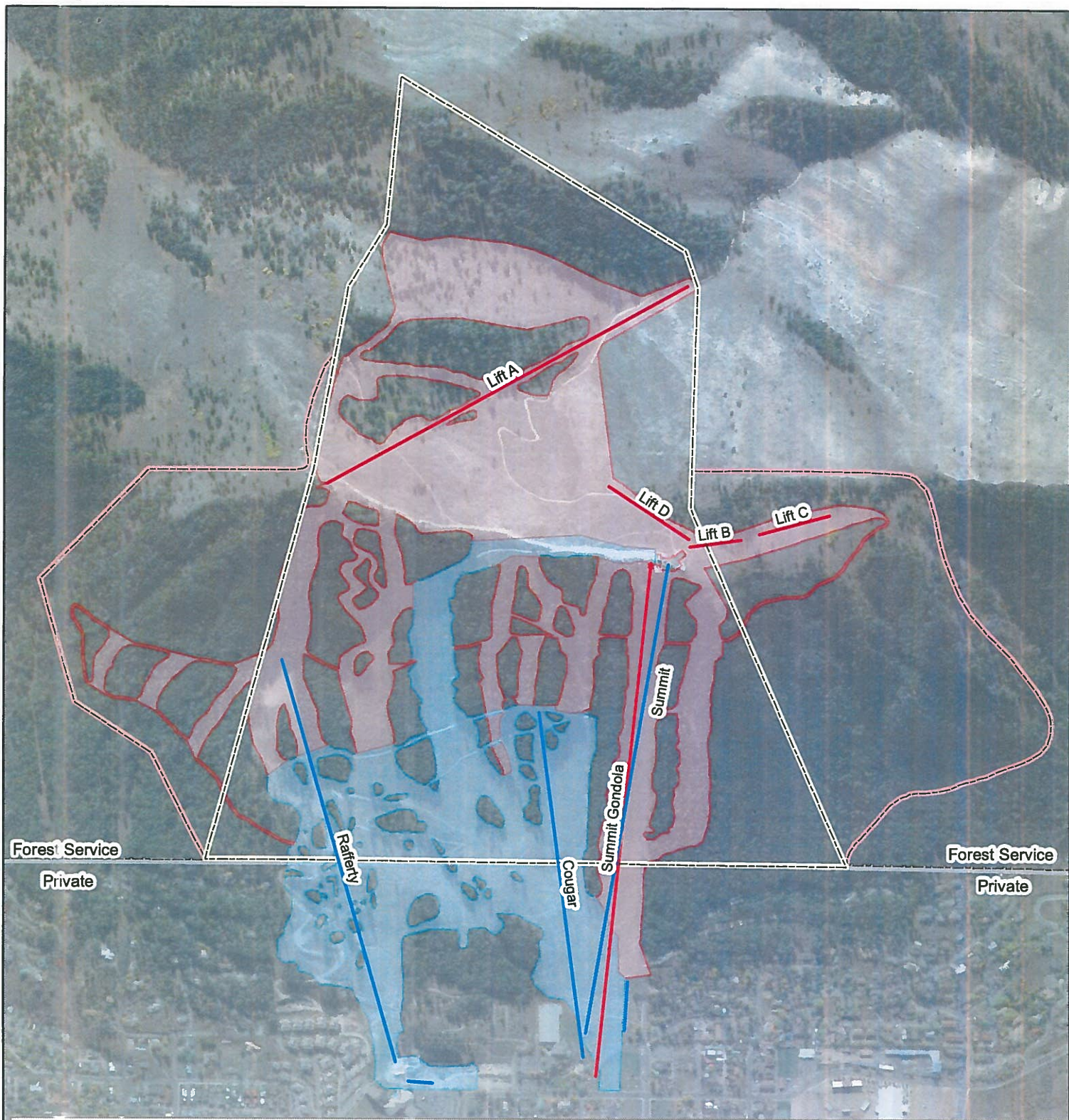


Snow King Mountain Resort Improvements Project
Figure 2. Existing and Proposed Lighting Coverage

- Existing Lift
- Proposed Lift
- Existing SUP Boundary
- Proposed SUP Boundary
- Forest Service Boundary
- Existing Lighting Coverage
- Proposed Lighting Coverage

0 0.25 0.5 Miles





Snow King Mountain Resort Improvements Project
Figure 3. Existing and Proposed Snowmaking Coverage

- Existing Lift
- Proposed Lift
- Existing SUP Boundary
- Proposed SUP Boundary
- Forest Service Boundary
- Existing Snowmaking Coverage
- Proposed Snowmaking Coverage

0 0.25 0.5 Miles





Snow King Mountain Resort Improvements Project
Figure 4. Proposed Summer Projects

- | | | |
|-------------------------------------|-----------------------------------|--|
| Proposed Yurt Camp | Proposed Hiking Trail | (1a) Summit Building and Gondola Terminal |
| Proposed Lift | Proposed ADA Yurt Trail | (1b) Observatory |
| Proposed Zip Line | Proposed Mtn Bike Zone | (1c) Wedding Venue |
| Proposed Access Road | Proposed Mtn Bike Trails: | |
| Proposed Building | Advanced Excavated | |
| Existing SUP Boundary | Advanced Singletrack/Features | |
| Proposed SUP Boundary | Beginner Excavated | |
| Forest Service Boundary | Intermediate Excavated | |
| Proposed Stairway Trail Improvement | Intermediate Singletrack/Features | |



Snow King Mountain Stakeholder Group
Staff and Consultant Summary of Outcomes and the Process
May 17, 2018

GOAL OF THE STAKEHOLDER PROCESS

The goal of the Snow King Mountain Stakeholder Group process was for a group of 16 members of the community to work together to come up with multiple scenarios for the future of Snow King Mountain that balance community interests. The group included representatives from Snow King and the Town of Jackson staff sitting down with community members with diverse preferences and experiences regarding Snow King—some looking at the issue through an environmental lens, some through a business lens, some as Snow King users and user groups, and some as neighbors, but all with the needs and future of the community at heart (membership list attached).

The Stakeholder Group met six times between March and May, working to understand the community interests, identifying the issues and factors at play on the mountain and at the base, brainstorming and exploring different options and ideas, and, finally, agreeing on four different scenarios that represent a reasonable range of alternatives for the future of the Snow King Mountain Resort. These four vision scenarios are summarized in the accompanying table. The visions represent a substantial commitment of time and effort by the Stakeholder Group and a careful deliberation about how best to balance the community's interests and ideas.

PURPOSE OF THIS DOCUMENT

The four scenarios that emerged from the stakeholder dialogue are captured in a separate summary table. The purpose of this document is to provide additional information about some aspects of the scenarios and, perhaps more importantly, about the nature of the Stakeholder Group's discussions. The summary table is the outcome and output of the stakeholder process, as captured by Town staff and the facilitator. ***This report is intended to support that document and enhance shared understanding of the group's work, but it is not a group work product.*** It was prepared by staff and the facilitator, and the Stakeholder Group was invited to review it and provide edits, but given the short turnaround required and the lack of in-person discussion about the summary, it should be viewed as a staff and contractor document rather than a group report.

COMMUNITY INTERESTS

- ✓ Conservation of wildlife habitat and wildlands
- ✓ Economic viability of Snow King Mountain recreation and resort area
- ✓ Diversity of year-round recreational opportunities for diverse user groups
- ✓ Community accessibility and affordability
- ✓ Preservation of the cultural, environmental, and historical character of Jackson
- ✓ Prioritization of community safety
- ✓ Availability of high-quality facilities
- ✓ Minimized impacts to the surrounding areas.
- ✓ Consideration of impacts to infrastructure and services, both positive and negative
- ✓ Balanced impacts of development and tourism on the community, both positive and negative, that can serve as a model for others
- ✓ Consideration of community-wide educational opportunities
- ✓ Consideration for holding events
- ✓ Broadened appeal of the offerings and amenities at Snow King Mountain
- ✓ Clear and concise guiding documents to clarify rights, responsibilities, and accountability for all parties involved in the future of Snow King Mountain
- ✓ Maintained and enhanced world-class training and facilities
- ✓ Prioritization of environmental sustainability

Snow King Mountain Stakeholder Group
Staff and Consultant Summary of Outcomes and the Process
May 17, 2018

ROLE OF THE COMMUNITY IN THE PROCESS

The process included two community meetings to allow the Stakeholder Group to learn about the broader community's interests and visions. At the first community meeting, participants were invited to share their interests on the future of Snow King—these are the underlying motivations and “why’s” they have for the preferences they have. The Stakeholder Group refined the list of 88 interests from the community meeting down to a list of 16 interests that then served as a touchstone for the remainder of the process. At the second community meeting, the Stakeholder Group summarized the options they had identified for all the issues at play in Snow King’s future, and then invited community members to build their own scenarios. The Stakeholder Group received 288 completed community vision packages, and then used those to inform their final discussion on which and how many scenarios to share with Town Council and Snow King.

PRIMARY STEPS IN THE PROCESS

The first Stakeholder Group meeting occurred the day after the first community meeting. At this meeting, the group developed their operating protocols (attached) and discussed the community interests (see above). The remaining meetings involved the follow steps and actions:

- Development of a preliminary vision for the base
- Discussion of options for the primary elements of the area (front of the mountain trails, zip line, summit, back of the mountain, boundary expansion and road, east portal and other SRKMA properties, etc.)
- Delineation of future responsibilities and commitments for Snow King, the Snow King Resort Management Association (SKRMA), and the Town
- Clarification of the options to share with the community to learn how they would package the options to meet the identified interests
- Development of four final scenarios to submit to Town Council and Snow King for consideration

KEY ISSUES IN THE DISCUSSION

The Stakeholder Group worked hard to be creative and find new paths forward, while also staying anchored in the best interests of the community. There were several key issues that the group discussed at great length, working to understand one another’s perspective and to find options for the future that accommodated as many of the community interests as possible.

KEY ISSUES DISCUSSED

- ✓ Balancing allowing the gondola to land on Town property with developing new community benefits at the base
- ✓ Ensuring additional community benefits, such as increased housing, improvements to parking and traffic, and community access to summit amenities in exchange for development opportunities for Snow King
- ✓ Improving traffic flows and parking for all uses, without pushing problems off of main roads and arterials and into adjacent neighborhoods
- ✓ Balancing the environmental impacts of putting in a new road with the potential gains in safety for staff and visitors to the summit
- ✓ Maintaining the character of the Town while providing growth and development opportunities for Snow King
- ✓ Ensuring that the roles and responsibilities are clear for Snow King, SKRMA, and the Town into the future

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Gondola Landing and a Vision for the Base

The Stakeholder Group discussed Snow King's proposal to install a new gondola in place of the existing Summit Lift and to land the new gondola on Town of Jackson property. The group acknowledged that landing a new gondola on Town property would represent a substantial contribution from the community to Snow King, particularly since the land that would be used is currently a parking lot used to access the community park. However, the group also noted that this potential contribution from the community represents a substantial opportunity for the Town to negotiate some exciting amenities for the residents of Jackson in exchange for use of Town property.

While not all members of the group agreed on what the best package of "gives" and "gets" should be to ensure that the Town and residents receive an appropriate amount of community benefit for landing the gondola on Town property, there was convergence in the group around a vision to maximize gains for all by thinking creatively about the base. Toward this end, several members of the Stakeholder Group met between meetings to develop ***a vision for the base of Snow King that could substantially improve the flow of activities on the mountain and facilitate Snow King's delivery of mountain recreation, while also bringing exciting new recreational opportunities to the area for residents.*** The underlying idea behind the vision is that Snow King, the Town, and the residents would all gain from the vision, adding value for everyone through creative thinking and thoughtful development.

The new vision for the base included the following elements:

- Mutual planning, development, and creation of a world-class west base area, which would be ***the largest, most accessible and contiguous (green/grass and white/snow) public/recreational space possible***, designed for optimal functionality for multiple uses (both public and resort) in all seasons.
- ***Removal and replacement of the Summit Lift with a gondola.***
- Careful siting of the gondola landing on Town property ***to maximize contiguous green and white space on the property.***
- Development of ***a world-class park, event center, and youth sports facility*** accommodating public and private events and competitions, a community center, spectator hospitality, resort amenities, and headquarters for the Jackson Hole Ski and Snowboard Club, Doug Coombs Foundation, Jackson Hole Youth Hockey, Jackson Hole Moose Hockey, Jackson Hole Skating Club, the Jackson Hole High School Ski Team, the Jackson Hole Chapter of the Girls Scouts, and/or a year-round youth/teen center.
- ***Consideration of a variety of community, athletic, and recreational uses at the new sports facility***, including an additional ice rink, a climbing gym, meeting rooms, office space, study space or a branch library, among other things.
- ***Creation of an expanded and enhanced outdoor park space*** designed to accommodate multiple uses including but not limited to: baseball/kickball, markets and fairs, concerts, general public use, youth sports and winter sports dryland, and community events.
- ***Establishment of shared funding / expense and operating agreements***, association, or similar organizational structure to help create this vision and cover ongoing

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operations and maintenance of base area facilities (e.g., plowing, parking, janitorial services for shared buildings) and community benefits.

The idea behind this vision for the base is that it would substantially improve the recreational opportunities for the community by increasing the contiguous community space at the base to allow for more outdoor uses and by developing a community mountain and event center for new and expanded indoor uses. There was strong support among stakeholders about the need for a clear delineation of responsibilities between the Town, Snow King Mountain Resort, and Snow King Resort Management Association (SKRMA), in order to improve maintenance of roads and facilities to improve the user experience and increase safety.

It is important to note that the Stakeholder Group talked at length about the many members of the community who indicated a preference for *not* landing the gondola on Town property in their vision packages at the community meeting. The group members acknowledged and carefully considered this preference. Upon further deliberation, many in the group ultimately agreed the vision at the base that included landing the gondola on Town property held the greatest promise for delivering substantial community benefit to Town residents while also facilitating operational efficiencies for Snow King.

Community Benefits Now and for the Future

Members of the Stakeholder Group stressed the importance of developing vision packages for Snow King that promised a strong return to the local community for their continued and increased support of Snow King.

Community benefits included more recreational opportunities at the base (see above), as well as a new building at the summit of Snow King that would be open and welcoming to visitors and the community alike. The new summit building would include a restaurant open to the community, community space, a telescope and planetarium, and other amenities. The summit area would include picnic tables, a weather station, and easy access to the glorious views that make Jackson special. The summit would be served by a new gondola, and there would be improvements to existing ski terrain for the benefit of visitors and residents alike. These would be available year-round—free for hikers in the summer and for a lift-ticket fee in the winter (with advance purchase, season pass, and daily pass options).

COMMUNITY BENEFITS INCLUDED IN STAKEHOLDER VISION SCENARIOS

- ✓ Reconfiguration and expansion of contiguous green/snow space at Phil Baux Park
- ✓ New event space at Phil Baux Park
- ✓ A new summit building with access for the community, including a restaurant, a telescope/planetarium, and community space
- ✓ New picnic areas at the summit and yurts on the backside of the mountain
- ✓ Improved and in some cases expanded ski terrain on the mountain
- ✓ Expansion and improvement of the existing ice rink
- ✓ Creation of a new community mountain sports center
- ✓ Improved flow for drop-offs and through traffic at the base
- ✓ Increased and improved parking at the existing ice rink
- ✓ New housing for Snow King employees provided on Snow King property to alleviate housing pressures elsewhere in the community
- ✓ Clear commitments from Snow King and SKRMA for future management, financial investment, and maintenance of amenities and infrastructure

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Other recreational benefits that this vision included for the community include expansion of the existing ice rink and the creation of a new world-class community mountain sports center (described above). These developments would expand the indoor sports recreation opportunities available in Jackson, providing more ice for hockey and figure skating, a climbing wall, and other fitness and sports opportunity. There would also be improved space to support management and growth of community sports and community groups like Jackson Hole Ski and Snowboard Club, Doug Coombs Foundation, Jackson Hole Youth Hockey, Jackson Hole Moose Hockey, Jackson Hole Skating Club, the Jackson Hole High School Ski Team, the Jackson Hole Chapter of the Girls Scouts.

The Stakeholder Group also sought benefits to the community outside of the sports and recreation spheres. They saw a lot of room for improvement in parking, traffic, and transportation at the base of Snow King. ***The group agreed on the need for a new parking, traffic, and use study for the area to assess the problems, identify the sources and patterns behind the problems, and recommend creative solutions. The group further agreed that the study should be jointly funded and implemented by Snow King, SKRMA, and the Town.*** The group acknowledged that they are not traffic engineers or otherwise experts in the field, but they also had strong preferences for alleviating parking challenges in the area and ensuring that Snow King and SKRMA invest in solutions along with the Town. Some members of the group felt strongly that the parking improvements on main streets and arterials should not have the effect of pushing parking and traffic onto side streets and into neighborhoods adjacent to Snow King and SKRMA properties. The Stakeholder Group discussed a variety of options for ways to address parking and improve the flow of traffic, but did not agree on the best strategies. The parking and traffic improvements options that gained the most traction in the group are captured in the accompanying scenario summary table.

A Discussion of Finances

Most members of the stakeholder group expressed support for maintaining the viability of Snow King into the future, although they expressed different understandings and visions for what that meant, what would be needed to accomplish it, and what the Town's role in it should be. Early on, Snow King requested that the group not delve into the financial details of the resort, suggesting that it would not be the best use of the group's limited meeting time to try to understand, debate, or seek agreement on the financial status or revenue needs for Snow King. Some members continued to believe that knowing the needs of Snow King and the relative cost and revenue projections for different elements being considered for future development would help the group make informed choices for a vision. Others stated that this line of discussion held more opportunity for disagreement and debate than it did for visioning and creative thinking. In the end, the group invested their time in visions rather than finances. However, they did discuss more broadly the need for SKRMA to contribute financially to the community benefit and recreational operations at Snow King. This was very important to some stakeholders and is reflected in the scenario table under "SKRMA commitments."

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Balancing Hard Issues

Among the more challenging issues that the group addressed were boundary expansion, road development, and zipline. Snow King representatives had previously and in stakeholder meetings expressed the importance of these topics to the future financial viability of the ski mountain. Community members expressed a variety of perspectives on these issues in their identification of interests and in their vision packages. Members of the Stakeholder Group also expressed different opinions on each, often with different understandings or calculations of the tradeoffs and gains for the community.

The group explored several ideas and options related to gains for Snow King and for the community but did not agree on or converge on a particular outcome. Some of the options considered are listed below. These are ideas discussed and considered by the whole group, but not necessarily supported by individual members of the group. The summary scenario table demonstrates different ways that these elements could be combined with other ideas to create unique packages of benefits for Snow King and the community.

HARD ISSUES TO BALANCE

✓ ***Boundary expansion:***

- Whether to do it, how much to do it, where to do it (face of the mountain, summit)
- Concerns about environmental impacts
- Benefits for the community in terms of expanded ski terrain
- Other benefits for the community?

✓ ***Road development:***

- Potential improvements in safety, operations, and summit access
- Concerns about grade of new road, visual impacts, and environmental impacts
- Benefits for the community in terms of potential new ski terrain between switchbacks
- Other benefits for the community?

✓ ***Zipline:***

- Whether to have one
- Where to put one if there is one
- Concerns about visual impacts and impacts to the experience on the mountain and to surrounding neighbors and the cemetery
- Benefits to the community?

- Boundary expansion at the summit *could* make sense if it included an expansion of the ski terrain to create new beginner skiing opportunities in a sunnier, warmer area
- Minimal boundary expansion on the face of the mountain *could* make sense if it allowed for development of a new road to improve safety and summit access
- A new road to improve safety and access *could* make sense if skiing is allowed between the switchbacks
- *If* a zipline is going to be built, it *could* fit better with the surrounding community *if* it was located next to the Rafferty Lift and *if* use was managed to respect visitors to the cemetery. Alternatively, *if* a zipline is going to be built, it *could* fit better with the surrounding community *if* it was located adjacent to the gondola, which *could* reduce visual impacts and alleviate concerns about the cemetery.

However, there were several concerns that consistently emerged that the Stakeholder Group was unable to resolve with regard to these options. These issues are listed below. Some of the issues could be informed and/or resolved through the National Environmental Policy Act (NEPA) analysis that the US Forest Service will conduct as part of a Snow King application process. Others are matters of preference or perspective and are therefore more difficult to resolve.

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- The potential impacts of expanding the ski area boundary and/or building a new road on elk habitat, migration corridors, and other natural resource values on the mountain
- The engineering challenge of constructing a new road on the front of the mountain on one hand, and addressing safety and operational concerns related to accessing resort infrastructure and the summit on the other hand
- The change in the experience on the mountain and in the surrounding neighborhoods with the addition of a zipline, particularly related to noise and potential loss of a low-key atmosphere
- The potential visual impacts from a new road and/or a zipline
- The ability or lack of ability to minimize or mitigate these potential impacts
- What the appropriate package of community benefits should be in exchange for boundary expansion and/or new road development and/or a zipline

Scenario Packages and Areas of Divergence

The Stakeholder Group talked at great length about how best to balance gains and opportunities for Snow King with gains and opportunities for the community. Maintaining community character and protecting environmental and natural resource values were important variables in the equation. While there are many areas of agreement among the stakeholders that are reflected in the pages above and in common language in different boxes in the scenario summary table, different members of the group weighed those elements differently against other gains and opportunities for the community. For this reason, the Stakeholder Group encourages Town Council and Snow King to look at each scenario as a complete package without “cherry picking” the common elements and removing them from the context of the scenario packages. ***While there is general stakeholder convergence around many scenario elements, there remains divergence among the stakeholders about important aspects of the future of Snow King, including whether to have a zipline and where to put it if there is one, whether to develop a new road and where to put it if there is one, and whether, where, how much to expand the Snow King boundary. The convergence in many cases is based on compromises made in other topic areas, some of which may not be obvious to those who were not a part of the discussion. The group hopes that future negotiations, analyses, and permitting processes among and between Snow King, SRKMA, the Town, and the US Forest Service yield a balance of outcomes that allow for the continued viability of Snow King while providing community benefits and maintaining the feel of the community that makes Jackson such a desirable place to call home.***

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WHAT'S IN THE TABLE

The following table summarizes four scenarios that the Stakeholder Group agreed represent a reasonable range of alternative visions for the future of Snow King. Each scenario should be viewed as a complete package, as each balances the interests in a unique and carefully thought-out way. Some elements discussed in the table are marked with an asterisk (*). The asterisk indicates that the same language for that element occurs in each of the four scenarios. However, this does not necessarily mean that members of the Stakeholder Group support that language or that element no matter what; each scenario includes other components to balance these elements differently. The Stakeholder Group encourages Council and the community not to infer that there is universal agreement about the elements with the asterisks and to review those elements in the broader context of each scenario as a stand-alone package of carefully considered trade-offs.

Note: The Stakeholder Group seriously and carefully considered the interests and vision packages that emerged from the two community meetings. The Stakeholder Group integrated the community's perspectives into their own deeper dive into potential futures that address all the identified interests and considerations. Early in their work together, the Stakeholder Group converged around a vision for the base of the mountain that fundamentally rethinks the base in a way that maximizes the community benefits and meets the greatest number of interests to the largest degree. The Stakeholder Group encourages Council and the community to view the vision for the base and the accompanying scenarios not through a lens of a particular interest, but through a lens of what will be best for the whole community in the long-term. Please read the accompanying summary report to learn about the Stakeholder Group's vision for the base and other elements and ideas that the group considered.

This summary document was prepared by Heather Bergman of Peak Facilitation Group and Tyler Sinclair, Director of Planning for the Town of Jackson. Due to the urgency of getting information to Council, the Stakeholder Group did not have time for a thorough, in-person review of this table as a group. Individuals suggested clarifications and edits in response to an emailed draft document; Heather and Tyler incorporated those to the best of their ability, working to remain consistent with the notes from the meeting. Any errors in this document should be attributed to the writing team, not to the stakeholders.

ELEMENTS	SCENARIO A	SCENARIO B	SCENARIO C	SCENARIO D
Gondola Landing	Gondola landing on Town of Jackson property	Gondola landing on Town of Jackson property	Gondola landing on Town of Jackson property	Gondola landing on Town of Jackson property <i>Note: The group briefly discussed the concept of a land exchange or purchase such that Town owns all or a portion of KM6 for community purposes and Snow King owns a portion of current ball field to land gondola and other amenities. Some members of the group indicated that they do not believe the idea is viable;</i>

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ELEMENTS	SCENARIO A	SCENARIO B	SCENARIO C	SCENARIO D
				<i>others indicated that they would need more information and/or discussion before forming an opinion.</i>
Ice Rink*	Expand ice rink to the east to allow an additional sheet of ice and other options in the current area	Expand ice rink to the east to allow an additional sheet of ice and other options in the current area	Expand ice rink to the east to allow an additional sheet of ice and other options in the current area	Expand ice rink to the east to allow an additional sheet of ice and other options in the current area
Community Mountain Sports Center*	Community mountain sports center included as part of the Snow King Center ice rink, dependent upon ice rink expansion options	Community mountain sports center included as part of the Snow King Center ice rink, dependent upon ice rink expansion options	Community mountain sports center included as part of the Snow King Center ice rink, dependent upon ice rink expansion options	Community mountain sports center included as part of the Snow King Center ice rink, dependent upon ice rink expansion options

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ELEMENTS	SCENARIO A	SCENARIO B	SCENARIO C	SCENARIO D
Parking	- Phil Baux Park should not to be used for surface parking - Move parking from Phil Baux Park to other Snow King property - Reconfigure and expand current Town-owned upper and lower parking lots at ice rink to increase number of spaces and build additional cantilevered parking at ice rink to create additional parking spaces - Consider parking at KM6—surface or underground, depending on development - Town of Jackson property to be used for drop-offs and turnaround with minimal parking for events - Bike lanes on Snow King Avenue - A parking and traffic study should be undertaken collaboratively by Snow King Resort Management Association (SKRMA) and the Town of Jackson to support a new Transportation Demand Management Plan.	- Phil Baux Park should not to be used for surface parking - Recoup lost parking at Phil Baux Park through: - Develop easiest surface parking options in the near term - Reconfigure and expand current Town-owned upper and lower parking lots at ice rink to increase number of spaces - Create more on-street parking on South Cache and Snow King Ave. - Consider angled parking on Snow King Ave. on north side with road widening to accommodate bike lanes - Town of Jackson property to be used for drop-offs and turnaround with minimal parking for events - Bike lanes on Snow King Avenue - A parking and traffic study should be undertaken collaboratively by Snow King Resort Management Association (SKRMA) and the Town of Jackson to support a new Transportation Demand Management Plan.	- Phil Baux Park should not to be used for surface parking - Recoup lost parking at Phil Baux Park through: - Develop easiest surface parking options in the near term - Reconfigure and expand current Town-owned upper and lower parking lots at ice rink to increase number of spaces - Create more on-street parking on South Cache and Snow King Ave. - Consider angled parking on Snow King Ave. on north side with road widening to accommodate bike lanes - Consider surface or underground, depending on development - Town of Jackson property to be used for drop-offs and turnaround with minimal parking for events - Bike lanes on Snow King Avenue - A parking and traffic study should be undertaken collaboratively by Snow King Resort Management Association (SKRMA) and the Town of Jackson to support a new Transportation Demand Management Plan.	- Phil Baux Park should not to be used for surface parking - Recoup lost parking at Phil Baux Park through: - Develop easiest surface parking options in the near term - Reconfigure and expand current Town-owned upper and lower parking lots at ice rink to increase number of spaces - Create more on-street parking on South Cache and Snow King Ave. - Consider angled parking on Snow King Ave. on north side with road widening to accommodate bike lanes - Consider surface or underground, depending on development - Town of Jackson property to be used for drop-offs and turnaround with minimal parking for events - Bike lanes on Snow King Avenue - A parking and traffic study should be undertaken collaboratively by Snow King Resort Management Association (SKRMA) and the Town of Jackson to support a new Transportation Demand Management Plan.

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ELEMENTS	SCENARIO A	SCENARIO B	SCENARIO C	SCENARIO D
Zip Line	No zip line <i>Note: A zip line could be incorporated into this scenario: a) if it was accompanied by additional community benefit provided by Snow King, and b) only if the zip line was put adjacent to the Rafferty lift.</i>	No zip line	Zip line on west side of mountain (West Portal), activity recommended to be built adjacent (on east side) of Gondola.	Zip line on east side of the mountain adjacent to the Rafferty Lift.
Boundary Expansion/Road	Expand boundary to encompass new road as proposed by Snow King Mountain but without the additional terrain proposed on the front side; this <u>does</u> allow for skiing between switchbacks.	Expand boundary to encompass new road as proposed by Snow King Mountain but without the additional terrain proposed on the front side; <u>do not</u> allow for skiing between switchbacks.	Expand boundary to encompass new road as proposed by Snow King Mountain but without the additional terrain proposed on the front side; this <u>does</u> allow for skiing between switchbacks.	No boundary expansion; new road within existing boundary, for summer operations and safety purposes, could still be used for downhill skiing in the winter. <i>Note: Consider which needs could be met by a road on the backside to inform and potentially limit size and impact of road on front side of mountain.</i>
Summit Multi-use Building*	Multi-use building that is welcoming to both visitors and locals • Green development • Space for community activities • Allow for community use even when events are going on • Appropriate size to accommodate needs without being too big; maximize flexibility of space while minimizing footprint • No mid-mountain lodge as previously considered in the	Multi-use building that is welcoming to both visitors and locals • Green development • Space for community activities • Allow for community use even when events are going on • Appropriate size to accommodate needs without being too big; maximize flexibility of space while minimizing footprint • No mid-mountain lodge as previously considered in the	Multi-use building that is welcoming to both visitors and locals • Green development • Space for community activities • Allow for community use even when events are going on • Appropriate size to accommodate needs without being too big; maximize flexibility of space while minimizing footprint • No mid-mountain lodge as previously considered in the	Multi-use building that is welcoming to both visitors and locals • Green development • Space for community activities • Allow for community use even when events are going on • Appropriate size to accommodate needs without being too big; maximize flexibility of space while minimizing footprint • No mid-mountain lodge as previously considered in the

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ELEMENTS	SCENARIO A	SCENARIO B	SCENARIO C	SCENARIO D
	MDP if there is a building at the summit • Restaurant should be welcoming for all patrons • Picnic tables • Summit Park • Weather forecasting station • Telescope and planetarium	MDP if there is a building at the summit • Restaurant should be welcoming for all patrons • Picnic tables • Summit Park • Weather forecasting station • Telescope and planetarium	MDP if there is a building at the summit • Restaurant should be welcoming for all patrons • Picnic tables • Summit Park • Weather forecasting station • Telescope and planetarium	MDP if there is a building at the summit • Restaurant should be welcoming for all patrons • Picnic tables • Summit Park • Weather forecasting station • Telescope and planetarium
Summit	West Summit minimal expansion to allow beginner skiing (magic carpet, facilities)	No expansion allowed	West Summit minimal expansion to allow beginner skiing (magic carpet, facilities)	No expansion allowed
Back Side of the Mountain	No change in boundary, as proposed by Snow King Mountain including a new lift and bike and ski terrain within existing permit boundary, with consideration for wildlife migration and habitat; includes bike park as proposed by Snow King Mountain; plus yurts (to be accessible to community as a community benefit)	No change in boundary with limited development for human-powered activities and yurts (to be accessible to community as a community benefit)	No change in boundary, as proposed by Snow King Mountain including a new lift and bike and ski terrain within existing permit boundary, with consideration for wildlife migration and habitat; includes bike park as proposed by Snow King Mountain; plus yurts (to be accessible to community as a community benefit)	No change in boundary, as proposed by Snow King Mountain including a new lift and bike and ski terrain within existing permit boundary, with consideration for wildlife migration and habitat; includes bike park as proposed by Snow King Mountain; plus yurts (to be accessible to community as a community benefit) Maintain option for road on the back side of the mountain
Front of Mountain Trails*	• Staircase Trail to be realigned/reinforced • Hiking Trail to be realigned to get pedestrians away from the road and construction traffic; allow for summer and winter use • Summit Trail needs to be more obvious and have better wayfinding • Two biking zones from the Snow King Mountain	• Staircase Trail to be realigned/reinforced • Hiking Trail to be realigned to get pedestrians away from the road and construction traffic; allow for summer and winter use • Summit Trail needs to be more obvious and have better wayfinding • Two biking zones from the Snow King Mountain	• Staircase Trail to be realigned/reinforced • Hiking Trail to be realigned to get pedestrians away from the road and construction traffic; allow for summer and winter use • Summit Trail needs to be more obvious and have better wayfinding • Two biking zones from the Snow King Mountain	• Staircase Trail to be realigned/reinforced • Hiking Trail to be realigned to get pedestrians away from the road and construction traffic; allow for summer and winter use • Summit Trail needs to be more obvious and have better wayfinding • Two biking zones from the Snow King Mountain

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ELEMENTS	SCENARIO A	SCENARIO B	SCENARIO C	SCENARIO D
	proposal to be included; start at mid-station of Rafferty lift, have one crossing point only • If the road is shared with the Sink or Swim trail, then reroute trail to maintain single-track experience • Maintain and enhance connections to surrounding neighborhoods and area trails • Add bike lane on Snow King Avenue to the resort • Collaborate with Town, County, community groups, and others for trail building	proposal to be included; start at mid-station of Rafferty lift, have one crossing point only • If the road is shared with the Sink or Swim trail, then reroute trail to maintain single-track experience • Maintain and enhance connections to surrounding neighborhoods and area trails • Add bike lane on Snow King Avenue to the resort • Collaborate with Town, County, community groups, and others for trail building	proposal to be included; start at mid-station of Rafferty lift, have one crossing point only • If the road is shared with the Sink or Swim trail, then reroute trail to maintain single-track experience • Maintain and enhance connections to surrounding neighborhoods and area trails • Add bike lane on Snow King Avenue to the resort • Collaborate with Town, County, community groups, and others for trail building	proposal to be included; start at mid-station of Rafferty lift, have one crossing point only • If the road is shared with the Sink or Swim trail, then reroute trail to maintain single-track experience • Maintain and enhance connections to surrounding neighborhoods and area trails • Add bike lane on Snow King Avenue to the resort • Collaborate with Town, County, community groups, and others for trail building
Uphill Access/Travel in Winter	Charge for uphill access/travel in winter • Advance purchase discount option • Season pass option • Daily pass option	Charge for uphill access/travel in winter • Advance purchase discount option • Season pass option • Daily pass option	Charge for uphill access/travel in winter • Advance purchase discount option • Season pass option • Daily pass option	Charge for uphill access/travel in winter • Advance purchase discount option • Season pass option • Daily pass option Enhance beginner terrain within the existing boundary, including from the mid-station of the Rafferty Lift, above the cemetery and on the back side of the summit within the current boundary.
East Portal	East Portal to serve primarily as commercial, lodging, and retail • Resort entry, gateway to “resort activities,” summer focus	East Portal to serve primarily as commercial, lodging, and retail • Resort entry, gateway to “resort activities,” summer focus	East Portal to serve primarily as commercial, lodging, and retail • Resort entry, gateway to “resort activities,” summer focus	East Portal to serve primarily as commercial, lodging, and retail • Resort entry, gateway to “resort activities,” summer focus

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ELEMENTS	SCENARIO A	SCENARIO B	SCENARIO C	SCENARIO D
	- Welcoming, accessible area - More intense use expected in this area - Important for winter/skiing aspect as well as summer activities	- Welcoming, accessible area - More intense use expected in this area - Important for winter/skiing aspect as well as summer activities	- Welcoming, accessible area - More intense use expected in this area - Important for winter/skiing aspect as well as summer activities	- Welcoming, accessible area - More intense use expected in this area - Important for winter/skiing aspect as well as summer activities - Emphasize portal for beginner skiers and ski school.
Lots 53, 57, and 58	All three lots to be used for employee housing and lodging - Place building envelope locations to maintain experience on ski hill - Maintain/create welcoming feel - Locate building envelopes to minimize impacts on adjacent property owners - Apply housing requirements (see housing section below)	All three lots to be used for employee housing and lodging - Place building envelope locations to maintain experience on ski hill - Maintain/create welcoming feel - Locate building envelopes to minimize impacts on adjacent property owners - Apply housing requirements (see housing section below); housing requirement to be met on-site	All three lots to be used for employee housing and lodging - Place building envelope locations to maintain experience on ski hill - Maintain/create welcoming feel - Locate building envelopes to minimize impacts on adjacent property owners - Apply housing requirements (see housing section below)	All three lots to be used for employee housing and lodging - Place building envelope locations to maintain experience on ski hill - Maintain/create welcoming feel - Locate building envelopes to minimize impacts on adjacent property owners - Apply housing requirements (see housing section below)
Housing	Town of Jackson and SKRMA negotiate new requirements; new agreement should provide parity with requirements in Land Development Regulations (LDRs) as much as possible address seasonal and full employees Ensure that housing requirements are based on usage and number of employees, not only square	Town of Jackson and SKRMA negotiate new requirements; new agreement should provide parity with requirements in Land Development Regulations (LDRs) as much as possible address seasonal and full employees	Town of Jackson and SKRMA negotiate new requirements; new agreement should provide parity with requirements in Land Development Regulations (LDRs) as much as possible address seasonal and full employees	Town of Jackson and SKRMA negotiate new requirements; new agreement should provide parity with requirements in Land Development Regulations (LDRs) as much as possible address seasonal and full employees

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**Snow King Vision Stakeholder Group
Final Vision Scenarios - May 17, 2018**

ELEMENTS	SCENARIO A	SCENARIO B	SCENARIO C	SCENARIO D
	footage			
Snow King Mountain Commitments*	• Maintain clear and negotiated hours of lift operations (current hours desired but acknowledgment that needs may change in the future) • Develop procedural agreement with Town of Jackson regarding how/when to allow closures for conditions (summit and ski hill) • Ensure / negotiate affordable rates for locals with Town of Jackson (Details TBD; different definitions of “affordable” and “local” make it tricky.) • Maintain access for current user groups	• Maintain clear and negotiated hours of lift operations (current hours desired but acknowledgment that needs may change in the future) • Develop procedural agreement with Town of Jackson regarding how/when to allow closures for conditions (summit and ski hill) • Ensure / negotiate affordable rates for locals with Town of Jackson (Details TBD; different definitions of “affordable” and “local” make it tricky.) • Maintain access for current user groups	• Maintain clear and negotiated hours of lift operations (current hours desired but acknowledgment that needs may change in the future) • Develop procedural agreement with Town of Jackson regarding how/when to allow closures for conditions (summit and ski hill) • Ensure / negotiate affordable rates for locals with Town of Jackson (Details TBD; different definitions of “affordable” and “local” make it tricky.) • Maintain access for current user groups	• Maintain clear and negotiated hours of lift operations (current hours desired but acknowledgment that needs may change in the future) • Develop procedural agreement with Town of Jackson regarding how/when to allow closures for conditions (summit and ski hill) • Ensure / negotiate affordable rates for locals with Town of Jackson (Details TBD; different definitions of “affordable” and “local” make it tricky.) • Maintain access for current user groups
SKRMA Commitments*	• Ensure SKRMA is a functioning entity as described in the year 2000 Resort Master Plan agreement, which is the current agreement with TOJ. • Present the SKRMA “entity structure” to the TOJ council to agree on “mutual” compliance. • Clearly define SKRMA’s responsibilities and members to avoid future “open to interpretation” issues • Develop an agreement on commitments that functions	• Ensure SKRMA is a functioning entity as described in the year 2000 Resort Master Plan agreement, which is the current agreement with TOJ. • Present the SKRMA “entity structure” to the TOJ council to agree on “mutual” compliance. • Clearly define SKRMA’s responsibilities and members to avoid future “open to interpretation” issues • Develop an agreement on commitments that functions	• Ensure SKRMA is a functioning entity as described in the year 2000 Resort Master Plan agreement, which is the current agreement with TOJ. • Present the SKRMA “entity structure” to the TOJ council to agree on “mutual” compliance. • Clearly define SKRMA’s responsibilities and members to avoid future “open to interpretation” issues • Develop an agreement on commitments that functions	• Ensure SKRMA is a functioning entity as described in the year 2000 Resort Master Plan agreement, which is the current agreement with TOJ. • Present the SKRMA “entity structure” to the TOJ council to agree on “mutual” compliance. • Clearly define SKRMA’s responsibilities and members to avoid future “open to interpretation” issues • Develop an agreement on commitments that functions

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**Snow King Vision Stakeholder Group
Final Vision Scenarios - May 17, 2018**

ELEMENTS	SCENARIO A	SCENARIO B	SCENARIO C	SCENARIO D
	in perpetuity that is transferable to any/all new owners - Clarify and separate where appropriate SKRMA commitments from Snow King Mountain commitments - Clarify where the SKRMA and Snow King Mountain commitments overlap and are connected. - Require a financial commitment from all SKRMA members consistent with the current SKRMA/TOJ agreement. - Ensure adequate parking; develop transportation demand management (TDM) plan - Clarify maintenance expectations and requirements, including snow removal - Contribute some percentage of fees/dues to support recreation (community center, ice rink, grant funding, etc.) - Re-visit and confirm funding requirements per the 2000 Resort Master Plan with TOJ. (Or propose a new mechanism to TOJ.)	in perpetuity that is transferable to any/all new owners - Clarify and separate where appropriate SKRMA commitments from Snow King Mountain commitments - Clarify where the SKRMA and Snow King Mountain commitments overlap and are connected. - Require a financial commitment from all SKRMA members consistent with the current SKRMA/TOJ agreement. - Ensure adequate parking; develop transportation demand management (TDM) plan - Clarify maintenance expectations and requirements, including snow removal - Contribute some percentage of fees/dues to support recreation (community center, ice rink, grant funding, etc.) - Re-visit and confirm funding requirements per the 2000 Resort Master Plan with TOJ. (Or propose a new mechanism to TOJ.)	in perpetuity that is transferable to any/all new owners - Clarify and separate where appropriate SKRMA commitments from Snow King Mountain commitments - Clarify where the SKRMA and Snow King Mountain commitments overlap and are connected. - Require a financial commitment from all SKRMA members consistent with the current SKRMA/TOJ agreement. - Ensure adequate parking; develop transportation demand management (TDM) plan - Clarify maintenance expectations and requirements, including snow removal - Contribute some percentage of fees/dues to support recreation (community center, ice rink, grant funding, etc.) - Re-visit and confirm funding requirements per the 2000 Resort Master Plan with TOJ. (Or propose a new mechanism to TOJ.)	in perpetuity that is transferable to any/all new owners - Clarify and separate where appropriate SKRMA commitments from Snow King Mountain commitments - Clarify where the SKRMA and Snow King Mountain commitments overlap and are connected. - Require a financial commitment from all SKRMA members consistent with the current SKRMA/TOJ agreement. - Ensure adequate parking; develop transportation demand management (TDM) plan - Clarify maintenance expectations and requirements, including snow removal - Contribute some percentage of fees/dues to support recreation (community center, ice rink, grant funding, etc.) - Re-visit and confirm funding requirements per the 2000 Resort Master Plan with TOJ. (Or propose a new mechanism to TOJ.)
Town of Jackson Commitments*	Leases Clean up/renegotiate/consolidate	Leases Clean up/renegotiate/consolidate	Leases Clean up/renegotiate/consolidate	Leases Clean up/renegotiate/consolidate

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**Snow King Vision Stakeholder Group
Final Vision Scenarios - May 17, 2018**

ELEMENTS	SCENARIO A	SCENARIO B	SCENARIO C	SCENARIO D
	existing leases to reflect new uses and improvements that emerge from this process • Write new lease for Gondola landing and SKM 1 land usage with Town of Jackson • Includes ice center, ski lodge, and any new things that emerge from this process Parking • Update the current travel demand management (TDM) plan and parking strategy in collaboration with SKRMA for private and public land Parks • Maintain parks and other Town-owned amenities in the area. • Collaborate with SKRMA to ensure maintenance and integrated access to park, ice rink, and associated amenities • Coordinate with SKRMA on programming and events Housing • Explore options for investing public funding in employee housing for Town of Jackson staff in conjunction/ partnership with requirements for employee housing for SKRMA Review • Ensure timely and efficient review of all plans, proposals,	existing leases to reflect new uses and improvements that emerge from this process • Write new lease for Gondola landing and SKM 1 land usage with Town of Jackson • Includes ice center, ski lodge, and any new things that emerge from this process Parking • Update the current travel demand management (TDM) plan and parking strategy in collaboration with SKRMA for private and public land Parks • Maintain parks and other Town-owned amenities in the area. • Collaborate with SKRMA to ensure maintenance and integrated access to park, ice rink, and associated amenities • Coordinate with SKRMA on programming and events Housing • Explore options for investing public funding in employee housing for Town of Jackson staff in conjunction/ partnership with requirements for employee housing for SKRMA Review • Ensure timely and efficient review of all plans, proposals,	existing leases to reflect new uses and improvements that emerge from this process • Write new lease for Gondola landing and SKM 1 land usage with Town of Jackson • Includes ice center, ski lodge, and any new things that emerge from this process Parking • Update the current travel demand management (TDM) plan and parking strategy in collaboration with SKRMA for private and public land Parks • Maintain parks and other Town-owned amenities in the area. • Collaborate with SKRMA to ensure maintenance and integrated access to park, ice rink, and associated amenities • Coordinate with SKRMA on programming and events Housing • Explore options for investing public funding in employee housing for Town of Jackson staff in conjunction/ partnership with requirements for employee housing for SKRMA Review • Ensure timely and efficient review of all plans,	existing leases to reflect new uses and improvements that emerge from this process • Write new lease for Gondola landing and SKM 1 land usage with Town of Jackson • Includes ice center, ski lodge, and any new things that emerge from this process Parking • Update the current travel demand management (TDM) plan and parking strategy in collaboration with SKRMA for private and public land Parks • Maintain parks and other Town-owned amenities in the area. • Collaborate with SKRMA to ensure maintenance and integrated access to park, ice rink, and associated amenities • Coordinate with SKRMA on programming and events Housing • Explore options for investing public funding in employee housing for Town of Jackson staff in conjunction/ partnership with requirements for employee housing for SKRMA Review • Ensure timely and efficient review of all plans, proposals,

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**Snow King Vision Stakeholder Group
Final Vision Scenarios - May 17, 2018**

ELEMENTS	SCENARIO A	SCENARIO B	SCENARIO C	SCENARIO D
	and permits related to SKRMA and Snow King	and permits related to SKRMA and Snow King	proposals, and permits related to SKRMA and Snow King	and permits related to SKRMA and Snow King

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From: Jim LaRoe
To: [Town Council](#); [Town Council](#)
Cc: [Tyler Sinclair](#); [Larry Pardee](#)
Subject: RE: For Consideration from a Stakeholder
Date: Sunday, July 29, 2018 8:46:15 PM

Dear Town Council,

Thank you for your service.

I am writing as a Stakeholder of the Snow King Engagement process and as a Citizen. It was an honor to be selected as a Stakeholder and still feel a strong sense of responsibility to follow through on key issues .

I have great respect for everyone involved in the Stakeholders process. However, I do have strong opinions on certain issues.

The final 4 Scenarios are a valuable work product . However, the Scenario's do not reflect all the important discussions and commitments that surrounded key issues.

The recent submission by Snow King made progress and reflected a number of Stakeholders discussions.

However, their submission showed "few" specific details and commitments. These details and commitments were the backbone and value of the Stakeholders process.

As we move into "long-term" binding agreements I believe it is imperative that "very specific details" be presented by Snow King.

I am concerned "all parties" will suffer, unless "specific details" are presented and debated before proposals are approved.

[If possible, I would like to meet with the appropriate Staff and/or Council members to express "my understanding" of the commitments and discussions that stand behind the issues in the Stakeholders process. \(I speak only for myself in his regard.\)](#)

The following are the primary issues that I believe are worth further discussion. I appreciate your consideration.

- SKRMA- Structure
- The MOU was between SKRMA and TOJ. (It was not with Snow King and Gardner Capital)
- Snow King and Gardner Capital stated to the Stakeholders ---they could not represent SKRMA in the Stakeholders process.
- The Town and Citizens should be made aware of who is in the negotiations with these agreements.
- Is it SKRMA ? Snow King ? Gardner Capital ? -- Is it a Non-profit ? How is it funded ?

Who can Bind them ?

- Proposals need a “specific schedule” of delivery. All work needs to be “Bonded” and tied to the agreed schedules.

SKRMA-Financial

- I believe, SKRMA in the 2000 agreement, was granted significant Up-Zoning of Land Value for Commercial Development.
- This was specifically done, I believe, to allow SKRMA to “ indefinitely run” Snow King without ever having to suffer any financial challenge with Mountain Operations.
- This was stated specifically on page 173 of Snow King Planned Resort District 2000.
- This language should never be removed. It is the backbone of a critical legal agreement with the TOJ and Citizens
- These obligations run with the land regardless of change of owner. A Change ownership gets the same benefits--- but also the same obligations.

SKRMA-Current

- I believe SKRMA is a current “binding” agreement with TOJ and should be currently enforced.
- My understating was SKRMA’s commitments and structure were to be presented (and accepted) by TOJ “before” any approvals were addressed.
- Important Community Benefits are currently in the SKRMA agreement and should still be enforced.
- The Approval process could take years.

The Gondi Landing

- The support for the Gondi in PB Park could be misleading, without insight to the Stakeholders discussions.
- I myself supported this, "but only" with considerable and very "specific commitments" from Snow King.
- For me, It was much more than-- vague green space --- but specific Deeded equivalent ground to the Town .

The Base in General

- I fully support the concept of a Mountain Sports Center and a great outcome of the Stakeholders process in my opinion.
- I was pleased to see that Snow King showed a new ice sheet and other facilities in their recent proposal and hope this extends to a climbing wall as well.
- Again, I believe much greater detail is needed . More than a footprint.
- Defined buildings, specific uses, funding plan , schedules and bonding.

Zip Line in PB Park

- In my opinion “a zip line” has no place landing in PB Park.
- PB Park will be greatly changed with the summer tourist congestion for the new Gondi alone .
- Considerable crowds of tourists loading the Gondi for the proposed restaurant, as well as new bus traffic at the Base.
- A zip-line here will only add more congestion, more crowds , noise and the damage the peace of our PB Park
- Also, my perception is that Snow King/ SKRMA is very well funded and does not need a zip-line for financial reasons.

If meetings can't be scheduled, I would be glad to submit more detailed written comments for your review.

Thanks again for your consideration.

Best, Jim

Jim LaRoe
307-200-6779 (H/O)
301-956-0649 (M)
Jackson, WY
jtlaroe7@gmail.com

From: Skye Schell
To: [Hailey Morton Levinson](#)
Subject: New base masterplan
Date: Monday, July 30, 2018 12:18:12 PM
Attachments: [Base Area MDP Map1.pdf](#)
[SK Resort Master Plan notice.pdf](#)

Dear Hailey,

Following up on our conversation, here is more information that I've recently received regarding the Snow King base masterplan:

1. Attached: the 1-page masterplan amendment map that SK/Town shared a couple weeks ago. This is all the public has seen so far. Note the lack of new hotels and condos on the hotel and KM-6 sites - made me wonder, are those no longer in the masterplan?
2. I found a new proposed base masterplan on the Snow King website [here](#). Compare the map on page 78 in the PDF to the attached base map... this one *includes* hotels and condos at hotel and KM-6. Answers my question but raises a new one. Why would these be *excluded* from the version of the map that SKMR shared with the public, and *included* in the version they're submitting for approval?
3. The reason for the substantial lodging / commercial upzone in the 2000 base masterplan was stated explicitly:

It must be noted that many of our community partnership activities mentioned above often come at a high cost to Snow King. **Resort operation of lodging and other facilities provides the financial and operational platform and the resources to support these and other community-oriented activities.**" [172-173]

The new proposed version changes it to remove the link *from lodging specifically to on-mountain* activities:

It must be noted that many of our community partnership activities mentioned above often come at a high cost to Snow King Resort and **operation of lodging, conference, and on mountain activities** provide the financial and operational platform and the resources to support these and other community-oriented activities. [171]

If we unwind the deal on one side (SK/SKRMA commitments), we should probably unwind it on the other side (Town commitments - upzone) to be fair to our community.

4. I've attached the letter we got about an August 15 Planning Commission public hearing on this 211-page masterplan. I'm concerned that the public will only have 5 days to digest a 211-page document between staff report and public hearing. Even a month would be pushing it, given the scope and scale of this 18-year-old deal. How can fairly we have a public hearing without time for real review? Could you try to extend that amount of time so people can reasonably review the new document, understand the proposed changes, and respond?

Thanks,
Skye

--

Skye Schell
Executive Director
Jackson Hole Conservation Alliance

office (307) 733-9417

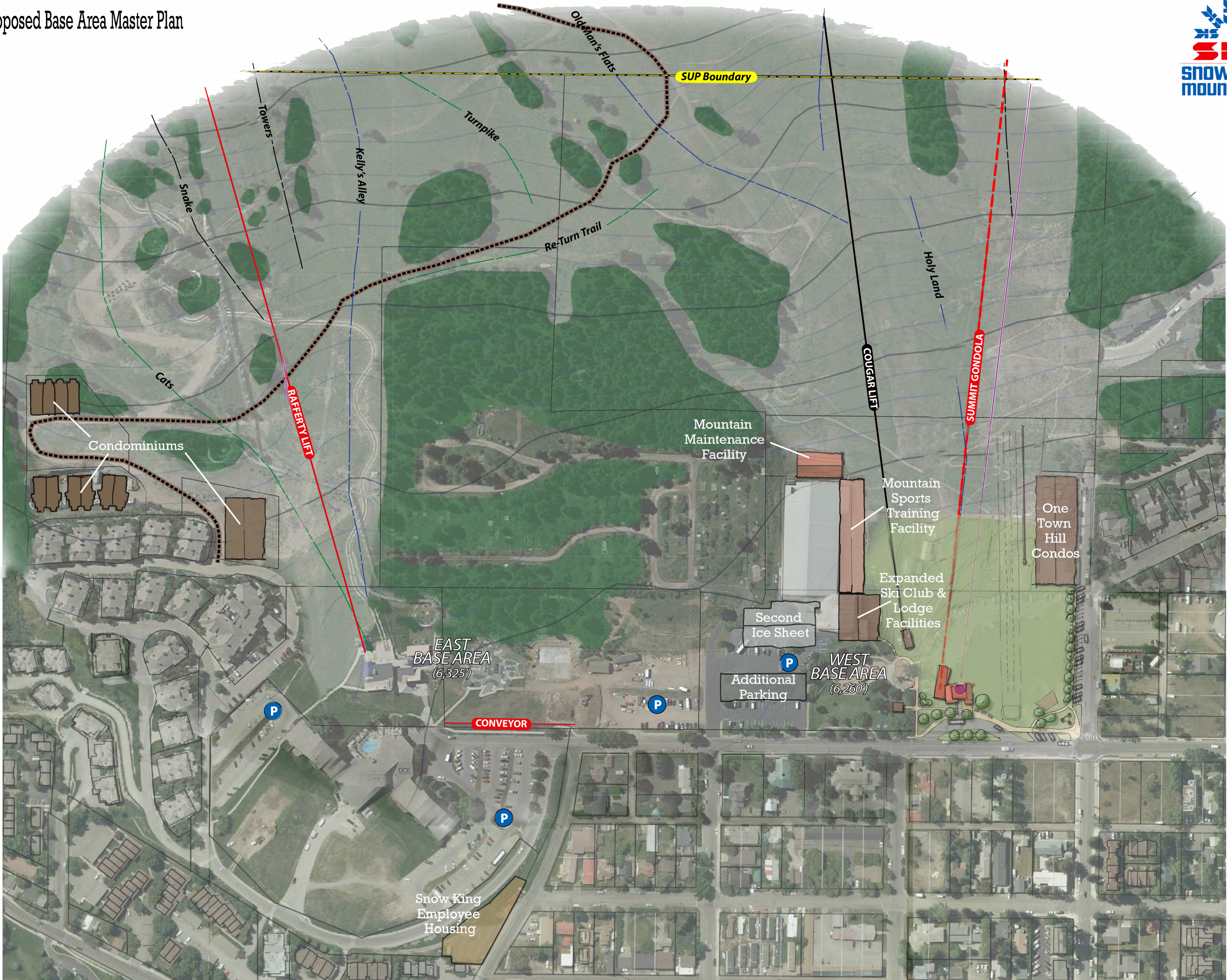
www.jhalliance.org

fb [JHConservationAlliance](#)

Help Build [Safe Wildlife Crossings for JH!](#)

Save the date: August 29:

[Alliance Summer Block Party feat. Wildlife Crossings](#)



*Proposed Base Area Master Plan Amendment. Snow King will work with Town of Jackson and Parks & Rec to finalize.



PLANNING & BUILDING DEPARTMENT

July 19, 2018

**RE: Item P18-208: Amendment to the Resort Master Plan for Snow King Master Association
10 E Snow King Avenue**

Dear Property Owner:

The Town of Jackson has received a request for approval of an Amendment to the Resort Master Plan for Snow King Master Association located at 10 E. Snow King Ave., legally known as PT NW1/4SW1/4, SEC. 34, TWP. 41, RNG. 116 TRACT B. (Aerial view of property attached) Per the Land Development Regulations, as a property owner within 200 feet of the subject property (excluding rights-of-way), you are being notified of the request(s) and the upcoming public hearing(s).

Public comment is encouraged and will be accepted at any time during the review and hearing process.

August 7, 2018: Comment deadline for incorporation into Staff Report

August 10, 2018, 5:00PM: Staff report is online at: <http://townofjackson.com/AgendaCenter> or available for pickup at the Town Hall Planning Department (copy fee applies)

August 15, 2018, 5:30PM: Planning Commission hearing (Town Hall)

Please contact me at the Jackson Planning Department, 307-733-0440, ext. 1301, if you need further information.

**Tyler Sinclair
Planning Director**

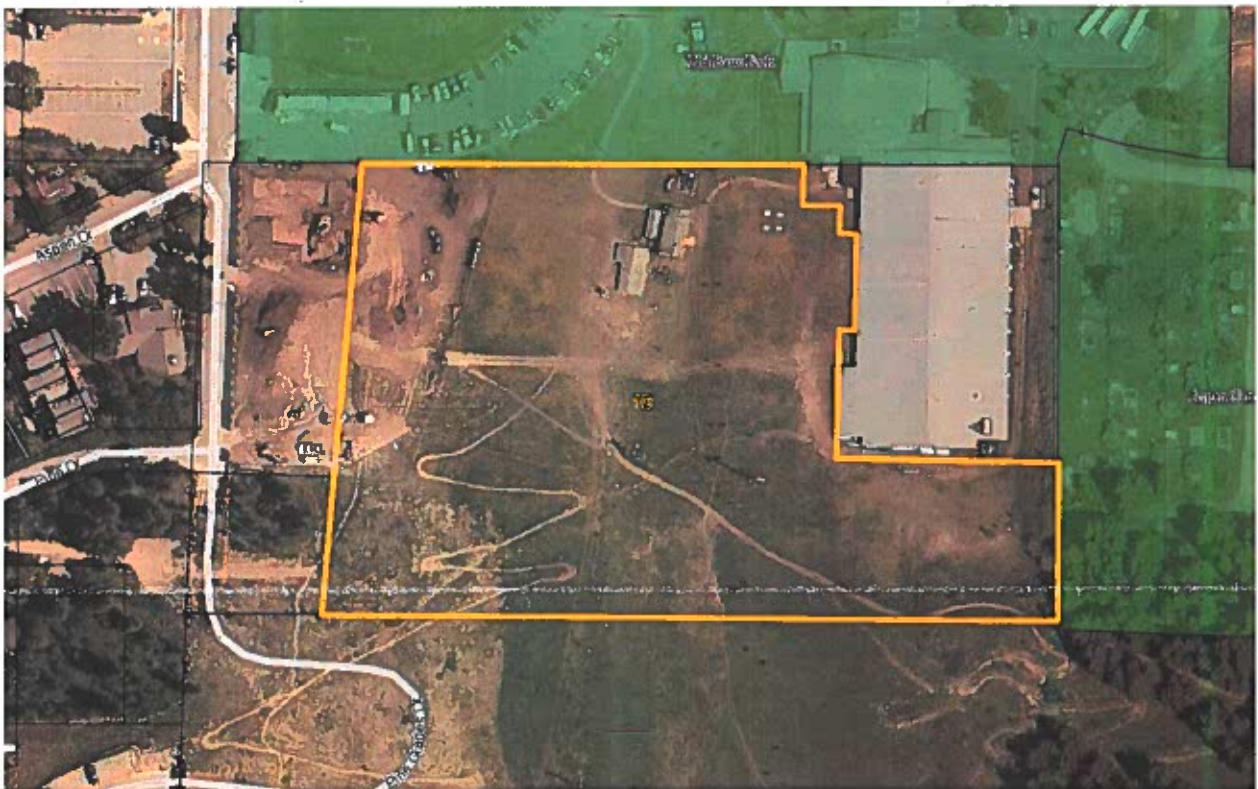
(Legal Notice from Jackson Hole News & Guide)

PUBLIC HEARING

The Town of Jackson Planning Commission will hold a public hearing to consider a request for approval of an Amendment to the Resort Master Plan for Snow King Master Association located at 10 E. Snow King Ave., legally know as PT NW1/4SW1/4, SEC. 34, TWP. 41, RNG. 116 TRACT B.

The hearing is scheduled for Wednesday, August 15, 2018, beginning at 5:30 p.m. at the Town Hall, 150 East Pearl Avenue, Jackson, WY. The application can be viewed online at: <http://townofjackson.com/467/Current-Applications>. For further information, please contact the Planning Dept. at 733-0440, Ext. 1301. [Item P18-208 Sinclair] **Publish 07/25/18**

Aerial View of Property



10 E. Snow King Ave.
PT NW1/4SW1/4, SEC. 34, TWP. 41, RNG. 116 TRACT B.

From: Sam Pope
To: [Town Council](#)
Subject: Future of Snow King
Date: Thursday, August 02, 2018 4:04:05 PM

Dear Members of the Town Council,

I wanted to write to you today to express my strong disapproval of Snow King's less than transparent plans for growth.

Of course we all know that Jackson has changed dramatically in the past twenty or so years. Not all of the change has been bad, some of it has been inevitable and a lot, has seemingly been for the benefit of entities other than the people who choose to make a home here.

Snow King has stood out as a place that still exists almost exclusively for the benefit of the community. One of the few.

The current owners want to make money. Unfortunately, there is no place for community on a balance sheet and to expect them to make decisions that are going to affect anything other than their bottom line, is both naive and unrealistic.

Snow King should be owned by the town, a non profit or a coop. There is plenty of precedent for the in the West and this is truly the only way to ensure it won't become an overdeveloped amusement park. Probably the best way to do this is to end the significant subsidies that are given to a private entity so that they can make a lot of money, at our expense. They were given a chance to hold up their end of the bargain and they came up short. As the saying goes, "fool me once ..."

Here, we have the opportunity to do something strictly for the benefit of the people that call Jackson home. To do so would set a meaningful precedent for the future of this community.

I hope you will consider the significant public opposition to the current plan.

--

Sam Pope
Producer/Director

KGB Productions

1155 Gregory Lane / PO Box 403
Jackson, WY 83001

P: 307.690.0300 E: pope@kgb-productions.com

From: katefield02@everyactioncustom.com
To: [Town Council](#)
Subject: Please renegotiate the Snow King leases & update the Master Plan
Date: Monday, August 06, 2018 5:56:49 PM

Dear Jackson Town Council,

Thank you for allowing public comments on the proposed amendment to the Snow King Base Master Plan, and for helping to ensure a balanced future for our Town Hill. This is our community's chance to come up with a whole new vision and plan for Snow King. Please renegotiate all the leases on Town land, and this Base Master Plan, so that they are fair deals and so our community gets at least as much benefit as we are giving away in development.

Thank you for your dedication to our community.

Sincerely,
Mary Field
1325 S Hwy 89 Apt 207 Jackson, WY 83001-8295
katefield02@yahoo.com

From: Mike May
To: [Steve Ashworth](#)
Cc: [Town Council](#)
Subject: Phil Baux park - Snow King proposal
Date: Tuesday, August 07, 2018 2:02:47 PM

Good day Steve,

I'm writing today to ring in on a hot topic in town of late, specifically Snow King resort's proposed take over of Phil Baux park. I cannot make Thursday's public meeting so I hope you will consider my comments here.

While I agree that the park is potentially a logical place to land a gondola I just want to make it clear, as you're well aware, that Phil Baux park is public property and great care should be taken to make sure that public land stays in public hands and/or Snow King needs to deliver fair value in return for the park if they want to take that land over for their private operation.

Logical place to land a gondola or not, Snow King has no right and zero entitlement to that land, and I hope as discussions are taking place this is in the forefront of our collective minds. I'll go ahead and say it, rumor on the street is that Snow King feels that the park is in the bag. We all know how rumors fly so I'll leave that there, but suffice to say that after seeing the stakeholder scenarios - all of which had the gondola landing on public land - I have great concern that Phil Baux is simply being assimilated into the proposal without any clear concession on what Snow King will be contributing in the deal. Beyond that, I've spoken to a number of stakeholders who went through that exercise and to say there was consensus that Phil Baux was on the table simply isn't true.

So again, I ask you to please safeguard our public land or get a proper exaction from the private entity looking to absorb our public park.

Thank you for your time.

Sincerely, Mike May

Jackson, Wyo.

From: lorna miller
To: [Pete Muldoon](#)
Subject: Snow King and the Gondola proposal
Date: Wednesday, August 08, 2018 11:52:22 AM

Dear Mayor Muldoon,

Before Director Ashworth of Parks and Rec comes before you with a recommendation regarding the Snow King proposal to construct the gondola building on Phil Baux Park, I would like to suggest that the *entire Town Council take a field trip out to Teton Village*.

Pay close attention to the gondola building and infrastructure there; listen to the machinery, etc, how far the sound actually carries, walk uphill towards the ropes course and then notice the gondola impacts as you come back down again. When seen from different angles, one can gain a real understanding of probable impacts. Then imagine what that will be like if placed on the Phil Baux Park.

I have no idea if the gondola entry to the building will require a similar excavation or not with a significant clearance beyond the building footprint being required for the lead in to the loading dock. This potential impact is not shown on the Snow King map presented to the public.

It would also be instructive to take the short walk over to the Village Commons and imagine what that park-like experience would be if the Gondola building was basically in the middle there, or even on the edge. The commons space is heavily used and provides a very pleasant user experience and safe kids play area.

The gondola will not be shut off to accommodate a public event where a quieter environment might be desirable. It will run in the evening too and that requires lighting and, of course, there will no doubt be the gondola version of "elevator music." Certainly the village gondola has that.....

I understand that, if not built on the park, the gondola will be built on Snow King property uphill, however I would suggest that the impacts while there, will be a lot less. They will be on *the edge* of public property and not centrally located on public property. And since a gondola will likely be there in any event the "access/gateway to the National Forest" will still be there too.

A field trip gives insights that are impossible to garner from a spoken presentation with maps. It all seems so innocuous until you see an actual structure and hear the operating machinery. The fact that the valley has a functioning gondola is a great opportunity for the realistic evaluation of potential impacts on the town park.

Sincerely,

Lorna Miller

From: Sam Petri
To: [Town Council](#); commissioners@tetoncountywy.gov
Subject: Snow King gondola concerns - Save Phil Baux Park!
Date: Wednesday, August 08, 2018 4:08:24 PM

Hello Town of Jackson Councilors and Teton County Commissioners,

I sent this email to Steve Ashworth at Parks and Rec ahead of tomorrow's meeting with Snow King. I thought I should also send it on to you all.

Thanks for your time reading my letter. I appreciate your time and consideration. Thanks!

Sam Petri

Hi Steve and the Parks and Rec advisory board,

Sam Petri here. I live on Pine Drive, near the base of Snow King, and am writing with my concerns regarding the proposed Snow King Gondola in Phil Baux Park. I would come to the meeting tomorrow, but I will be out of town. Below are my concerns for public record.

After reading your Staff Report on the Snow King Master Plan Amendment, I would first like to say that I was very pleased to see that I share with Parks and Rec staff that "The success and public compatibility of the plan rests in maintaining safe, free and accessible use of the public's property for the entire community for non-ski season."

I also share with you that landing a Zip Line of any kind in Phil Baux park is a bad idea - it commercializes the people's land with an amusement park ride.

However, I am very concerned with the idea of landing a gondola -- or a lift of any kind -- in Phil Baux Park, for a number of reasons. I am also concerned about the proposed amphitheater, as I have never seen that in any of the Snow King proposals so far.

While I do understand a gondola in Phil Baux Park was in every Snow King Stake Holder scenario, and that perhaps you are seeking a compromise with them, it has been well documented that the [stakeholders process was flawed](#), that [no one actually agreed](#) on all the scenarios, and that the public didn't get to comment properly. So, those scenarios don't necessarily represent the voice of the people who actually use Phil Baux Park - people with no backyards, people who live in cramped apartments, who use the park for birthday parties, and family gatherings. Please do not be pressured by Snow King's developers, who are billionaires seeking entitlements so they can increase its value and likely sell it. They literally seek to monetize the park - the people's land.

You say that. " ... for this to be successful, it is critical to maintain an open and clear east to west public connection through the entirety of the park."

I couldn't agree more! That's what we have now.

However, how will that be possible when there is a gondola, and gondola line in the middle of the park? The current Exhibition double chair services about 100 people an hour. The new 6 or 8 person gondola (the current owners of Snow King change it in their various proposals) will service about 1,200-1,400 people per hour in bright Snow King-blue Gondola eggs - about 100 of them.

Will you want to have your child play on the jungle gym, or host a birthday party in the Phil Baux pavilion while hundreds of people line up out of tour busses to load the noisy gondola (think of the hum the one at Teton Village makes) to ride the new noisy Zip line - the fastest in the country, at 70 mph? Or to get drunk at the top? Or to get drunk, and then ride the zip line to Snow King's private land, just uphill to the south? How is that safe?

How does this not commercialize the park? How does this not give the park over to Snow Kings owners - whoever that might be in the future?

The construction of a modest, small, Aerial Tram should be encouraged on the footprint of the current Exhibition lift, on Snow King's private property, as a reasonable alternative to assist with construction of an improved panorama house and provide better emergency access, and provide much-needed tram announcements/education to all year round guests.

Further, please consider the commercial entitlements around the entirety of Phil Baux Park, along Snow King Avenue, and Cache. Each one of those potential developments will bring more cars, more customers, and more pressure on Phil Baux Park. There is currently a new brew pub set to open right across the street from the proposed Gondola. Combine that with a proposed massive new panorama house made for summer weddings, burgers, fries, beer, a zip line and this no longer becomes a "western portal" but a "western wall" unwelcoming to the general public, unless they have money to pay for all the rides.

Which brings me to the amphitheater - I am not sure what that is, but if it's on public land just to the south of the gondola, I would want to make sure it doesn't undermine Jackson Hole Live, and our free access to public lands. Will Snow King hold its own concerts there? Will it be some kind of VIP area during Jackson Hole Live? How will it impact the skiing? How will it impact access up the hill, to the south in the summer? How will this proposed amphitheater relate to the gondola? It all seems to be taking place right in the center of Phil Baux Park impacting the permeability to the north, south, east, and west.

Please maintain the borders of Phil Baux Park, and don't let the owners of Snow King further encroach on our public lands. They don't share the same values as the people, they only seek to take public land as theirs to increase the value of their business venture and to help push through their proposal with the US Forest Service.

Thank you,



Sam Petri
307-690-7064

From: Vonde Smith
To: [Town Council](#)
Subject: Snow King
Date: Friday, August 17, 2018 3:41:43 PM

To Whom It May Concern:

I support moving plans for the Snow King gondola and further development of Snow King facilities forward.

Vonde Smith

Vonde M. Smith, PC

Of Counsel

Admitted in Wyoming

SMITH LC

Post Office Box 8729

Jackson, Wyoming 83002

tel: 307.201.6000 | fax: 307.201.6001

direct: 307.200.0030

email: vsmith@smith-lc.com

www.smith-lc.com

Physical Address:

15 South Jackson Street

Jackson, Wyoming 83001

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From: Jan Lovett
To: [Town Council](#)
Subject: Snow King Development
Date: Tuesday, August 21, 2018 10:46:34 PM

Town Officials-

Thank you so much for wrestling with the development of Snow King. While I am a huge supporter of the JH Ski Club, I have a huge concern with the development of Snow King, especially the loss of Phil Baux Park for our community. The owners of Snow King always seem to come to the citizens Jackson with hat in hand asking fo more, more more. I have tried to figure out what the residents of our town and county are getting in return for the loss of a beautiful town park, and I have not been able to figure it out. Snow King claims to be our town hill, but there needs to be more of a benefit to the town. Snow King is privately owned and is allowed to lease land from the Forest Service for its operations. That is a huge subsidy to the private business. When Teton Village was expanding their bike park, ropes course, trampolines, disc golf... they did not ask to be subsidized by the citizens of Teton County. I'm not sure why Snow King cannot make all these improvements. SK will reap the benefits of the ticket sales. How do they plan to share that with the people of Jackson?

I have lived in Jackson for over 40 years and have seen public agencies "give away" land to the Center for the Arts, fun Manuel's ice rink, and fund bus transportation for visitors when residents go without. I think it is time for elected officials to do what is best for citizens, not businesses and organizations.

Thanks you for listening.
Jan Lovett

From: Sam Petri
To: [Town Council](#); [County Commissioners](#); comments-intermtn-bridger-teton-jackson@fs.fed.us; [Snow King Engagement](#); environmental@jhnewsandguide.com; marymoore@fs.fed.us; poconnor@fs.fed.us; [Ben Graham](#)
Subject: Please extend comment period, host Snow King forum
Date: Tuesday, August 21, 2018 12:38:13 PM

Dear Mayor and Town Council, Teton County Commissioners, and Bridger-Teton National Forest officials,

Sam Petri here from Pine Drive in Jackson, Wyoming. If we haven't met yet, we certainly will in the coming months, as I am dedicated to protecting Snow King Mountain from the massive, out-of-line development currently proposed by an investment group on our public land. I strongly feel no other current proposed development could more fundamentally change the look and feel of Jackson Hole, as Snow King Mountain is the backdrop to our community.

First, I would like to thank Town Council for the discussion at Council Chambers on Monday, I thought it was productive, and it helped me to understand the decision making process moving forward. Thank you.

While I did not make a comment at the meeting -- I was there to listen and learn -- I am writing with some thoughts that were presented about the upcoming process.

Much of what you will read below is in line with what you may have already received from Shane Rothman. I truly hope that this letter doesn't dilute his or my comments, but instead, hope it shows my commitment to the process and how I want to make sure the public is aware of what is being proposed, and has ample time to comment properly.

Thanks for your consideration and your commitment to weighing the diverse perspectives regarding what is being proposed on our public land.

Please extend the comment period:

- The proposal is overwhelming and the comment period is short.
- PLEASE advocate for a longer comment period for the public in regards to the BTNF. This would not affect any other portion of this process, and a 60 day timeframe should be considered the standard for the public to review such a significant proposal.
- An October 4th closing of the comment period after 60 days would be much more suitable, and would still allow Council to review the updated public feedback, prior to submitting their own comments by October 15th.

Host Forum in a neutral location:

- A collaboration with the BTNF, as well as Wyoming Game and Fish, to host a "comments & questions" forum at the new BTNF Headquarters in town, would be a great way to bring the community together in this new space. I believe it is by far the most appropriate site, and would be the most effective way to encourage the public to assist the BTNF with the management of our public land.
- This should be scheduled towards the end of an extended comment period. Mid-Late

September would be most appropriate, and would allow for proper scheduling and notification. This meeting should be announced with at least 2-3 weeks of notice, and the Council should first ensure that all elected officials can attend on this important date.

-There are many aspects of this plan that require a Q&A discussion with BTNF officials to learn more. There are many directives from the USFS that must be adhered to, and I think the public/local government/media needs the opportunity to have an informational gathering, prior to the end of the comment period.

-It can be assumed that it would be most efficient for our BTNF officials to address everyone at once, rather than spending their limited time to address informational requests from individuals, local government officials, and local media outlets.

-I do not believe the Grandview Lodge is an appropriate location for this for many reasons. It is not a proper atmosphere for this gathering, and will likely be much costlier to taxpayers. The only future discussions that are appropriate at this venue should be SKRMA related(which the public is still unaware of any progress, yet it heavily pertains to these “inter-related” review processes...)

-If an arrangement cannot be made to host this forum at the BTNF Headquarters, other public venues such as the Library or Center for the Arts could be considered instead.

Other additional thoughts:

- Email address for SKengagement@jacksonwyo.gov is not working. Public comment may have been lost.

- Email address for BTNF comments was posted wrong during the beginning of the comment period.

- No area residents or previous commenters (that I know of) have received an official scoping document in the mail, which has been protocol for all previous projects. It is much preferable to have a tangible document to study and take notes on. I live on Pine Drive, about 100 yards from Snow King. In fact, I basically live ON Snow King Mountain. This development will directly effect my life. I am very surprised I never received anything in the mail.

-These plans are projecting far more significant and immediate impacts than those within the Resort District Master Plan. I would not expect the Council to properly review the RDMP within a mandatory 30-40 day period, and the Council and BTNF should not expect the public to be reviewing both of these plans simultaneously in only a 30-40 day period, either. There is an imperative need to allow for facilitated educated comments at this time, and there appears to be no reason why the comment period would not be able to be extended.

Thank you for your time and consideration, and I would greatly appreciate it if the suggested actions regarding this can be made, as soon as possible.

See you out there,

Sam Petri
Jackson, Wyoming
307-690-7064

Center Management Inc.

A Wyoming 501-c-3 non-profit Public Benefit Corporation

Comments on Snow King Master Plan Review and Phil Baux Park and Snow King Ball Park Redevelopment Master Plan Concepts

Mayor Muldoon and Jackson Town Council:

Center Management, Inc. (CMI) operates the Snow King Sports & Events Center (Center) for the Town of Jackson (Town). Built by the Town in 1992 with substantial donations by the skating community, the Center has been the centerpiece of the community's winter sports activity for many years. Our community also benefits from using the Town's Snow King Ball Park and Phil Baux Park for expanded recreational programs during our busy summers, including the JacksonHoleLive concert series produced by CMI.

The Town's priority should be the protection and enhancement of these areas for use by the many community beneficiaries:

- JH Ski & Snowboard Club
- Youth Hockey and Figure Skating programs
- Snow King Mountain summer and winter operations
- Jackson Hole Moose hockey
- JHLive Summer Concerts
- Recreation League hockey
- People's Market
- Hispanic family events
- Eco Fair
- Hill Climb
- Snow Cross
- Summer camps
- Uphill and downhill hikers and mountain Bikers
- Conferences such as Western Design
- Visitors and spectators

CMI was an active participant in the Stakeholder discussions and strongly supports the group's recommendations for:

- 1) **Expansion of the Town-owned Center to incorporate the growth in Ski Club and Skating programs**, possibly/likely as part of an exchange for the 5-acre parcel of land adjacent to the Center and/or as financial consideration in Snow King Mountain's (SKM) leasing of Town land for private use. The highest priorities are the Town's need to restructure the Lodge Room and Ski Club spaces into a mountain sports training center as well as the Town's and/or County's need to add a second sheet of ice to accommodate growth in skating programs.
- 2) **Locating the proposed Gondola close to Snow King Avenue** in order to 1) preserve uphill green space for skiing, large-scale community events and community access to public lands; 2) enhance ski club and mountain ops access to the Center; and 3) ensure maximum stage visibility for large scale concerts and events on the Ball Park.

Center Management Inc.

A Wyoming 501-c-3 non-profit Public Benefit Corporation

- 3) **Providing additional and more functional parking at the base and Center**, with primary access off Cache rather than Snow King Avenue, and suitable for staging Hill Climb ops, food trailers/trucks, farmer's market trucks, recreational access, etc.
- 4) **Relocation of SKM sales and F&B activities to the Gondola complex**, and SKM's mountain operation facilities for snow cats and other equipment to the rear of the Center.

We also encourage your further consideration of incorporating better facilities that support the Town's capacity to host large-scale community events, including:

- **A permanent stage complex at the Ball Park**, perhaps as part of the Gondola complex and modeled after Victor's modest Music on Main stage
- **A graded and grassed amphitheater area** that better connects the ski terrain to the Ball Park for an enhanced event experience, recreational access and stage visibility
- **More pavilions and restrooms in Phil Baux** and other public spaces for small group uses
- **Power, water and communications infrastructure** to support the community users above

The Ball Park and Phil Baux areas are uniquely-suited among all public spaces in Town for such events...please don't compromise them for narrower purposes.

As a practical matter, we appreciate that satisfying all parties' needs and interests will be challenging. In fact, some traditional uses of the base area for soccer, football, softball and other recreational sports may need to be shifted to other locations in the Town or County in favor of the community's uses above.

As the non-profit operator of the Town's major asset at Snow King—the Center—we urge the Council's sensitivity to protecting—and strengthening—the economic viability of the Center and its programs, including the popular JacksonHoleLive concerts. It's essential to use this opportunity to ensure that SKM's planned investments strongly support the Town's economic stake in these assets.

Respectfully,

CMI Board of Directors - John Valiante, Steve Sullivan, Jim Coleman

CMI Management - Bob Carruth, Jeff Potter

JacksonHoleLive – Shannon McCormick

Contact:

Bob Carruth – (307) 201-1633, Carruthx4@hotmail.com

Jeff Potter – (307) 201-1633 x3, jeff@cmijh.com

From: shane rothman
To: [Town Council](#); [County Commissioners](#); comments-intermttn-bridger-teton-jackson@fs.fed.us; [Snow King Engagement](#); environmental@jhnewsandguide.com; [Ben Graham](#); marymoore@fs.fed.us; poconnor@fs.fed.us
Subject: Host Snow King forum, extend comment period
Date: Tuesday, August 21, 2018 9:39:39 AM

Dear Mayor and Council (and BTNF officials),

Thank you all for the “reviewing” discussion at Council Chambers on Monday, it definitely helped to clarify the outline.

I am writing to reiterate some thoughts that were presented about the upcoming process, and here’s a few key points I’d like to stress further:

Extend Comment Period

-PLEASE advocate for a longer comment period for the public in regards to the BTNF. This would not affect any other portion of this process, and a 60 day timeframe should be considered the standard for the public to review such a significant proposal.

-An October 4th closing of the comment period after 60 days would be much more suitable, and would still allow Council to review the updated public feedback, prior to submitting their own comments by October 15th.

Host Forum:

-I would most appreciate a collaboration with the BTNF, as well as Wyoming Game and Fish, to host a “comments & questions” forum at the new BTNF Headquarters in town. I believe it is by far the most appropriate site, and would be the most effective way to encourage the public to assist the BTNF with the management of our public land.

-This should be scheduled towards the end of an extended comment period. Mid-Late September would be most appropriate, and would allow for proper scheduling and notification. This meeting should be announced with at least 2-3 weeks of notice, and the Council should first ensure that all elected officials can attend on this important date.

-There are many aspects of this plan that require a Q&A discussion with BTNF officials to learn more. There are many directives from the USFS that must be adhered to, and I think the public/local government/media needs the opportunity to have an informational gathering, prior to the end of the comment period.

-It can be assumed that it would be most efficient for our BTNF officials to address everyone at once, rather than spending their limited time to address informational requests from individuals, local government officials, and local media outlets.

-I do not believe the Grandview Lodge is an appropriate location for this for many reasons. It is not a proper atmosphere for this gathering, and will likely be much costlier to taxpayers. The only future discussions that are appropriate at this venue should be SKRMA related(which the public is still unaware of any progress, yet it heavily pertains to these “inter-related” review processes...)

-If an arrangement cannot be made to host this forum at the BTNF Headquarters, other public venues such as the Library or Center for the Arts could be considered instead.

Other additional thoughts:

- Email address for SKengagement@jacksonwyo.gov is not working. Public comment may have been lost.

- Email address for BTNF comments was posted wrong during the beginning of the comment period.

- No area residents or previous commenters (that I know of) have received an official scoping document in the mail, which has been protocol for all previous projects. It is much preferable to have a tangible document to study and take notes on.

-These plans are projecting far more significant and immediate impacts than those within the Resort District Master Plan. I would not expect the Council to properly review the RDMP within a mandatory 30-40 day period, and the Council and BTNF should not expect the public to be reviewing both of these plans simultaneously in only a 30-40 day period, either. There is an imperative need to allow for facilitated educated comments at this time, and there appears to be no reason why the comment period would not be able to be extended.

Thank you for your time and consideration, and I would greatly appreciate it if the suggested actions regarding this can be made, as soon as possible.

Sincerely,
Shane Rothman
Jackson WY

From: Ryan Stanley
To: [Town Council](#)
Subject: Fwd: Snow King Mountain Releases Revised Base Area Maps
Date: Tuesday, August 21, 2018 2:09:45 PM
Attachments: [image001.png](#)
[Park Concep A.pdf](#)
[Phil Baux Park Concept B.pdf](#)



FOR IMMEDIATE RELEASE

August 21, 2018

Snow King Mountain Releases Revised Base Area Maps

Community Feedback Leads to Two New Proposed Maps for Base Area

Jackson, Wyoming – Snow King Mountain Resort presented two additional draft base area maps to the Town of Jackson on Monday for submittal.

Both maps are grounded on a wide variety of community feedback Snow King Mountain received after the submittal of their Base Area Master Plan Amendment to the Town several weeks ago.

Keeping a parking lot for the People's Market, a kickball/baseball field, not having the gondola landing so close to Snow King Avenue and not interrupting the 'east to west' flow of the bottom of the field are just some of the comments Snow King heard from locals, user groups and the Parks & Rec Advisory Board.

"Community feedback continues to shape this process and we are listening to ideas and responses from locals and user groups," says Snow King Mountain General Manager Ryan Stanley. "We are presenting these revised maps based on Parks & Rec feedback as well as public comments. We will continue to listen and remain flexible in our proposal to the community and Town based on public comments."

Snow King Mountain will work to get the newly proposed maps out in front of as many locals and users of Phil Baux Park in order to gain feedback and hear comments. They will be hosting two "Coffee and Conversations" in the next several weeks for anyone who wants to learn about the new maps and provide feedback.

-End-

About Snow King Mountain Resort

Founded in 1939, Snow King Mountain Resort – just six blocks from Town Square in the heart of Jackson Hole – is Wyoming's first ski resort. Since locals first began to ski the "Town Hill" in the 1920's generations of Jackson locals and visitors have learned to ski on its iconic slopes via recreational skiing, racing, uphill skiing, and the full-service mountain sports school.

Snow King Mountain offers 3 lifts, 32 ski runs on 400 acres, 1571 vertical rise, two terrain parks, two

restaurants, and a full-service rental and ski tuning facility. For non-skiers and snowboarders, King Tubes snow tube park, the Cowboy Coaster, and the Summit Scenic Chairlift provide alternatives for every member of the family to enjoy the thrills of winter and take in the best view in town with amazing views of downtown Jackson and the Tetons.

Ryan Stanley
General Manager
Snow King Mountain Resort
ryan@snowkingmountain.com
Office: 307-201-5004



E Snow King Ave

S Cache St

RESTROOM

HORSE SHOE PITS

PICNIC SHELTER

- OPEN TURF -

PICNIC SHELTER

RANGER BOULDER

RESTROOM

Kickball

UPDATED PLAYGROUND

TETON BOULDER PARK

BLACKLINE

Bathroom

Tickets

GONDOLA LIFT

COUGAR CHAIR LIFT

Ski Club Expansion

SNOW KING ICE CENTER

2nd Sheet of Ice

- OPEN TURF -

Unobstructed Winter Zone

- OPEN TURF -

Winter Tubing (3) Lanes

Unobstructed Winter Zone

SNOWKING MOUNTAIN RESORT

Climbing Gym & Mountain Sports Training Center

ASPEN CEMETERY (Town of Jackson)

CCC'S TOWN HILL LOFTS, LLC

SNOW KING CENTER (Town of Jackson)

Snow King Base Area & Phil Baux Park
Concept Design A

S Cache St

E Snow King Ave

KM6, LLC

CCC'S TOWN HILL LOFTS, LLC

TUBE
LIFT

Tickets

Gondola

Ski Club &
Lodge Room
Expansion

SNOW KING
ICE CENTER

2nd Sheet of Ice

Mountain
Sports
Training
Facility

ASPEN CEMETERY
(Town of Jackson)

SNOW KING CENTER
(Town of Jackson)

Snow King Base Area
And Phil Baux Park
Concept Design B



From: John Tozzi
To: [Town Council](#); [Tyler Sinclair](#)
Subject: Support for Snow King Phase 2
Date: Tuesday, August 21, 2018 9:29:09 AM

Dear Tyler and Elected Officials,

As a long time resident of Jackson Hole, I would like to express my support for Phase 2 of Snow King Mountain. As a family of five, we have been involved with Jackson Hole Ski and Snowboard Club and supporters of Snow King Mountain for over 15 years, and would like to continue to see infrastructure improve to support ALL of Jackson. For safety and efficiency, it only makes sense to allow Snow King to continue to update and improve their aging infrastructure. Anything else is a disservice to this community. Snow King Mountain, in combination with the Ski Club, provides a truly World Class training venue for our local kids, and there is so much more potential at our Town Hill.

I see the measured growth of Snow King as a benefit, not a burden, and without a doubt it would improve all aspects of Snow King for our community and families, recreation, JHSC, and tourism.

Thank you for your consideration and hearing from community members who recognize and are grateful for the extreme benefit of Snow King, its amenities, and preserving the long standing relationship and world class training facility for our young athletes.

Best regards,
Johnny Tozzi

From: susan divjak
To: [Town Council](#)
Subject: Town Hill Proposed Development
Date: Sunday, August 26, 2018 2:18:07 PM

We are 16 year residents of Jackson, now retired. We have seen many changes during that time, and are concerned about this proposed development. We have become a small town with big city traffic. Rumors abound that Gaslight Alley will become a luxury hotel, businesses on Broadway will be cleared for a Ritz Carlton Hotel. Do we need more \$500 a night hotel rooms, condos that locals cant afford, or Disney like attractions on our Town Hill. I dont think so!!

Tourists come for wildlife, views, mountains, clean air, western vibes. We can lose our town soul to commercialism - growth is good. But lets make sure it is going in the right direction.

With respect, Susan Divjak

From: shane rothman
To: marymoore@fs.fed.us; poconnor@fs.fed.us; [County Commissioners](#); [Town Council](#); [Snow King Engagement; Steve Ashworth](#); environmental@jhnewsandguide.com
Subject: Comment period, ziplines, PB Park, road, expansion, etc
Date: Sunday, August 26, 2018 10:32:01 AM

Hello Mayor and Council, County Commissioners, and BTNF decision makers,

Please advocate for an extension to the comment period. There is way too much to address, there is too much going on, discussions are still evolving, and SK continues to state that they are still considering more changes to the plans.

I do not have the time to write detailed reasons for each aspect, propose suitable preferred alternatives, or even dig into my hard drives(I am seeking help from someone more computer literate)to share about 10,000 images of wildlife, or “POV” snowboard runs that capture wildlife encounters, popular wintering locations (such as exactly where the Eastern switchback and trails would be), large avalanches, poor snowpack depth and conditions, and much more. I am literally begging for an extension to allow for proper time to present this undeniable proof, and I would consider both myself and cooperating entities as negligent if this cannot be achieved.

Here is a post that I just wrote concerning the ziplines, road, and expansion. Please excuse my frustrated tone, but I do not have the time to rewrite this for each audience.

The following was written on 8/26/2018:

Let’s talk about the zipline one last time before we go any further down the “expansion road”...

Don’t let the 70mph zipline proposal distract you from this bigger picture. The “Screeching Eagle” (they’d totally name it that) would be the biggest joke in town, and it’s not gonna happen.

In the event of an unlikely zipline approval, the annoyance wouldn’t be permanent whatsoever, especially if someone gets maimed or possibly killed. Don’t worry about them building it anymore, and focus on the permanent intrusions.

It definitely won’t be going anywhere on or near Phil Baux Park, or even down the face of the King, unless the King is run by complete jerks, but Jeff Golightly will come through as “the nice guy” who has to politely tell Max Chapman to tell his Vice President/GM Ryan Stanley that maybe it’s not such a “first-class” or “world-class” addition after all.

It’s apparent that this is “still a thing”, but Ryan Stanley will have to back off of it soon, and make the public well aware that he’s made another “concession” resulting from the “community feedback”. It’s totally foreseeable, and don’t waste your time thinking otherwise.

It will likely end up allowed on Stanleyland(don’t call it Rafferty), over at the other ziplines, but there’s no way that SKMR LLC would be dumb enough to put that thing on their own 25 acres of private property below the lift’s midstation. What if the seat belt thing came loose???(Happened at Targhee many years ago, still no ziplines there)... Max Chapman would then instead “infuse his group’s capital” for more ziplines on public land in the heavily disturbed and transformed “world class” area that already has miles worth of cables and a powerline’s worth of utility poles scattered everywhere too. Then they can charge over \$100 bucks for the ropes course instead of \$75 or whatever. That is totally foreseeable also.

Case closed... Unless Max & Co just simply balk at the whole investment in the first place. That’s what Max politely threatened to do if Mark Barron & Council didn’t give them immediate and unfair approval for the entire Cowboy Coaster package deal on 11/17/2014, (less than a year after electeds, donors and taxpayers were conned into paying for the fancy mismanaged snowmaking system). Only Stanford saw right through everything, and called it a gimmick, knowing there was nothing minor about their “minor development plan”. The other Councilors(same Council since then) totally fell for the pressure, and barely even asked a question or made comments. They didn’t

even discuss the operating hours after being told 50 times from SK about how “quiet” coasters are. Employee housing was never monitored for compliance, and it really wasn’t even a thought until about 6 months later when hordes of temporary construction workers came to bulldoze Rafferty’s area to construct the poorly designed and planned permanent infrastructure. The housing issue coincidentally became an “emergency” during Phase 1, and community morale has been down since. And SK still claims they don’t make enough money, but now they throw in the keywords “in winter”, as if Stanleyland wasn’t intended to fund winter operations. That has been a totally foreseeable strategy since the approval of Phase 1, and you’d be naive to think that a capital management firm wouldn’t be thinking of an “exit strategy” whether anything gets approved or not.

SKMR LLC keeps pushing their heavily overpriced ski tickets as “community benefits”, but the TOJ electeds will make them build some housing before anything moves forward prior to any “groundbreaking” additions. You should have very high confidence about this, but you never know what an elected official might do towards the end of their term.

Enough of the distracting tangents!
Here’s the real issue:

Does anyone here really think the BTNF could approve the new road? It’d be really bad if they did...
Send a quick comment concerning the road to the BTNF to help relocate this idea into the garbage can.

There’s an endless amount of work that could be done inbounds, which has never come close to its potential. The current road has also needed work for many years, yet their poop pumping truck makes frequent visits to the top for the “emergency access” without any poop-spill headlines, like over at Max’s other well known property. They only need a road for cement trucks and to monopolize radio tower access, and they are totally just using gullible “beginner skiers” as their excuse to compromise their best inbounds terrain and unique backcountry experience.

How are they even serious about expansion and a road when they haven’t maintained any terrain or even scratched the surface of their potential inbounds?

Cmon Jackson, and cmon Snow King, why does everything have to be so difficult, complex and controversial? It doesn’t have to be this way, but the future outlook remains grim under private ownership.

...Thank you for your time and consideration, and please excuse my attitude for being quite frank about this whole situation. I have done my due diligence, and listened to the community, as well as our wildlife.

Shane Rothman
Jackson WY

From: tristan droppert@everyactioncustom.com
To: [Town Council](#)
Subject: Please renegotiate the Snow King leases & update the Master Plan
Date: Monday, August 27, 2018 11:19:19 AM

Dear Jackson Town Council,

I wish to comment on the Snow Kind expansion,

I will be brief. I think it is critical that we do not allow our park to be bisected, we have such little open park space within the downtown envelope we cannot sacrifice this critical community space to a gondola.

The back bowl skiing is ok in my opinion, and expansion in that direction would have minimal impact on town. The bike trails could be of great benefit as well with minimal impact to town and nearby residents. But the zipline needs to be researched and reported on more. It seems like they are trying to create a "six flags in the woods" environment which is not a value ad to Jackson, we already have so many opportunities for tourism and adventure without more man-made attractions.

I also believe the building of an 18 ft wide road is both excessive and unnecessary when there is already a road on the West side that can be negotiated and refurbished.

For many reasons we should be very careful in considering expanding the resorts boundaries into wildlife or NF land.

Thank you for your consideration.

Sincerely,
tristan droppert
4303 PO Jackson, WY 83001
tristandroppert@gmail.com

From: Sam Petri
To: comments-intermtn-bridger-teton-jackson@fs.fed.us; [Snow King Engagement](#); [Town Council](#); [County Commissioners](#)
Subject: Snow King Mountain Resort On-mountain Improvements
Date: Monday, August 27, 2018 12:36:13 PM

Dear Bridger-Teton National Forest officials,

Thank you for your service to our shared public land.

I am writing because I am very concerned about the proposed Snow King Mountain Resort On-Mountain Improvements, which I believe have massive environmental impacts, social impacts to our community, and in many cases, flies in the face of the 2012 Teton County Comprehensive Plan.

I've been following along as closely as I can, meeting with people in our community, writing letters to the editor in the local newspaper, and reading everything I can about what I believe is one of the most impactful developments proposed in Jackson Hole.

I'd like to preface all of this by saying how much I love Snow King Mountain. I truly hope it can succeed for another 80 years and beyond. I own a house and live right next to it, and I much rather live next to a vibrant ski hill, than a ghost town. When I first heard that investors wanted to inject ~\$20 million into the hill, I was excited, as I know first hand how much Snow King desperately needs capital improvements.

But this isn't about the viability of the ski area, it's about what we, as a community, feel is appropriate use of our public land.

I do believe almost every development in this current proposal is far too big for such a small ski area. The current "owners" (what do they really own? some old lifts? The majority of the land it's operating on is public.) are asking for too much, with seemingly no regard for the environment, or our community or our shared public land. It is with a heavy heart that I am in such opposition. I wish current "ownership" would listen to the community and be better stewards of Wyoming's first ski hill, one of the oldest in the country. But time and time again they continue to try to force through this outrageous proposal, which is so inappropriate given the type of hill Snow King is. So here I am, making comment. What else can I do? And when will these people take "No" for an answer? Seems like never!

Below are 10 aspects that I believe should not be considered due to protocol, previous decisions, impacts to wildlife, setting a poor precedent, and much more. I've provided alternatives where I can.

Thanks again for your commitment to our public lands and our community.

1. The new road:

- This requires expansion into sensitive year-round wildlife habitat
- Requires steep road cuts, compromises every signature ski trail with steep and dangerous intersections(Elk, Grizzly, Belly Roll, Exhibition, Bearcat).

- Requires major increase in avalanche mitigation along ridgeline and through steep forest, will create new starting zones for destructive wet avalanches below the road.
- Will require snowmaking pipes along route, pipes/hydrants could leak and contribute to major erosion or landslide (no pipes were allowed to be laid horizontal during the 2014 snowmaking project)
- Should require a bond of over \$20M to cover potential landslides and erosion issues, and a potential threat to private property on the lower slopes
- Encourages beginners and intermediates to explore dangerous forests known for marginal base depths and extremely variable snow conditions, and typically subpar average base depths below the Cougar Lift top terminal elevation(7095', the typical rain/snow line). Snow depth and conditions on the upper half of SKM typically deteriorate fast on the descent due to frequent fluctuations in the rain level. People without local knowledge will be lured into dangerous areas and a rapidly fading snowpack, especially from the road's location on the upper West Side of the ski area. This is a major liability issue especially for a "struggling" ski area. All terrain outside SK's current footprint should remain only accessible through backcountry gates.
- This road is being excessively designed to cater to cement trucks, not recreation.
- This road appears to be more about controlling exclusive access to cell towers, not for beginner skiers.
- A new lift will provide faster and safer "emergency access" than riding up or down in a vehicle. Fire suppression equipment should be permanently placed at the Summit, and the infrastructure to do so has been in place since 2014.
- A small tram (10 to 20 person tram car) should be considered the most ideal lift for the needs of this mountain, and would significantly reduce the need for ATV vehicle trips up the mountain both during construction and after. Current ATV traffic is already a burden on the public users, neighbors, and wildlife
- This road will be a mile wide scar (eyesore) on a historic ski hill, which serves as the famous backdrop of Jackson. This compromises the historic integrity. A recent historic evaluation required for "Phase 1" found that many structures weren't worth preserving, but the unchanged view of Snow King Mountain would be eligible to be registered as a historical landmark.
- Most portions of the existing road were built by the CCC in the 1930's, and should definitely be eligible for historic designation at WY's first ski area.
- The existing road would still be necessary to access the top of Elk and Grizzly from the Summit Lift, and to traverse East towards Rafferty from the top of the Cougar Lift. Having two separate roads within close proximity will totally compromise safe, fun skiing, and the potential for race events on Elk and Grizzly.

Alternative: Due to the challenges of constructing and maintaining this route, the preferred alternative route should be to use the existing backside road, and trying to

improve the current road.

2. East/West Expansion:

- 1. Our 2012 Comprehensive Plan gives very specific direction: in order to protect and preserve our area's ecosystem, "existing Planned Resorts should be limited to their existing footprint" (Policy 3.1.d). Therefore, the Forest Service should not allow new development, roads, or chairlifts outside the existing operating footprint. Instead, they should encourage Snow King to improve terrain and amenities only within their existing footprint.

-These areas have been historically used by wintering wildlife, especially Mule Deer and Elk, and must remain in a natural state without the use of machinery.

-Increased human recreation alone will need to be managed carefully in the future to ensure proper etiquette is used.

-No other ski areas can compare to the wildlife present on these slopes. Perhaps Sleeping Giant in Cody could compare, but it is highly unlikely that they would propose major developments and an expansion, despite previous struggles to maintain "viability".

-Backcountry skiing is a large and growing segment of users, and SKM will still benefit from this trend, while avoiding liability.

-The Public is fortunate enough to be able to recreate in these areas that share the same characteristics of nearby winter closure areas such as Josie's Ridge and Crystal Butte. The SK "backcountry" should serve as an educational experience, in balance with nature.

3. Lifts B and C, Ski School Headquarters:

-These beginner areas will require mass grading, and the removal of a mature aspen stand as well as sagebrush, in an important area for migrating and wintering wildlife. Currently there is no reasonable pitch on this Ridge to provide a good location for this, and this area would be altered significantly. Last year, SKM allegedly received approval to unnecessarily mow down acres of Sagebrush habitat for the 2 hour long solar eclipse event, including acreage outside their SUP boundary, with no public process. Many people were upset by this, which is minuscule in comparison to their plans.

-Placing first-time beginners and a ski school headquarters at the top of the mountain is a very poor idea due to the fact that most days up there are not sunny, and typically feature exposure to wind and blowing snow. There is very little precedent(if any) for a ski area to place beginners on an exposed ridge, and this could lead to future accidents at the "steepest ski area" in North America.

-Beginners will likely be forced to pay full price for a lift ticket to access this area, which will eliminate the \$10 ticket that has enabled so many users to learn. It will not be nearly as affordable, and many beginners will be hesitant to believe that they can learn to ski up there, especially if it isn't perfectly sunny. Operating lifts/carpets in this area would surely not make any revenue on all days with slightly inclement weather, and hurt long term viability and

affordability of the ski area.

-Many of these users might even flee the Summit due to incoming weather before they acquire the necessary skill level, leading to the potential for major accidents(sliding off this trail would have severe consequences for a beginner, and would likely require a technical rescue to get the injured person back up to the road for an evacuation).

-Other reasonable alternatives exist for beginners, such as:

1. Improving the Rafferty Area for such use, as it was always intended to be(SK has compromised their historic beginner terrain by building condos and a mountain coaster, but there is still potential).

2. The “Turnpike” trail also possesses the perfect grade for a learning area, and there are existing plans that would be easily approved and fully supported by the public.

3. Another ideal location for the typical perfect “bunny hill” slope lies on the vacant land behind the Snow King Resort Hotel, which receives more sun than anywhere on the frontside, and is located adjacent to existing parking and service amenities. Ownership of the Hotel should consider working with SKMR to use this terrain to generate shared revenue instead of building a costly hotel expansion.

4. The “ski school” headquarters should remain in the new Rafferty building at the base to reduce impacts to the Summit, encourage use of Rafferty, and provide a welcoming introduction, especially for days with inclement weather.

4. The top-to-bottom zipline:

-This unprecedented thrill ride has no place on our public lands, especially in this location.

-This is against USFS policy and will set an extremely poor precedent for all future development. No current ziplines in the USA can compare to the speed (70 mph) and length (~1,600 feet of vertical drop). There is no educational value, is not “in harmony with nature”, and does not complement the surrounding environment. Most people would never want to hike/recreate(the dominant historical user group) anywhere near a contraption like this, or live near it, or get married next to it.

-A dangerous liability that would result in certain death if anything were to happen. Snow King would be marred forever by the horror story.

-Constant noise. Snow King is already far too noisy, all noise-generating activities should remain strictly confined to their already-impacted private lands on Rafferty. Currently our “Cowboy Coaster” operates above noise-compliance levels, and stays open until 9pm during peak summer, despite the business application stating 8pm would be the closing time. I foresee that most of the ridership would consist of inebriated tourists leaving the summit restaurant, and I would not trust a SK employee to perform sobriety tests.

-Jackson residents despise this idea, and definitely don’t want this controversial scream machine/eyesore/distraction inside Phil Baux Park. A petition to stop this, negative

publicity/media coverage, and a potential lawsuit are foreseeable results of this proposal. This will also waste time for our local government during this decision making process, while they have far more important things to be working on.

-This is also not suitable to place near a wedding venue, cemetery, public park, or even the brand new luxury lofts at the base.

Alternative: A more suitable location for this activity would be Las Vegas NV, Orlando FL, Atlantic City NJ, etc...

4. The Summit Restaurant Building:

-This is an excessively large building, especially for a ski area that does not experience enough skier visits to justify.

-This will contradict protocol due to the fact that it does not focus on recreational users. It's simply a sneaky way to build a fancy restaurant on our public land.

-The proposed location will be a prominent eyesore on the mountain, require too much tree removal, generate too much light pollution, and could be subject to a failing foundation. This will block out precious sun rays during winter for Town residents as well. There is no suitable setback location on the narrow ridge to help conceal. This will also have unknown effects to the snowpack surrounding the building, and will definitely cause heavy drifting in certain areas.

-This area will surely become attractive to bears and other scavenging wildlife. I do not trust tourists or SKMR LLC to practice proper food storage etiquette, especially since they have not installed bearproof containers anywhere on their property, and have become notorious for leaving full garbage cans outside throughout the base area and at the Rafferty mid-mountain station. Previous complaints have never been addressed properly, despite the simple obvious solution. The presence of bears frequenting the Summit would likely help generate revenue and provide media exposure, and ownership could view this as a bonus attraction. I would never trust SK employees to haze our wildlife away from this site in an ethical manner.

Alternative: A suitable alternative is to allow improvements/expand/retrofit the existing Panorama House, and make it a historical landmark. This was the original plan when the snowmaking/infrastructure upgrades were approved in 2013/2014. This site is hidden from Jackson's skyline.

5. The Gondola:

-An 8 person lift capable of transporting 1200-2400 people per hour is complete overkill. Current hourly numbers on the Summit Lift during ski season average far less than 100 per hour during 95% of the winter (from years of personal observation). Snow quality will be greatly diminished and become even icier due to increased traffic.

-The carrying capacity of the Summit should not exceed over 150 people at any given time.

-Their official color, bright blue(almost neon) should be discouraged on public lands, and all infrastructure should use the color green to blend in with surroundings.

-A heated, enclosed gondola storage facility is a waste of resources and their precious, limited skiable terrain.

-There is insufficient space for a detachable lift's terminal on the Summit Ridgeline

Alternative: The construction of a modest (10 to 20 person) Aerial Tram should be encouraged as a reasonable alternative to assist with construction and provide better emergency access, and provide the much-needed "tram announcements/education" to all year round guests. While I know this sounds like a larger lift, because locally our mind all jumps to the tram in Teton Village, I believe a small tram would have less visual impact on the mountain - fewer towers, more energy efficient, fewer cars, and only needs to run when needed. I have ridden small trams in Europe and know they exist and feel like it could work for Snow King.

6. Expanded snowmaking coverage:

-The proposed snowmaking expansion is complete overkill, and will not assist SK to provide a sustainable future, and instead will only add to their costly winters

-Should never be allowed outside of current footprint due to the presence of wintering wildlife

-The only places that should require snowmaking are the top of Rafferty Lift(should have been part of Phase 1, but was likely not eligible with the usage of "Categorical Exclusion"), Exhibition, and perhaps allow snowmaking from nearby hydrants for a small area on "Lift D" (if that receives approval).

- The plume of snow of all those snow guns would completely cloud the entire town.

7. Clearcutting new Ski Trails:

-Should not be allowed outside of current footprint due to the presence of year round wildlife

-"Trail 3" is by far the worst concept within their current boundary. This is the steepest gradient on SKM, contains numerous cliffs, and anywhere could serve as an avalanche starting zone. The Rafferty Lift is placed in a known runout zone. Cutting this trail will endanger the public and will require dangerous avalanche control techniques. Skier compaction will not guarantee safety due to the historically variable snowpack and constantly changing conditions. An avalanche could be triggered anywhere on this steep gradient, far outside the traditional loaded starting zones. When conditions are hardpacked or icy, this trail will be a "slide-for-life" and an extreme liability for ownership.

Alternative: Inside the footprint, very narrow ski trails and glading (selective thinning) are suitable proposals that would add character and drastically improve expert terrain. Careful considerations must be given to protect from erosion. The canopy must remain intact to prevent increased fire danger.

8. “Lift A” on the backside:

-This Lift is impossible due to the close proximity to radio towers(no trespassing signs surround a large radius), in a wind-prone, south facing area with a typically unskiable snowpack.

-A chairlift would blow like a kite on many days. Frequent closures can be expected, which would strand users lower down in the drainage.

-It provides easy access to dangerous terrain(with wildlife present)off the Radio Tower Summit. This area should remain accessible only by hiking. It also provides easy access to remote drainages that do not feed back to the ski area.

-This area has already been denied a Yurt and cross-country skiing

-The “Bike Park” is an insult to the studies and protocol that were created when Skyline Trail was built. There would be no way to ensure that these users would not be poaching our trail system. The Bike Park would be hot and dusty, and a challenge to maintain properly. Emergency access to rescue injured riders would pose a serious challenge, and would not be quick. Any trail built on the upper half of the frontside would even be a challenge for experts due to exposure and very tight switchbacks. This would further encourage poaching an epic ride towards Game Creek, Skyline, Ferrins, Wilson Canyon, etc.

-Private property owners at the bottom of Leeks Canyon will likely have concerns about trespassing, increased runoff from snowmaking, providing construction/emergency search and rescue access, and more.

Alternative: A reasonable, sustainable, and more-supported alternative would be a much shorter surface lift such as a T-bar (bottom and top need to be shortened) with no snowmaking, grading, or clearcutting. This lift would operate as conditions allow, and if no wildlife is present. Current roads would be used to facilitate construction of terminals, and serve as the return trail to the "Saddle". This area's natural state would serve as an intermediate's introduction to off piste and backcountry skiing.

9.. Affordability:

-These plans definitely foreshadow a significant increase in ticket prices to cover the capital being spent. It will likely take decades for investors to see a return on their investment, if ever(selling the ski area appears to be their best option). This will likely alienate a major portion of SKM's intend target market: locals in search of affordable lift accessed skiing.

10. These plans contradict our current community priorities:

-I understand that the USFS supports job creation, but special consideration is needed for Teton County within the BTNF District, where every business has been struggling more and more to find employees. Our service industry can't keep up with our current demand, and the wages are not fair enough to reside locally. At the very least, Snow King should complete a significant employee housing facility before any new jobs are created, and before any

significant construction projects begin. Local residents have made workforce housing requirements our top priority ever since the effects of “Phase 1” began in Spring of 2015. **Snow King Mountain currently has no designated housing for their employees**, and has an invisible track record except for in 2017 when they violated the municipal code for housing/“stacking” 14-20 employees in one modest house in a quiet neighborhood. It can be assumed that they have been taking advantage of their seasonal employees and the leniency of local government for many years. It appears that There has been a historical lack of compliance to their 2000 Resort District Master Plan.

Regarding the proposed Snow King expansions, I ask that you please analyze the impacts from all projected uses, and require that Snow King commit in legally-binding documents to fully mitigate all impacts before getting approval to build any new projects. Please analyze these and similar key questions:

- How many skier days does Snow King host today – and how many will it host after boundary, trail, and lift expansion?
- How many people ride the Summit lift now and how many people do they expect to ride the new gondola – in winter, and in summer?
- How many people do they expect to ride the zipline, every day, and total?
- How many employees does Snow King have now – vs. after building all these projects?
- How much parking does Snow King use now – vs. after building these projects?
- How many new parking spots will this development require, and where will they put those spots?
- How much more impact will there be on utilities – water, sewer, garbage, etc?

Thank you for your time and consideration,

Sam Petri
P.O. Box 4775
Jackson, Wyoming 83001

From: lynne becker
To: [Town Council](#)
Subject: Zipline
Date: Wednesday, August 29, 2018 11:14:38 AM

When I am sitting in my backyard relaxing and dreaming
Do I want to hear people coming down a zip line yelling and screaming?

Just a little rhyme to let you know I am vehemently opposed to a zip line on
Snow King Mountain.

Thank you for your consideration.

Lynne Becker
45 year resident.

From: wyoforever@everyactioncustom.com
To: [Town Council](#)
Subject: Snow King
Date: Tuesday, August 28, 2018 11:17:44 AM

Dear Jackson Town Council,

Hello,

Thank you for allowing public comments on the proposed amendment to the Snow King Base Master Plan, and for helping to ensure a balanced future for our Town Hill. This is our community's chance to come up with a whole new vision and plan for Snow King. Please renegotiate all the leases on Town land, and this Base Master Plan, so that they are fair deals and so our community gets at least as much benefit as we are giving away in development.

Specifically, I ask you consider these items:

... Amend the base masterplan to change it from things we don't want (convention center, 1100 more hotel rooms or 550 more condos), to things we do want (affordable housing, another ice rink, climbing gym, ski club facility), to create a balanced future for our community.

... Fair market leases for the other Town land they lease – or subsidies if locals get free uphill or affordable year-round access. Don't give away of Phil Baux Park / the ballpark! Please negotiate a fair trade of equally-valued land in exchange for Phil Baux park.

... Please ask the Forest Service to analyze the impacts from all projected uses (ziplines, gondola, restaurant, skiing, etc); and require SK agree to fully mitigate all impacts on-site (housing, traffic, parking) before getting approval to build any new projects.

Thank you for your dedication to our community.

Sincerely,
Rose Caiazzo
PO Box 4342 Jackson, WY 83001-4342
wyoforever@gmail.com

From: Skye Schell
To: [Town Council](#)
Cc: [Tyler Sinclair](#)
Subject: Ideas to set up the Town's Snow King process for the best outcome
Date: Wednesday, August 29, 2018 2:54:16 PM
Attachments: [Town Council SK Process Comments - Alliance.pdf](#)

Dear Mayor Muldoon & Councilors, and Planning Director Sinclair,

Please see my attached comments regarding your process for making decisions regarding Snow King.

We believe that it is critical that our community be able to make decisions about the future of Snow King in a holistic and comprehensive manner. Decisions about the base area private lands ("Town Master Plan"), base and ski area Town lands ("Lease agreements") and Forest Service lands ("FS Master Plan") should all proceed in tandem. Please do not make weighty decisions regarding Snow King development on Town and private land until you and our whole community can see how those decisions fit in with negotiations regarding development on Forest Service lands.

In our attached letter, I attempt to explain why Town and Forest decisions are so inextricably linked that you should carefully consider them in tandem. I hope these comments are helpful as you discuss your process next week. Please be in touch if I can explain anything further.

Sincerely,
Skye

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Skye Schell
Executive Director
Jackson Hole Conservation Alliance

office (307) 733-9417 x1
www.jhalliance.org
fb [JHConservationAlliance](#)

Help Build [Safe Wildlife Crossings for JH!](#)

*Save the date: August 29:
[Alliance Summer Block Party feat. Wildlife Crossings](#)*

[Support our mission. Give through Old Bill's Fun Run!](#)

August 29, 2018



Town Council & Mayor
Jackson, WY

Dear Mayor Muldoon and Councilors:

Thank you for the opportunity to comment regarding your upcoming Snow King process. We believe Jackson Hole can be a national model of a strong community living in balance with nature, and Snow King can be the greatest example of this balance: a ski hill built on our community values of protecting wildlife and providing access to nature on our public lands.

Following up on your August 20 discussion, we would like to propose a process / timeline alternative that we believe will result in a better process and outcome for our whole community.

We believe that it is critical that our community be able to make decisions about the future of Snow King in a holistic and comprehensive manner. Decisions about the base area private lands ("Town Master Plan"), base and ski area Town lands ("Lease agreements") and Forest Service lands ("FS Master Plan") should all proceed in tandem. *Please do not make weighty decisions regarding Snow King development on Town and private land until you and our whole community can see how those decisions fit in with negotiations regarding development on Forest Service lands.*

Town and Forest Service decisions are inextricably intertwined

In 2000, our Town made a deal with Snow King to allow dramatically more commercial and lodging development at the base in exchange for that development serving as the "financial and operational platform" for the ski area¹. That latent development equates to 550 new condos or 1100 new hotel rooms. Nearby condos are currently selling for \$1.5-2 million, so 550 condos means \$800 million to a billion dollars of condo revenue. A small portion of that revenue is supposed to – and easily could – support the winter skiing operations.

Unfortunately, the new investor group wants to remove their responsibilities from that deal with the Town, and instead set up a new deal with the Forest Service where on-mountain amusements like a zipline service as the financial platform for skiing. However, they want to keep the 500,000 sf of commercial development they received from the Town in 2000. We believe that the investors need to decide whether to have their cake or eat it... but not both. Either they follow through with the 2000 master plan deal and use development revenue to support the ski hill, or we should undo the deal (and remove the massive future commercial development potential) and they can use new zipline revenues to support the ski hill.

	Town: Base master plan	USFS: On-mountain
Option 1: stick with deal	Follow through with 2000 deal: use revenues from the base to support ski area, keep 500,000 sf of latent development	Don't need to build new amusements to generate revenue, since revenue comes from base
Option 2: new deal	Undo 2000 deal: don't use base revenues to support ski area – and remove 500,000 sf of latent hotel/condo/commercial development	Build new amusements to generate on-mountain revenue to support ski area, since no revenue from base

This is a weighty discussion that deserves your full attention. Most important for now: please don't pre-determine the outcome by making a unilateral Town decision on the left-hand column without being able to negotiate the right-hand (Forest Service) column too.

Similarly, re-negotiating Town lease agreements for Phil Baux Park, the almost 30 acres of ski area the Town owns, the ice rink, etc, should be done in tandem with decisions about allowing ziplines, new lifts, etc – not prematurely in advance of those decisions.

Either way, the only way we can fairly and holistically have this conversation is to hold off on making Town decisions about the base master plan until we are able to negotiate a full package with Snow King's investors (development on private *and* Town *and* Forest land). And we can't do that until the Forest Service reaches the next step of their process.

The Forest Service will release their full Draft Environmental Impact Statement in February 2019. Even if they release portions ahead of time, we won't have full certainty about its contents until February. **Therefore, we suggest that you start public hearings in October, but wait to hold actual Town decision-making meetings until the Draft EIS comes out in February 2019.**

Here is a proposed alternative calendar to create a comprehensive process:

	Aug 18	Sep 18	Oct 18	Nov 18	Dec 18	Jan 19	Feb 19	Mar 19	Apr 19	May 19	Jun 19
Town Master Plan	Staff review	PC Rec	TC public hearings				Joint hearings, TC review	Applicant revisions	3 readings		
FS Master Plan (EIS)							* Draft EIS *				* Final EIS *
Lease Agreements							Drafting of agreements		Signing of agreements		

Please schedule your decisions so that these three processes can truly move holistically and comprehensively, so that our community can best negotiate a great outcome for our Town Hill.

Please let me know if we can be of assistance.

Sincerely,



Skye Schell
Executive Director
Jackson Hole Conservation Alliance

ⁱ *Snow King Planned Resort District Master Plan [2000]*, page 172-173. Referenced in <https://jhalliance.org/2018/04/17/whats-deal-skrma/>

From: [Geneva Chong](#)
To: [Larry Pardee](#); [Town Council](#); [Tyler Sinclair](#); [County Commissioners](#); info@snowkingmountain.com
Subject: Idea for Snow King process communication
Date: Friday, August 31, 2018 1:54:22 PM

Good afternoon,

I had the pleasure of meeting my son's 4th grade teacher today, and we talked about Snow King (classroom view attached). As we admired it we talked about the current and potential value for kids and families as a focal point of our community. He is concerned that it is in danger of going away.

Please, it would be wonderful if Snow King and TOJ would issue a joint statement that operations will continue as they have, and the planning process is to determine how things will change in the future. I feel it is unnecessary and damaging for the conversation and process if people feel threatened and uncertain.

Please contact me with any questions.

Thank you for your work and have a wonderful Labor Day weekend.

Geneva Chong
307-699-0330

From: Alli Noland
To: [Town Council; commissioners@tetoncountywy.gov](mailto:commissioners@tetoncountywy.gov)
Subject: Snow King Master Plan Comments
Date: Friday, August 31, 2018 2:43:55 PM

Dear Honorable Council Members and Commissioners,

Thank you as always for taking the time to read and consider my comments. Your service and commitment to making Jackson and Teton County a great place for everyone is truly appreciated.

I am concerned by what I see and hear about Snow King's ultimate end goal and how it will permanently affect this community, and while I appreciate some of the improvements they've made thus far, I can easily see how they would not be awesome for everyone, especially those who live near the base (which I do not), and for wildlife who call that area home.

When considering the next round of approvals for Snow King, please include the following in your deliberations:

We need comprehensive negotiations. All stakeholders need to be on board, not just developers. Politicization of our valley's needs and lands can only come back to bite later.

The Masterplan needs to be amended. If we thought the discussion about affordable housing was rancorous before, I can only imagine how bad it will be with 1000+ new hotel rooms and the people needed to support them. The needs of the people who live here and sustain Snow King Mountain and the Town of Jackson through good times, but more importantly, through bad, should outweigh the needs of developers. Workforce and affordable housing and facilities that will be used by residents are what's needed most.

Town Land belongs to the residents of Town, it is not anyone's to give away. I find this particularly irksome. The base of Snow King has been a gathering place for locals and visitors alike for decades. The shady open space, picnic area, climbing walls, and ball field are used by almost every single person who lives in Teton County. As taxpayers, we all own that land together, and to give it away would be short sighted and seemingly very selfish.

The Forest Service needs to be involved. As one of the major stakeholders, the Forest Service should have access to all the information available, and they should assess the actual impacts of the completed construction, as well as projected uses. As the developers would be leveraging public lands for their own profit, said developers should be required to fully mitigate impacts on site before approvals are given for new projects.

Again, thank you for your time, consideration and service!
Alli Noland

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Alli Noland

[Terra Public Relations](#)

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[307-733-8777](#) o

[307-699-4572](#) c

From: Frederick Reimers
To: [Steve Ashworth](#); [Town Council](#)
Subject: Snow King/Howelsen Hill
Date: Friday, August 31, 2018 8:34:30 AM

Dear Jackson Town Councilors and Mr. Ashworth,

This was a note I sent to the county commissioners, and thought it proper to send your way as well.

+++++

Last Monday I tuned into the county commissioners meeting for about five minutes, all that I had time for in a busy work day. During that time I listened to Snow King's GM Ryan Stanley highlight Steamboat Spring's Howelsen Hill as a defense of the proposed designs for Snow King. Stanley said that the community of Steamboat tried to get private investors to run Howelsen because it loses so much money, and no one would. As a former resident of Steamboat (2001-2004, where I was an editor for Paddler magazine), it took me 15 minutes to check those facts with a couple of phone calls to the town of Steamboat:

-Howelsen Hill is mostly used by locals, and in that group mostly as a ski racer training center.

-Yes, the ski hill loses about half a million dollars a year, the town foots the bill.

-MOST of the money is lost because of one reason only: Howelsen runs a ski jump training facility. Citizens are very attached to that training resource so it is not on the table to close it.

-They put out an RFP not out of desperation but of curiosity to see if anyone could run it more efficiently. They had very stringent and non negotiable guidelines on how the hill would be run. They did receive only one proposal, and they rejected it.

-The community voice was firmly to support the ski hill as a racer training facility and community ski hill. They are very emotionally attached to it (director's words). The community told the town they wanted to continue supporting the hill - and the ski jump facility - despite any loss because - his words here - *"they did not want to see it become like, a Disneyland, you know"*

-The park operates an alpine slide and more water based ski training features in the summer. It has ball parks, forest trailheads for biking and hiking. It is a beloved community asset.

So, while not patently untrue, Stanley chose to relay about 10% of the facts to support his mission for Max Chapman's amusement park/possible flip deal. The full story is quite different. An understanding of community ski hills in places like Steamboat and Bozeman (Bridger Bowl) should be a part of this discussion, but we should be sure

we get our facts straight.

Thanks for your time.

Frederick Reimers

Jackson, WY

541-520-4873

frederick.reimers@gmail.com



Educating and Inspiring through Wyoming's Extraordinary Skies

info@wyomingstargazing.org 1-844-WYO-STAR www.wyomingstargazing.org PO Box 9584 Jackson, WY 83002

Town of Jackson
150 E Pearl Avenue/PO Box 1687
Jackson, WY 83001

August 31, 2018

Dear Mr. Mayor and Town Council Members,

I am writing on behalf of Wyoming Stargazing to encourage your support for the most recent Snow King Phase 2 Development Plan. As you know, Wyoming Stargazing has been collaborating with Snow King for several years to develop plans for an observatory and planetarium for the summit of Snow King Mountain. Both of those facilities are included in the Phase 2 Development Plan.

The construction of those facilities would bring to fruition the vision with which I started Wyoming Stargazing five years ago. In ever-expanding cities, it has become rare -- perhaps impossible -- for people to learn about the Cosmos through direct observation. The unparalleled protection of our wild habitats here in Jackson Hole make it one of the few remaining places in the country where the night sky is both accessible and ideal for appreciation and study. From personal experience, I know that the study and practice of astronomy has the potential to inspire and motivate learners to explore science and the arts and to develop confidence and ownership of their learning in ways unattainable in the classroom.

If approved, the observatory will provide a one-meter telescope, big enough to see galaxies billions of light years away. We plan to promote nighttime family programming for locals and visitors alike, and to assist our local school districts in promoting hands-on scientific literacy. While most one-meter telescopes are used almost exclusively for research, ours will be used almost exclusively for public outreach, making it one of the largest telescopes in the world used for that purpose.

If implemented as designed, the observatory and planetarium will also include:

- ♦ a 20ft clam-shell dome that houses the one-meter telescope
- ♦ an outdoor viewing deck and an indoor gallery to display images taken with the telescope
- ♦ ~55 seats under a 12-meter dome designed for digital projection
- ♦ a larger multipurpose auditorium for conferences and other events

Exposing locals and visitors to engaging, educational programs, we hope participants of all ages leave our programs with a stronger sense of their place in the Cosmos, as well as knowing that Jackson Hole is an amazing, unique place within a vast universe. Building awareness around the cosmic perspective will light a spark for students, children and adults to learn more, and will impact how people see each other and the natural world.



Educating and Inspiring through Wyoming's Extraordinary Skies

Snow King is uniquely positioned -- both geographically and financially -- to make this vision a reality. By supporting a complete plan for Snow King's Phase 2 Development, all of Jackson Hole has the possibility to have community benefit spaces like the planetarium and observatory, as well as other amenities for the ski club, mountain bikers, and other interest groups. Wyoming Stargazing supports plans for a gondola to the summit with its updated landing location away from Phil Baux Park and the baseball field because it will ensure comfortable access to the planetarium and observatory for all ages and abilities in year-round weather conditions, especially later in the evenings when nighttime programs are in session. We also support the construction of a new road to the summit to provide much safer access than currently exists for construction, service, and emergency vehicles.

We are thankful to have partnered with Snow King at every step of the design of the observatory and planetarium, and to have received broad community support for both of those facilities. We encourage you to support Snow King in its efforts to ensure the longevity of our town hill and to bring these extraordinary benefits to our community.

Sincerely,

Samuel Singer, PhD

Founder and Executive Director, Wyoming Stargazing

From: whitney.marcella.wright@everyactioncustom.com
To: [Town Council](#)
Subject: Please consider Snow King holistically
Date: Friday, August 31, 2018 9:20:44 AM

Dear Jackson Town Council,

Thank you for allowing public comments on the proposed amendment to the Snow King Base Master Plan, and for helping to ensure a balanced future for our Town Hill. This is our community's chance to come up with a whole new vision and plan for Snow King. Please renegotiate all the leases on Town land, and this Base Master Plan, so that they are fair deals and so our community gets as much benefit as we are giving away in development. In addition, please don't rush big decisions - wait until after you and our community can see how these decisions will fit in with negotiations regarding Forest Service lands in early 2019.

Thank you for your dedication to our community and your hard work on this project.

Sincerely,
Whitney Wright
PO Box 362 Jackson, WY 83001-0362
whitney.marcella.wright@gmail.com

From: Jantina3755@everyactioncustom.com
To: [Town Council](#)
Subject: Please consider Snow King holistically
Date: Saturday, September 01, 2018 8:35:32 AM

Dear Jackson Town Council,

Thank you for allowing public comments on the proposed amendment to the Snow King Base Master Plan, and for helping to ensure a balanced future for our Town Hill. This is our community's chance to come up with a whole new vision and plan for Snow King. Please renegotiate all the leases on Town land, and this Base Master Plan, so that they are fair deals and so our community gets as much benefit as we are giving away in development. In addition, please don't rush big decisions - wait until after you and our community can see how these decisions will fit in with negotiations regarding Forest Service lands in early 2019.

Thank you for your dedication to our community and your hard work on this project.

Aspen got destroyed, Vail is a rich man's town.....Dont want Jackson to follow their example.

Sincerely,
Jantina Tuthill
3265 W King Eider Rd Jackson, WY 83001-9194
Jantina3755@gmail.com

From: Andrew Jakovac
To: [Town Council](#); [County Commissioners](#); marymoore@fs.fed.us; poconnor@fs.fed.us; environmental@jhnewsandguide.com; [Ben Graham](#)
Subject: Snow King Evaluation Timeline
Date: Tuesday, September 04, 2018 11:19:02 AM

Mayor, Councillors, and Commissioners,

I am writing to you in concern regarding the enormity of the proposals by the Snow King investor group, and the rush processing demand that has been made, and the news that this does not coincide with the Forest Service review timeline. The impacts of this decision are far-reaching, permanent, and will change the face of this town. Please do not rush this decision on a developer's timeline. Please do this slowly, carefully, and in conjunction with the Forest Service timeline.

I hope that you recognize most especially in this case that your duty and concerns should be first and foremost with the residents of this town, who have many misgivings about the community benefits versus the costs of the Snow King investors wishes.

Residents and their families whose future in this town will be greatly impacted by this development have been extremely busy all summer. The Snow King owners' maps and 'plans' are constantly changing, but in the end, appear disingenuous and not forthright. Community input? It looks like the ones submitted for approval aren't much different from the ones the original mission – despite the endless meetings and contrary community input, and then 'maps' some on napkins? How is that not just grounds to throw this garbled mess out and start over? It's widely understood the stakeholder process was deeply flawed, but this train rolls on.

It's a concern to see still under consideration to take a local park and make a tourism Disneyland and launching pad for an events center at the top, municipal public land, currently in use, for a private investment group? The community said NO. Not, maybe, if you move your landing area over. People said: NO. (And that lift clearly isn't for skiers. It's for shuttling tourists to Chapman's - or, whoever he flips the lease, development, and approvals to...Vail Resorts, maybe, events center at the top. Have you considered the value you are adding to the lease, and who you are giving it to?)

What's wrong with a cheaper lift, on Snow King private land, above the park. Why are they saving that land? Is it to build condos later? What is even going here? Are you asking these questions on behalf of the community you serve?

No one in this community wants a thrill ride top to bottom, tourists screaming out over town all day every day. Snow King's ownership is not listening, because they do not care. They have shown no evidence, and done nothing in good faith to benefit this community, other than

hang on to the ski hill and use the lifts closing as leverage for a grossly overdeveloped amusement park on what is a valued local respite and access point to nature.

The new road will completely ruin the skiing we are supposedly trying to save, and it goes into the ever diminishing wildlife habitat, and, over to our community bike trail Ferrins and Hagen. Why can't they put a fraction of that money into upgrading Leeks canyon? Have you asked these questions? Have you received any truly valid reason why not? Has anyone?

The supposed benefits to the community are outweighed by the negatives here, by far, in my opinion. We are already suffering from a lack of housing, too many low paying service jobs, traffic, crushes of tourists, and a diminishing quality of life and community. That is called poorly managed tourism, not success.

Please, fix the problems we have before you throw more fuel on the fire with this needlessly massive and burdensome project. Please slow the consideration, and not be rushed on this developer's timeline, when there are huge issues and impacts at stake for those who actually make the community run.

Thanks for your time, attention to this matter, and your service.

Thank you,
Andrew Jakovac

From: Colleen Crook
To: [Town Council](#)
Subject: Re: Town Hill
Date: Wednesday, September 05, 2018 5:57:45 PM

Commodity or Community? The more Jackson, WY becomes a commodity that caters to the recreational wants of the masses the more the community suffers and are alienated. We have a wild and natural experience at our doorstep that people sorely need. They can get zip lines, increased exhaust and overcrowding in other places.

In a National Geographic article on sustainable communities Dan Buettner states "... Enlightened leaders make conscious decisions to favor quality of life over economic development or political expediency." Teton county and the city of Jackson have some tough decisions to make - to continue to market this beautiful valley that's turning into a theme park and game reserve where entitlement is courted and catered to or become a sustainable community for the quality of life for all of its residents.

Regards,

Colleen M. Crook

Land and Homeowner since 1978

--

Colleen M. Crook

From: skishooting@everyactioncustom.com
To: [Town Council](#)
Subject: Please consider Snow King holistically
Date: Wednesday, September 05, 2018 10:48:42 AM

Dear Jackson Town Council,

Thank you for allowing public comments on the proposed amendment to the Snow King Base Master Plan, and for helping to ensure a balanced future for our Town Hill. This is our community's chance to come up with a whole new vision and plan for Snow King. Please renegotiate all the leases on Town land, and this Base Master Plan, so that they are fair deals and so our community gets as much benefit as we are giving away in development. In addition, please don't rush big decisions - wait until after you and our community can see how these decisions will fit in with negotiations regarding Forest Service lands in early 2019.

Thank you for your dedication to our community and your hard work on this project.

Sincerely,
russell scott
PO Box 994 Jackson, WY 83001-0994
skishooting@gmail.com

From: Linore Wallace
To: [Town Council](#)
Subject: Snow King Development
Date: Wednesday, September 05, 2018 6:39:40 PM

Dear Mayor Muldoon, Jim Stanford, Hailey Morton-Levinson, Don Frank and Bob Lenz:

As you start to ponder the Snow King Master Plan, I ask that you consider some of the following in your decision making as it concerns the Town of Jackson (TOJ) and its residents:

-The Master Plan and its amendments still propose placing the gondola and zipline landing on TOJ property. However, they are not forthcoming in exactly where and what the footprint of this would be. I think it would be irresponsible to approve any use of TOJ property without full disclosure of what they are proposing. All you have to do is look at the footprint of the gondola out at Teton Village and you can see how massive that is without the addition of a zipline landing building. They have admitted that they can place the gondola where the Summit lift is now; it would just not be “ideal” for them.

-The majority of town residents do not want to see any changes made to the existing ball field or Phil Baux Park despite all the amenities SK is promising. To remove the parking loop and turn it all into green space would eliminate the use of that area for functions like the Peoples Market or vendors for concerts and other events as they would not be able to drive and set up their wares on the grass area. This would mean they would have to park on the street requiring road closures during those events. The added parking they are proposing would in no way provide enough parking for the increase in traffic they are saying they will have with all of their improvements. And, the parking they say will be built on the east side of the ice rink building would only be temporary as that area is slated for commercial buildings in the future.

-The placement of a zipline on the front of Snow King would create a horrendous noise nuisance. As it is now, screaming can be heard all over the east end of Jackson all hours of the day and evening from the roller coaster that is in place by the hotel. During the late fall and into winter, the residents in east Jackson are already subjected to the incessant noise of snowmaking machines, bright lights and disruption of sunlight due to the snow clouds. To add a screaming zipline in that area that will run day and night all year round is not fair to the town residents. If a zipline is needed to make the operation of the mountain successful, it should be restricted to the amusement park area already established next to the hotel.

These are just a few of my personal concerns about the Snow King Master Plan being presented to you. I believe there is a lot of “blue sky” in their proposal that may not come to fruition down the road when the group of current investors decides to sell. Thank you for your time and consideration of my thoughts.

Linore Wallace

450 South Willow St.

PO Box 3366

Jackson, WY 83001

307-733-2768

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Linore Wallace

Jackson Hole Insurance Services

Life Insurance, Medical Insurance, Long Term Care Insurance

PH: 307-733-7007

PO Box 7444

Jackson, WY 83002

[*http://www.jacksonholeinsuranceservices.com/*](http://www.jacksonholeinsuranceservices.com/)

[*www.facebook.com/JHInServ*](http://www.facebook.com/JHInServ)

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From: Mary Ignatiadis
To: [Town Council](#)
Subject: Town Hill Development
Date: Friday, September 07, 2018 9:39:30 AM

Dear Town Council,

In many ways, the presence of Town Hill defines life in Jackson. Snow King is an important commercial center for the town, but more importantly, those of us who live here use, drive by, or look at the the Hill on a daily basis. **The relatively undeveloped nature of Town Hill plays a critical role in maintaining the Town's character, access to wilderness recreation, the presence of charismatic fauna and flora, and attracting visitors.** To ignore the voices of the townspeople asking for you to reconsider the current development proposal put forth by Snow King is a gross violation of your civic and moral duties.

Sincerely,
Mary Ignatiadis

From: shane rothman
To: [Town Council](#); [Tyler Sinclair](#); [Steve Ashworth](#); [County Commissioners](#); [Snow King Engagement](#); marymoore@fs.fed.us; poconnor@fs.fed.us; comments-intermttn-bridger-teton-jackson@fs.fed.us; jeff@gardnercmc.com; [Ben Graham](#); environmental@jhnewsandguide.com; [Editor, JH News & Guide](#)
Subject: Snow King Mountain "zipline"
Date: Saturday, September 08, 2018 10:23:56 AM

Hello Mayor, Council, Parks and Recreation Board, and BTNF officials,

Thank you for all of your time spent on Snow King. I appreciate your efforts to ensure that productive public comments will be recorded and discussed.

The timing and complexity has become confusing for all, and I believe that plenty of unnecessary time and controversy could be avoided with a simple motion to reverse the Council's previous decision to allow ziplines on public property. I am positive that this decision would have no chance of approval under today's different circumstances, and consider this current proposal to be an embarrassment and liability for the Town of Jackson.

Please consider the following:

-The decision to allow "ziplines" on public property was made under entirely different circumstances. Before the "Cowboy Coaster", Snow King did not have enough steady summer revenue to sustain winter operations, and was desperate for a quick source of supplementary income. Although current financial numbers are undisclosed, it is safe to assume that their summer business has skyrocketed, and future stability is already guaranteed under proper management.

-The proposed zipline is an unnecessary attraction that does not blend with our community character, nor does it foster an appreciation for nature, and it certainly is not harmonious with the surrounding environment. It does not fall within USFS guidelines, and it would be foolish for TOJ to support this.

-Parks and Rec has already clearly stated that this proposal does not fall within their guidelines, and is not a "community need". If SKMR LLC still insists that this must be packaged with the gondola on PB Park, the decision to deny approval will be much easier to make.

-Even the "zipline" is entirely different than what was proposed at the time(a short, tacky, mechanical carnival ride aka "Soaring Eagle", compared to a 70mph top-to-bottom scream machine that is totally unprecedented on American public lands.

-This does not belong anywhere near the West Portal or Phil Baux Park. This portal should remain community oriented, without the distraction, crowding, and noisy impacts of commercial amusement attractions.

-SKMR LLC would likely not dare to put this liability on their own private land due to fear of litigation. If they were to consider putting this on their Rafferty private lands, operating hours and noise mitigation parameters must be set in place, and guided by public comment.

-This zipline is a huge liability, any accident will result in serious injury or death, which would mar Snow King forever.

-The Snow King Resort District should be considered an extension of “the bar scene” in the future, and alcohol usage will increase greatly. Alcohol consumption at the proposed Summit Restaurant and recently constructed “Mega-Pub” across from Phil Baux Park would encourage ridership, and SK employees cannot be trusted to perform sobriety tests.

-If TOJ somehow allows this to be constructed, extreme controversy is easily foreseeable, resulting in negative media coverage and potential lawsuits to cease construction or operation.

-A circulated petition to remove this proposal and reverse the previous decision should not be necessary due to these foreseeable discrepancies in current policies for both TOJ and BTNF. This proposal should easily be rejected before discussing any further.

-Please contact SKMR LLC to advise for immediate removal of this proposal, and encourage them to listen to the community. They have been falsely stating that “the majority of the public who attended(SK engagement forum) voiced support for a zipline”, but absolutely no one mentioned a zipline amongst the estimated 100+ “community interests” that were presented.

-The only appropriate area on the mountain for a zipline is within the already impacted ropes course/coaster area on Rafferty(inside the footprint prior to “Phase 1”), but more respectful operating hours and a noise mitigation plan must be presented before anything were to receive approval.

Please strongly consider introducing a motion to reverse this prior decision at Monday’s Town Council Meeting with County Commissioners and the BTNF, and save everyone time, controversy, and future headaches. This is already serving as a distraction, and it’s beyond time to dismiss this idea, permanently.

Thank you all for your time and consideration,
Shane Rothman
Jackson Wy

From: Timothy Brown
To: marymoore@fs.fed.us
Cc: poconnor@fs.fed.us; [Snow King Engagement](#); -council@jackson.gov; commissioners@tetoncounty.gov; planningcommission@jacksonwy.gov; planningcommission@tetoncountyywy.gov; jlove@jhnewsandguide.com
Subject: Do not approve the expansion of Snow King
Date: Monday, September 10, 2018 2:54:25 PM

9/10/2019

Open letter to:
Mary Moore, District Ranger
Bridger Teton National Forest
Jackson Ranger District

We are fortunate to live in a small western town with good bones, however, over my 21 years living here, the bones are being removed in a haphazard effort to change the laid back western small town flavor we enjoy. The desired goal of the capitalists and elected's is a vision of another Aspen, Vail or Breckenridge. Our town should not be confused with Disneyland. The founding pioneers must be rolling over in their graves wondering where we are heading and why the character of the town is being destroyed.

The visionaries spend huge amounts of money to invite people to share a week of their lives on vacation in the great outdoors, then complain about the traffic congestion (so we build a four lane highway to nowhere), add additional hotel rooms and then complain we are not at capacity, cannot hire enough of our youth to work in the service industry, while we lament there is not enough housing, but, continue to approve and build more business space that cannot be staffed.

Meantime, venture capitalists are trying to expand the town hill showing a massive display of arrogance by insisting that the comprehensive plan voted on in 2012 is not valid or what the people intended. It was unanimously adopted by BOTH our Town Council and the Teton County Commissioners and voted on by the real people calling Jackson their home. We voted for peace and quiet, open spaces, and keeping developers in the existing foot print but according to the developers fiat, this is not what we meant. I repeat for emphasis, keeping the existing land use in its current foot print to enhance and protect our wild life and their migration corridors is most important to many in this town and I would like to think the Forest Service also agrees.

Under your leadership, the Forest Service is about to study the need for expanding the hill on three points of the compass into wild life habitat. It is a foregone conclusion that within the present footprint development will continue and the private base on Snow King will continue growth at a rapid rate. Your department is the last stop/step in the approval process. The Forest Service has the chance to say NO to expanding the current foot print into public land to satisfy the desires of a private equity firm wanting to make profits from the wealth of the public land owned by the people of this town. I speak for myself. The venture capitalists desires should not supersede the wishes of the voting tax paying people of this town.

When younger and for many years, my volunteer time working for the Forest Service through the Friends of Pathways digging/repairing trails and hauling miles of abandoned barbed wire on my back on the east side of Snow King in the Cache Creek drainage, taught this corporate capitalist easterner about

our diverse wildlife on our town mountain during all seasons. The animals are the mountain. Usage by the people of the town, on our world class multi-use trail system, are just visitors in their habitat. It would be a shame to see it marred by unnecessary development particularly during the most critical time for them, winter.

This is a once in a life time decision that you and your department have to decide during your first year living with us in Jackson. If expansion is approved - when the plows start digging the required 16 foot wide service road with deep cut banks, it will leave a 2.5 mile 90 foot wide scar on the mountain, cutting across all existing ski runs from east to west for all future generations to see when driving across the valley to Jackson - it cannot be changed. There are no do overs as the Snake River Canyon Club proved in 2002 and continues to be true today. I hope that you can bring some common sense (bigger is not necessarily better) back to this drawn out process, because, our elected's have failed to do so all over town in the name of progress during my time living here in the last known frontier town in America.

My hope is that other concerned citizens, neighbors and friends will express their views with you before the scoping comments end on October 3rd. Time is short! Without your intervention we may have to adopt a new slogan for our town, "Howdy partner! Welcome to anywhere USA."

Thanking you for your consideration I remain,
Just one man, one vote, one opinion.

Timothy Brown

From: shane rothman
To: [Town Council](#); [Snow King Engagement](#); [County Commissioners](#); marymoore@fs.fed.us; poconnor@fs.fed.us; comments-intermtn-bridger-teton-jackson@fs.fed.us
Subject: Snow King Mountain: process/host public forum?
Date: Monday, September 10, 2018 11:18:42 AM

Hello Elected Officials of Jackson and Teton County, BTNF, and other relevant cooperating agencies,

Once again, thanks for all of the work being done to address the future of Snow King Mountain! I am thankful for the countless hours being spent on this, and I'd like to help make this process more informative and as easy to understand as possible!

While meeting with the BTNF officials today, I'd like to continue to recommend the need for an additional public forum/Q&A/comment-gathering opportunity to help further educate residents in regards to policy/protocol, timeline updates, phasing of Phase 2, and more. An "open house" at a neutral location should be organized ASAP, before the 10/4/2018 closing of the comment period.

I'd also like to stress the importance of reminding the USFS that the BTNF District deserves special attention in regards to our local economy, where additional "jobs" are not a priority, because it is listed as a major directive in the USFS decision-making policy. Until updated/dedicated/designated employee housing at Snow King is GUARANTEED, the impacts of their future developments could greatly harm our local economy with significant negative repercussions to the housing issues.

Here are just some of the questions I have which could help me (and the rest of the public) provide the most informed comments as possible. Many of these questions require answers from multiple cooperating agencies. Please excuse the lack of sequence of these scattered thoughts, but time is of the essence for me as well!

(Questions for BTNF and other cooperating agencies, including SKMR LLC)

For reference purposes, are there any USFS MDP's that were not even "accepted" for further review? Is the BTNF legally obligated to accept every single plan, while spending as much time and public tax dollars as needed to properly vet the proposal?

- 1: What kind of zipline is prohibited on public land? Is there a precedent, have any been denied? How does the USFS (and private operators) mitigate noise effects?
2. What was the reasoning for not allowing an East Side Chairlift? Did SK voluntarily withdraw this proposal, or were they forced to revise their plan?
2. Would the BTNF even consider an expansion if there was no desire for a new road? Has the BTNF received complaints about people skiing/snowboarding in the surrounding wildlife habitat? What jurisdiction/responsibilities does Friends of Pathways have for this terrain? Has a "jump" trail ever been proposed for mountain bikers?
3. What is the protocol for building a new road on USFS lands? Are roads allowed in avalanche paths or potential mudslide paths? Can they be allowed to cut through steep expert terrain/established trails and feature impassable road cuts?
4. Have any soil studies been done? How is the stability of a slope gauged? Many surface water springs are located throughout the lower sections of the mountain, including the Cowboy Coaster area, Snow King Drive, and along the Hagen trail. What are the techniques used to mitigate potential landslides, and repair damaged terrain?
5. Is there any bonding required to ensure that a damaged road system would be fixed, or to pay for landslide damages to private property beneath?
6. Snow King Drive is a costly mess to fix. How will SKM/ BTNF be able to guarantee a leaky pipe won't cause a

costly eyesore on this road, with extended closures due to instability and repair?

7. Snow King's lower mountain road(private land) is unsuitable for construction vehicles, and needs to be rerouted ASAP before any further construction projects. This should be clearly stated prior to any approvals. The road is very steep(25%grades), and has tight switchbacks, an abundance of loose rock, and is prone to accidents and dust problems. What is the timeline for this "Phase 1 of Phase 2"? (The TOJ should allow SK to start building this portion of road as soon as possible, which will also improve their beginner ski terrain.)

8. Is there USFS protocol for placing a building along the skyline of a mountain? Teton County regulations likely prohibit this. The restaurant's proposed placement will block the precious limited sun rays daily in mid-winter, and cause extended glares.

9. Have there been any snow studies or climate data derived from the proposed expansion sites? Does BTNF research historical climate data when making a decision? What is the protocol for changing the hydrology observation site that has been in use for decades at the top of Snow King?

10. Who will be hired to conduct the biological surveys outside the boundary? Does Snow King get to choose who is hired? Will all four seasons be studied? Will they attempt to gain local input, or just make their decision based on a few walks in the woods?

11. What is the protocol for allowing restaurants on public land, even when recreational activities are closed? Could this restaurant legally operate year-round, including off seasons? Are there any established hours of operation, or could it even be used even for overnight events if desired? Will the site go completely dark every night?

12. Is there any current USFS protocol for using this restaurant/conference center for political purposes? Max C Chapman has always been a very active political donor, and will likely use this location to host frequent private events. These events could unfairly influence town politics on a local level due to wealthy attendees.

13. How will the BTNF determine a proper number for the human capacity of the Summit? Are skier numbers considered when deciding the size of a restaurant facility?

14. The previous snowmaking project did not allow snowmaking/water pipes to be laid horizontally across the hill. Why would it be allowed if there is a new road, clearcut trails, and increased snowmaking/runoff?

15. What is the protocol for placing a restaurant, or any inhabited building, near the radio towers? These sites are marked with no trespassing signs, and feature high frequency radio waves with unknown effects to humans.

16. Does SK or Friends of Pathways have a plan for rerouting public trails? The Hagen Trail would be heavily impacted by a road and new trails.

17. Where will the BTNF reroute hikers, bikers, and dogs if the ski area requires an extended closure? How many summer seasons will be needed to complete projects that require closure?

18. Are any new winter wildlife closures or increased restrictions proposed for the surrounding area outside the SUP?

There is already a conference center proposed for the KM6 parcel at the base. Are conference centers allowed on public land?

That's all for now, but I hope all agencies can collaborate to help further educate each other, and the public, in a timely manner!

Thanks again for your time and consideration!

Shane Rothman
Jackson WY

From: Tyeise Wetzel
To: [Town Council](#)
Subject: Support for Snow King
Date: Monday, September 10, 2018 10:11:40 PM

Just sending a quick note to show support for Snow King improvements!
Snow King is a valuable asset to the town of Jackson and has a long history here! Please help keep it alive!
Thank you!
Tyeise Wetzel

Sent from my iPhone

From: RICHARD LURIE
To: [Snow King Engagement](#)
Subject: Attention: Snow King Mountain Resort On-mountain Improvements
Date: Tuesday, September 11, 2018 7:36:22 PM

As president of the Grand View Condominiums, I would like to take this opportunity to express strong support for the proposed upgrades and additions to Snow King Mountain. The proposed improvements are all very reasonable, necessary to keep the mountain safe, make the Mountain more desirable as an all-year-round recreational center and are being achieved within the character of the current landscape. I am voicing my strong support in an effort to offset the exaggerations and misleading statements bordering on lies being propagated by the Conservation Alliance, a group that appears to be against any improvement.

I also would like to urge you to bring the Snow King Mountain Improvements proposal to a decision as soon as possible. The vitriol being expressed among the opposing factions is reaching an unhealthy level and is not good for our Town.

I believe the Town of Jackson is very fortunate the Snow King Mountain ownership group is willing to invest and improve "The Town Hill" and provide an all year round attraction that adds to the overall attractiveness of Jackson. There are many people (young and old, town resident or visitor) that do not want to deal with having Jackson Hole Mountain Resort their only recreational alternative. The distance from town, the crowds, the parking, and the expense are all major detractors which will make Snow King Mountain an attractive alternative if the improvements are allowed.

If the improvements that are proposed were to be denied, I suspect the chances are very high that the "Town Hill" will cease to exist and it would be a great loss to our community.

Respectfully submitted,

Rich

Richard Lurie

President

Grand View Homeowners Association

Snow King Loop Road

Jackson, WY 83001

From: [Tyler Sinclair](#)
To: [Tiffany Stolte](#)
Subject: Fwd: Snow King Mountain Resort On-mountain Improvements
Date: Wednesday, September 12, 2018 3:28:30 PM

Begin forwarded message:

From: Sam Petri <sampetri@gmail.com>
Date: September 12, 2018 at 14:59:34 MDT
To: <tsinclair@jacksonwy.gov>
Subject: Snow King Mountain Resort On-mountain Improvements

Dear Tyler Sinclair,

I wanted to reach out to you and share my thoughts on Snow King Mountain Resort's On-mountain Improvements. It is my hope you could forward this letter on to the planning commission ahead of next Wednesday's meeting, so they have time to read some public input, if that is appropriate. I understand you will be discussing the resort district master plan, and perhaps there are things in my below letter that do not directly apply to that discussion. But because everything is related, I thought I would share all of my thoughts here.

This is a letter I wrote to the Jackson Town Council, Teton County Commission, and the US Forest Service. In this instance, I have addressed it to the Town of Jackson Planning Commission.

Thanks! and here we go:

Dear Town of Jackson Planning commission,

I am writing because I am very concerned about the proposed Snow King Mountain Resort On-Mountain Improvements, which I believe have massive environmental impacts, social impacts to our community, and in many cases, it flies in the face of the 2012 Teton County Comprehensive Plan.

I've been following along as closely as I can, meeting with people in our community, writing letters to the editor in the local newspaper, and reading everything I can about what I believe is one of the most impactful developments proposed in Jackson Hole.

I'd like to preface all of this by saying how much I love Snow King Mountain. I truly hope it can succeed for another 80 years and beyond. I own a house and live right next to it, and I much rather live next to a vibrant ski hill, than a ghost town. When I first heard that investors wanted to inject ~\$20 million into the hill, I was excited, as I know first hand how much Snow King desperately needs capital improvements.

But this isn't about the viability of the ski area, it's about what we, as a community, feel is appropriate use of our public land.

I do believe almost every development in this current proposal is far too big for such a small ski area. The current management is asking for too much from the public, with seemingly no regard for the environment, or our community or our shared public land. It is with a heavy heart that I am in such opposition. I wish current management would listen to the community and be better stewards of Wyoming's first ski hill, one of the oldest in the country. But time and time again they continue to try to force through this outrageous proposal, which is so inappropriate given the type of hill Snow King is. So here I am, making comment. What else can I do? And when will these people take "No" for an answer? That's a serious question to consider - as none of this HAS to happen.

Below are 10 aspects that I believe should not be considered due to protocol, previous decisions, impacts to wildlife, setting a poor precedent, and much more. I've provided alternatives where I can.

Thanks again for your commitment to our community.

1. The new road:

- This requires expansion into sensitive year-round wildlife habitat
- Requires steep road cuts, compromises every signature ski trail with steep and dangerous intersections (Elk, Grizzly, Belly Roll, Exhibition, Bearcat). This is prima facie evidence that none of their developments are about the sport of skiing. The road literally ruins the skiing on the entire mountain.
- Requires major increase in avalanche mitigation along ridgeline and through steep forest, will create new starting zones for destructive wet avalanches below the road.
- Will require snowmaking pipes along route, pipes/hydrants could leak and contribute to major erosion or landslide (no pipes were allowed to be laid horizontal during the 2014 snowmaking project)
- Should require a bond of over \$20M to cover potential landslides and erosion issues, and a potential threat to private property on the lower slopes
- Encourages beginners and intermediates to explore dangerous forests known for marginal base depths and extremely variable snow conditions, and typically subpar average base depths below the Cougar Lift top terminal elevation(7095', the typical rain/snow line). Snow depth and conditions on the upper half of SKM typically deteriorate fast on the descent due to frequent fluctuations in the rain level. People without local knowledge will be lured into dangerous areas and a rapidly fading snowpack, especially from the road's location on the upper West Side of the ski area. This is a major liability issue especially for a "struggling" ski area. All terrain outside SK's current footprint should remain only accessible

through backcountry gates.

- This road is being excessively designed to cater to cement trucks, not recreation.
- This road appears to be more about controlling exclusive access to cell towers, not for beginner skiers.
- A new lift will provide faster and safer “emergency access” than riding up or down in a vehicle. Fire suppression equipment should be permanently placed at the Summit, and the infrastructure to do so has been in place since 2014.
- A small tram (10 to 20 person tram car) should be considered the most ideal lift for the needs of this mountain, and would significantly reduce the need for ATV vehicle trips up the mountain both during construction and after. Current ATV traffic is already a burden on the public users, neighbors, and wildlife
- This road will be a mile wide scar (eyesore) on a historic ski hill, which serves as the famous backdrop of Jackson. This compromises the historic integrity. A recent historic evaluation required for “Phase 1” found that many structures weren’t worth preserving, but the unchanged view of Snow King Mountain would be eligible to be registered as a historical landmark.
- Most portions of the existing road were built by the CCC in the 1930’s, and should definitely be eligible for historic designation at WY’s first ski area.
- The existing road would still be necessary to access the top of Elk and Grizzly from the Summit Lift, and to traverse East towards Rafferty from the top of the Cougar Lift. Having two separate roads within close proximity will totally compromise safe, fun skiing, and the potential for race events on Elk and Grizzly.

Alternative: Due to the challenges of constructing and maintaining this route, the preferred alternative route should be to use the existing backside road, and trying to improve the current road.

2. East/West Expansion:

- 1. Our 2012 Comprehensive Plan gives very specific direction: in order to protect and preserve our area’s ecosystem, “existing Planned Resorts should be limited to their existing footprint” (Policy 3.1.d). Therefore, the Forest Service should not allow new development, roads, or chairlifts outside the existing operating footprint. Instead, they should encourage Snow King to improve terrain and amenities only within their existing footprint.
- These areas have been historically used by wintering wildlife, especially Mule Deer and Elk, and must remain in a natural state without the use of machinery.
- Increased human recreation alone will need to be managed carefully in the future to ensure proper etiquette is used.
- No other ski areas can compare to the wildlife present on these slopes. Perhaps

Sleeping Giant in Cody could compare, but it is highly unlikely that they would propose major developments and an expansion, despite previous struggles to maintain “viability”.

-Backcountry skiing is a large and growing segment of users, and SKM will still benefit from this trend, while avoiding liability.

-The Public is fortunate enough to be able to recreate in these areas that share the same characteristics of nearby winter closure areas such as Josie’s Ridge and Crystal Butte. The SK “backcountry” should serve as an educational experience, in balance with nature.

3. Lifts B and C, Ski School Headquarters:

-These beginner areas will require mass grading, and the removal of a mature aspen stand as well as sagebrush, in an important area for migrating and wintering wildlife. Currently there is no reasonable pitch on this Ridge to provide a good location for this, and this area would be altered significantly. Last year, SKM allegedly received approval to unnecessarily mow down acres of Sagebrush habitat for the 2 hour long solar eclipse event, including acreage outside their SUP boundary, with no public process. Many people were upset by this, which is minuscule in comparison to their plans.

-Placing first-time beginners and a ski school headquarters at the top of the mountain is a very poor idea due to the fact that most days up there are not sunny, and typically feature exposure to wind and blowing snow. There is very little precedent(if any) for a ski area to place beginners on an exposed ridge, and this could lead to future accidents at the “steepest ski area” in North America.

-Beginners will likely be forced to pay full price for a lift ticket to access this area, which will eliminate the \$10 ticket that has enabled so many users to learn. It will not be nearly as affordable, and many beginners will be hesitant to believe that they can learn to ski up there, especially if it isn’t perfectly sunny. Operating lifts/carpets in this area would surely not make any revenue on all days with slightly inclement weather, and hurt long term viability and affordability of the ski area.

-Many of these users might even flee the Summit due to incoming weather before they acquire the necessary skill level, leading to the potential for major accidents(sliding off this trail would have severe consequences for a beginner, and would likely require a technical rescue to get the injured person back up to the road for an evacuation).

-Other reasonable alternatives exist for beginners, such as:

1. Improving the Rafferty Area for such use, as it was always intended to be(SK has compromised their historic beginner terrain by building condos and a mountain coaster, but there is still potential).

2. The “Turnpike” trail also possesses the perfect grade for a learning area, and there are existing plans that would be easily approved and fully supported by the public.

3. Another ideal location for the typical perfect “bunny hill” slope lies on the vacant land behind the Snow King Resort Hotel, which receives more sun than anywhere on the frontside, and is located adjacent to existing parking and service amenities. Ownership of the Hotel should consider working with SKMR to use this terrain to generate shared revenue instead of building a costly hotel expansion.

4. The “ski school” headquarters should remain in the new Rafferty building at the base to reduce impacts to the Summit, encourage use of Rafferty, and provide a welcoming introduction, especially for days with inclement weather.

4. The top-to-bottom zipline:

-This unprecedented thrill ride has no place on our public lands, especially in this location.

-This is against USFS policy and will set an extremely poor precedent for all future development. No current ziplines in the USA can compare to the speed (70 mph) and length (~1,600 feet of vertical drop). There is no educational value, is not “in harmony with nature”, and does not complement the surrounding environment. Most people would never want to hike/recreate (the dominant historical user group) anywhere near a contraption like this, or live near it, or get married next to it.

-A dangerous liability that would result in certain death if anything were to happen. Snow King would be marred forever by the horror story.

-Constant noise. Snow King is already far too noisy, all noise-generating activities should remain strictly confined to their already-impacted private lands on Rafferty. Currently our “Cowboy Coaster” operates above noise-compliance levels, and stays open until 9pm during peak summer, despite the business application stating 8pm would be the closing time. I foresee that most of the ridership would consist of inebriated tourists leaving the summit restaurant, and I would not trust a SK employee to perform sobriety tests.

-Jackson residents despise this idea, and definitely don’t want this controversial scream machine/eyesore/distraction inside Phil Baux Park. A petition to stop this, negative publicity/media coverage, and a potential lawsuit are foreseeable results of this proposal. This will also waste time for our local government during this decision making process, while they have far more important things to be working on.

-This is also not suitable to place near a wedding venue, cemetery, public park, or even the brand new luxury lofts at the base.

Alternative: A more suitable location for this activity would be Las Vegas NV, Orlando FL, Atlantic City NJ, etc...

4. The Summit Restaurant Building:

- This is an excessively large building, especially for a ski area that does not experience enough skier visits to justify.
- This will contradict protocol due to the fact that it does not focus on recreational users. It's simply a sneaky way to build a fancy restaurant on our public land.
- The proposed location will be a prominent eyesore on the mountain, require too much tree removal, generate too much light pollution, and could be subject to a failing foundation. This will block out precious sun rays during winter for Town residents as well. There is no suitable setback location on the narrow ridge to help conceal. This will also have unknown effects to the snowpack surrounding the building, and will definitely cause heavy drifting in certain areas.
- This area will surely become attractive to bears and other scavenging wildlife. I do not trust tourists or SKMR LLC to practice proper food storage etiquette, especially since they have not installed bearproof containers anywhere on their property, and have become notorious for leaving full garbage cans outside throughout the base area and at the Rafferty mid-mountain station. Previous complaints have never been addressed properly, despite the simple obvious solution. The presence of bears frequenting the Summit would likely help generate revenue and provide media exposure, and ownership could view this as a bonus attraction. I would never trust SK employees to haze our wildlife away from this site in an ethical manner.

Alternative: A suitable alternative is to allow improvements/expand/retrofit the existing Panorama House, and make it a historical landmark. This was the original plan when the snowmaking/infrastructure upgrades were approved in 2013/2014. This site is hidden from Jackson's skyline.

5. The Gondola:

- An 8 person lift capable of transporting 1200-2400 people per hour is complete overkill. Current hourly numbers on the Summit Lift during ski season average far less than 100 per hour during 95% of the winter (from years of personal observation). Snow quality will be greatly diminished and become even icier due to increased traffic.
- The proposed base location of the Gondola is on public land, and goes against the open, east to west flow of Phil Baux Park. Snow King owns 5.2 acres right at the base. If there must be a new gondola, or lift, tell them to put it on the 5.2 acres they own and leave our public lands alone.
- The carrying capacity of the Summit should not exceed over 150 people at any given time.

-Their official color, bright blue(almost neon) should be discouraged on public lands, and all infrastructure should use the color green to blend in with surroundings.

-A heated, enclosed gondola storage facility is a waste of resources and their precious, limited skiable terrain.

-There is insufficient space for a detachable lift's terminal on the Summit Ridgeline

Alternative: The construction of a modest (10 to 20 person) Aerial Tram should be encouraged as a reasonable alternative to assist with construction and provide better emergency access, and provide the much-needed "tram announcements/education" to all year round guests. While I know this sounds like a larger lift, because locally our mind all jumps to the tram in Teton Village, I believe a small tram would have less visual impact on the mountain - fewer towers, more energy efficient, fewer cars, and only needs to run when needed. I have ridden small trams in europe and know they exist and feel like it could work for Snow King.

6. Expanded snowmaking coverage:

-The proposed snowmaking expansion is complete overkill, and will not assist SK to provide a sustainable future, and instead will only add to their costly winters

-Should never be allowed outside of current footprint due to the presence of wintering wildlife

-The only places that should require snowmaking are the top of Rafferty Lift(should have been part of Phase 1, but was likely not eligible with the usage of "Categorical Exclusion"), Exhibition, and perhaps allow snowmaking from nearby hydrants for a small area on "Lift D"(if that receives approval).

- The plume of snow of all those snow guns would completely cloud the entire town.

7. Clearcutting new Ski Trails:

-Should not be allowed outside of current footprint due to the presence of year round wildlife

-"Trail 3" is by far the worst concept within their current boundary. This is the steepest gradient on SKM, contains numerous cliffs, and anywhere could serve as an avalanche starting zone. The Rafferty Lift is placed in a known runout zone. Cutting this trail will endanger the public and will require dangerous avalanche control techniques. Skier compaction will not guarantee safety due to the historically variable snowpack and constantly changing conditions. An avalanche

could be triggered anywhere on this steep gradient, far outside the traditional loaded starting zones. When conditions are hardpacked or icy, this trail will be a "slide-for-life" and an extreme liability for ownership.

Alternative: Inside the footprint, very narrow ski trails and glading (selective thinning) are suitable proposals that would add character and drastically improve expert terrain. Careful considerations must be given to protect from erosion. The canopy must remain intact to prevent increased fire danger.

8. "Lift A" on the backside:

-This Lift is impossible due to the close proximity to radio towers(no trespassing signs surround a large radius), in a wind-prone, south facing area with a typically unskiable snowpack.

-A chairlift would blow like a kite on many days. Frequent closures can be expected, which would strand users lower down in the drainage.

-It provides easy access to dangerous terrain(with wildlife present)off the Radio Tower Summit. This area should remain accessible only by hiking. It also provides easy access to remote drainages that do not feed back to the ski area.

-This area has already been denied a Yurt and cross-country skiing

-The "Bike Park" is an insult to the studies and protocol that were created when Skyline Trail was built. There would be no way to ensure that these users would not be poaching our trail system. The Bike Park would be hot and dusty, and a challenge to maintain properly. Emergency access to rescue injured riders would pose a serious challenge, and would not be quick. Any trail built on the upper half of the frontside would even be a challenge for experts due to exposure and very tight switchbacks. This would further encourage poaching an epic ride towards Game Creek, Skyline, Ferrins, Wilson Canyon, etc.

-Private property owners at the bottom of Leeks Canyon will likely have concerns about trespassing, increased runoff from snowmaking, providing construction/emergency search and rescue access, and more.

Alternative: A reasonable, sustainable, and more-supported alternative would be a much shorter surface lift such as a T-bar (bottom and top need to be shortened) with no snowmaking, grading, or clearcutting. This lift would operate as conditions allow, and if no wildlife is present. Current roads would be used to facilitate construction of terminals, and serve as the return trail to the "Saddle". This area's natural state would serve as an intermediate's introduction to off piste and backcountry skiing.

9.. Affordability:

-These plans definitely foreshadow a significant increase in ticket prices to cover

the capital being spent. It will likely take decades for investors to see a return on their investment, if ever(selling the ski area appears to be their best option). This will likely alienate a major portion of SKM's intend target market: locals in search of affordable lift accessed skiing.

10. These plans contradict our current community priorities:

-I understand that the USFS supports job creation, but special consideration is needed for Teton County within the BTNF District, where every business has been struggling more and more to find employees. Our service industry can't keep up with our current demand, and the wages are not fair enough to reside locally. At the very least, Snow King should complete a significant employee housing facility before any new jobs are created, and before any significant construction projects begin. Local residents have made workforce housing requirements our top priority ever since the effects of "Phase 1" began in Spring of 2015. **Snow King Mountain currently has no designated housing for their employees**, and has an invisible track record except for in 2017 when they violated the municipal code for housing/"stacking" 14-20 employees in one modest house in a quiet neighborhood. It can be assumed that they have been taking advantage of their seasonal employees and the leniency of local government for many years. It appears that There has been a historical lack of compliance to their 2000 Resort District Master Plan.

Regarding the proposed Snow King expansions, I ask that you please analyze the impacts from all projected uses, and require that Snow King commit in legally-binding documents to fully mitigate all impacts before getting approval to build any new projects. Please analyze these and similar key questions:

- How many skier days does Snow King host today – and how many will it host after boundary, trail, and lift expansion?
- How many people ride the Summit lift now and how many people do they expect to ride the new gondola – in winter, and in summer?
- How many people do they expect to ride the zipline, every day, and total?
- How many employees does Snow King have now – vs. after building all these projects?
- How much parking does Snow King use now – vs. after building these projects?
- How many new parking spots will this development require, and where will they put those spots?
- How much more impact will there be on utilities – water, sewer, garbage, etc?

Thank you for your time and consideration,

Sam Petri
307-690-7064

From: Amy Unfried
To: marymoore@fs.fed.us; comments-intermt-n-bridger-teton-jackson@fs.fed.us; poconnor@fs.fed.us
Cc: [Snow King Engagement](#); [Pete Muldoon](#); [Jim Stanford](#); [Hailey Morton Levinson](#); [Don Frank](#); [Town Council](#); commissioners@tetoncountyny.gov; [Mark Newcomb](#); [Paul Vogelheim](#); srhea@tetoncountyny.gov; [Natalia Macker](#); planningcommission@jacksonwy.gov; planningcommission@tetoncountyny.gov; parksandrecboard@tetoncountyny.gov
Subject: comments towards EIS re Snow King Mountain Resort Improvements Project
Date: Thursday, September 13, 2018 5:23:26 PM

Ladies and Gentlemen of the Bridger-Teton National Forest:

I am very concerned about the extravagant plans being proposed for the development of Snow King Mountain in Jackson. The proposals play fast and loose with two important values of this region: our wildlife and our community. Many aspects of the proposed development would impact Forest Service land, of which you are the stewards. Critical wildlife habitat is threatened in several places.

In addition, there is a desire to develop Town land that the Town must protect for the sake of our community.

A third area of great concern is the desire of the developers to break faith with the Town regarding the development permissions that the Town granted to the developers in 2000 in exchange for their assurance that they would maintain Snow King Mountain as a viable ski hill in perpetuity. The combined group of developers still has half a million square feet of development potential (equivalent to five Marriotts) that they are not talking about right now, while they're working on turning Snow King into a year-round carnival/amusement park, but attention must be paid to that development potential while the current proposals are under discussion. A deal is a deal, and the Town Council must hold the developers to the deal they made in the past to assure the future of skiing at Snow King.

The developers' proposals include a plan to build a road extending deep into two adjacent areas of Forest Service land that are critical wildlife habitat. *Bad* for the wildlife that is so important to Jackson Hole's special quality and tourist appeal.

Even worse, combined with this is their plan to locate their beginner ski area at the top of the mountain, including terrain on the far (southern) side of the mountain that also contains critical wildlife habitat including calving grounds for elk. Again, bad for the wildlife, and also bad for those beginning skiers, who, in the event of high winds or power outages, would have that new road the developers want to build as their only route down the mountain, crossing the steep existing ski slopes where not all skiers can be relied on to go slow enough not to endanger those beginner skiers. Beginners should instead be welcomed on the lower slopes, as is the case in most places.

Also, the developers plan a large building including a restaurant at the top of the mountain. In principle a restaurant is a decent idea, but it should not be large. I have heard 1000 square feet suggested, and that seems reasonable to provide snacks and lunches for skiers and hikers. It should not be a large destination restaurant—again, bad for the wildlife.

It is my understanding that there is an existing and serviceable road up the back side of the mountain already, which is now used to service the communications towers up there and could

equally provide supplies to the (small) restaurant building and equipment to the top of the lift. This seems like an excellent way around the problems that that new road on the front would create. If this alternative is not judged to be workable for the operation of the ski mountain, any new road should remain within the currently permitted area, with no encroachment on the wildlife areas.

As guardians of our public lands, you have a responsibility, in my view, to hold the developers to the scope of their previous agreement: to maintain the mountain as a ski mountain for the community, without extending in three directions into areas that would be severely detrimental to the wildlife we all love.

A zip line is another of the extravagant proposals, possibly terminating in Phil Baux Park; or a new gondola lift might be the new development that would terminate in the park. I understand that in other resorts the addition of a zip line has brought in large sums of revenue, and that's very tempting to a developer, and an argument can certainly be made for a new covered high-speed lift. However, none of these resort expansions should *ever* be allowed to terminate in Phil Baux Park—the Park belongs to the Town and it is not just empty land available for the taking, waiting for someone to come and put development on it. Bad for our community! Any zip line or new lift to be built at Snow King should be entirely within the confines of the existing ski mountain.

As to the use of the huge development potential at the base, it appears that the vision is of hotels and condos, and that's really not what this community needs half a million more square feet of. If instead the developers envisioned a mix that included benefits to the community such as affordable housing, a parking garage, an ice rink, and a climbing gym, that would begin to hold some appeal.

Very truly yours,
Amy Unfried
Wilson

Amy Unfried
amyunfried3@gmail.com

From: Stephen Unfried
To: Comments-intermtn-bridger-teton-jackson@fs.fed.us
Cc: marymoore@fs.fed.us; [Snow King Engagement](#); [Town Council](#); commissioners@tetoncountywy.gov; planningcommission@jacksonwy.gov; planningcommission@tetoncountywy.gov; parksandrecboard@tetoncountywy.gov
Subject: Attention: SKMR On-mountain Improvement Projects
Date: Thursday, September 13, 2018 5:20:01 PM

With respect to the scope of analysis for the draft environmental impact statement for the proposed projects at the Snow King Mountain Resort, as local residents we greatly value our “Town Hill”, which has provided easily accessible skiing to the community and an excellent venue for training our local ski teams.

However, given that we are fortunate enough to live in one of the most intact ecosystems in the temperate world, any projects undertaken must not impinge upon our wildlife or its habitat. For example, the proposed boundary adjustments on the east and west sides of the existing SKMR should not be granted as they would primarily facilitate building a new access road through prime wildlife habitat. Similarly, any projects on the back (south) side should be scrutinized with respect to their impacts on wildlife, especially elk calving grounds.

Within the existing frontside area, the access road and any additional “commercial” projects should be confined to the eastern side, leaving the ski runs on the western side as unimpaired as possible. If a new major lift to the summit is built, it should terminate well away from Phil Baux Park, which is a highly valued local amenity. Needless to say, all existing public access rights must be preserved.

Snowking 2018

Very attached to Snowking a big part of my life has been spent there since 1984. Running, hiking, skiing, uphill skiing, mountain bike riding and photographing. My son learn to ski there, some of my best powder days have been there. I fondly remember the old Snowking shack. Lunches at the Rafferty.

In the perfect world. Snowking Mountain and Hotel would be in the same hands and the Mountain would function as an advertisement to fill the Hotel. Or it would be a non profit ski hill like Bridger Bowl in Bozeman. Ain't so.

Jackson not just the City of Jackson needs Snowking and Snowking needs us. Where would ski racing and the Ski Club and the High School team be without the Snowking venue? With improvement and changes at Teton Village not there, what about the Town Downhill or Margarita Cup? What about the year round use.

Snowking Mountain is a business whether you want it to be or not. It needs to make money. What is the balance of making Snowking Mountain economically viable while maintain the historic character and public access to activities. Unfortunately, the standard formula for ski resorts is to break even or lose money on the mountain and use it as an advertisement to sell real estate and services. I've been bummed out over the years as trails and access have changes, but at the same time realize that there are more of use using the resource.

How many of use Snowking Mountain? All. How many of us have for paid activities at Snowking Mountain? How much have you paid for having Snowking there to use?

\$100 rent has ired people.

How do we maintain a town hill and make it economically viable.

Learn more to a Targhee that a Teton Village.

What improvements give the most economic return and the least impact. Is a gondola, restaurant with a few expensive weddings a year less impactful than more lifts.

I'm willing to pay a user fee for uphill ski travel since we use it because it is convenient, groomed avalanche controlled and it has snowmaking as long as that fits in the future plans. We also have to remember that most of the mountain is a lease from the Forest Service.

Are the users willing to support Snowking using and paying for activities? Sending visitors to Snowking?

Where does an affordable family ski resort fit in the mix. This is a big part of what I think of as a local hill.

What happens if the additions don't make Snowking economically feasible.

Snowking, the users, the town need each other.

If we sacrifice the boundaries of Snowking are we willing to not build more trails in adjacent wildlife areas.

How will the current historical summer hiking and biking trails and use be affected by changes. Will it be restricted. New trails for downhill bike or existing ones.

Do subsidies allow for less changes?

Do we need Phase 1.5 not 2.

From: Kirk Davenport
To: [Town Council](#); commissioners@tetoncountywy.gov; planningcommission@jacksonwy.gov; planningcommission@tetoncountywy.gov; parksandrecboard@tetoncountywy.gov; [Comments-intermt-n-bridger-teton-jackson@fs.fed.us](#); marymoore@fs.fed.us; jlove@jhnewsandguide.com
Subject: Snow King
Date: Monday, September 17, 2018 10:44:07 AM
Attachments: [Snow King Comments.pages](#)

Dear All —

Thank you for the time and energy you spend on behalf of all of us to balance wildlife, community character and the nearly irresistible urge to develop real estate in our Valley. I am writing to ask you to keep the following principles in mind as you decide how to handle the requests from the owners of Snow King to dramatically change the character of our town hill:

- 1. Protect wildlife habitat and honor our Town/County Comprehensive Plan:** don't allow the developers to bulldoze and fragment a massive amount of wildlife habitat to the east (into Cache Creek drainage), west (right up against a winter wildlife closure), or south (into sunny slopes with the best forage). This directly contradicts the core of our Comprehensive Plan: "protect and preserve the area's ecosystem in order to ensure a healthy environment, community and economy for current and future generations." Instead, help them see how they can improve terrain within the existing front-side footprint. My understanding is that the south side of the King includes important elk calving grounds as well as a healthy raptor population. These critters are critical to the magic that is Jackson Hole. Please fight for them!
- 2. Hold investors accountable to the 2000 base masterplan** in which the town gave them 500,000 square feet of commercial development in exchange for that serving as the "financial platform" for the ski resort. The investors are trying to get out of that deal and instead keep all that revenue for themselves, while using new amusements like a zipline, and a massive restaurant / wedding complex to be the "financial platform" for the resort. The town should make them choose - either they get to keep 500,000 sf of development at the base OR they can build new profit-centers like ziplines. I want to see the King succeed, but not by walking away from carefully negotiated commitments.
- 3. Negotiate strongly for use of Town land:** the town should start to charge fair market leases for the town land Snow King leases (instead of \$100/month for almost 30 acres, like now), especially if Snow King keeps charging locals to hike uphill on our own land, breaking with 80 years of free access tradition. Also, the town should not give away Phil Baux Park / ballpark land or allow a zipline on it at all. Any additional use of public town land needs a fair trade of private land in return.
- 4. Protect our community character.** Our land development regulations put clear rules in place for Planned Resort Zones (4.3.1), like "Ensure a balance is maintained between tourism and community that promotes social diversity but does not cause undesired shifts away from rural, western community character." Does all this proposed development meet this test?

Thank you for the thought you put into the consideration of the many requests from Snow King's owners. This is a pivotal moment in the history of Jackson Hole. Please do the right thing. Thank you

Kirk Davenport

From: Katy Klotz
To: comments-intermttn-bridger-teton-jackson@fs.fed.us
Cc: [Town Council](#); [County Commissioners](#)
Subject: Proposed Improvements to SK Mountain
Date: Monday, September 17, 2018 4:16:57 PM

Ladies and Gentleman

We are writing you as homeowners and full time residents in East Jackson. We are very much in favor of the Mountain's plans for the Hill. We firmly believe these plans will ensure the viability and financial success of the Mountain, and be of real value to the entire community for decades to come. We strongly encourage you to work with the Mountain to overcome minor concerns that persist, and quickly approve the bulk of their plans, or all of their plans, as quickly as possible.

Thank you

Katy and Tom Klotz

From: shane rothman
To: tchpb@tetonwyo.org; [County Commissioners](#); [Snow King Engagement](#); [Town Council](#); marymoore@fs.fed.us; poconnor@fs.fed.us; [Steve Ashworth](#); comments-intermtn-bridger-teton-jackson@fs.fed.us
Subject: Snow King Mountain's historical Integrity
Date: Monday, September 17, 2018 1:07:22 PM

To all cooperating agencies in regards to Snow King Mountain:

Snow King Mountain is one of the last unrecognized significant historical sites remaining in Jackson, and by far our most recognized landmark. No one has ever written a book about its amazing history, but the Teton County Historical Preservation Board did provide a detailed report prior to "Phase 1", and found that a few buildings are eligible for designation, as well as the whole mountain itself:

"In order for a property to be listed on the National Register of Historic Places, it must have documented historic significance and retain historic integrity, so that its significance can be seen and understood. There is no doubt that the Snow King ski area is significant in Jackson Hole history and culture. This preliminary evaluation has determined that the property also retains sufficient integrity to warrant nomination to the National Register of Historic Places as a cultural landscape. Further research is required to positively identify and evaluate all of the contributing and non-contributing features of the landscape."

While Max C Chapman and Assistant Jeff Golightly meet with the Teton County Historical Preservation Board to discuss the future of the historic Deloney Street parcel that may be developed into a 90,000 square foot hotel site, they should also discuss what can be done to acknowledge the superior history at Snow King Mountain. Their package of proposals and demolitions would ruin any prospect of proper designation in the future. Hopefully SKMR LLC would agree that the "Town Hill" deserves recognition for its role as one of the first ski areas to be established on USFS lands (and the first in Wyoming), and that there are still physical elements that can assist to educate future generations.

Here are some additional conclusions that can be found at: <https://www.tetoncountywy.gov/DocumentCenter/View/2808/Snow-King-Area-Report-PDF>

Evaluation of historic significance:

The Snow King ski area appears to be eligible for the National Register of Historic Places as a rural historic landscape under Criterion A, with areas of significance in Community Development and Recreation. The ski area has played a major role in the development of Jackson Hole as a ski destination. Although later eclipsed by the Jackson Hole Ski Area, Snow King was the first ski area to be developed in Wyoming and early on established Jackson Hole's reputation as a ski town. Snow King has also played a major role in the culture and traditions of Jackson Hole, from fund raisers, carnivals and other community events to ski races and exhibitions.

Evaluation of historic integrity:

As an operating ski area, Snow King has necessarily changed to keep pace with the changes in the sport of skiing, with new, faster lifts, wider trails, and updated ski facilities. However, while many of the character-defining features of the historic ski area have been replaced in the past 50 years, the mountain itself and the ski trails retain integrity as character-defining elements of the cultural landscape that have shaped the image and character of Jackson Hole since the late 1930s. Features described above that are more than 50 years old and retain

historic integrity are also contributing features in the rural historic landscape. In addition to ski runs and trails, specific buildings and structures more than 50 years old include:

- Old Snow King lift line and unloading station (1959)
- Panorama House (c. 1960)
- Snack shack (c. 1959)
- Maintenance shop (date unknown)
- Ski patrol cabin (c. 1959)
- Old lift house (1959)

...I would be very proud to see Snow King officially acknowledged as a landmark in any way, shape or form. I believe that the “unchanged view” should be preserved (with consideration for potential new “narrow ski trails” with minor visual impacts), and believe that a further restored “Panorama House” could be a great viable and educational alternative, compared to the costly current proposal that sets a poor precedent for usage of public lands. The current Panorama House building should not be demolished, and still has great potential for future usage.

Acknowledgement of these specific aspects will not only pay tribute to the community’s history, but can also provide Snow King with a unique opportunity to market their ski area as an anomaly amongst the rapidly changing ski resort industry.

Thank you all for your time and consideration,
Shane Rothman
Jackson WY

September 17, 2018



Dear Mayor Muldoon & Town Councilors:

Thank you for the opportunity to comment regarding Snow King. We believe Jackson Hole can be a national model of a strong community living in balance with nature, and Snow King can be the greatest example of this balance: a ski hill built on our community values of protecting wildlife and providing access to nature on our public lands.

We are dismayed that Snow King's current owners ignored at least half of our community's input and have submitted a proposal to you and the Forest Service that would add a zipline to Forest and Town land, expand the development footprint into important wildlife habitat in three directions, and get developers out of the deal from 2000 in which a Town upzone of commercial land at the base pays for the ski area – instead asking us to sacrifice the character of our Town Hill for new profit centers like the zipline.

You are the decision-makers on many of these elements: thank you for your attention and care. Today, we ask you to also write to the Forest Service during their Scoping Comment period, on behalf of our community.

1. Please ask the Forest Service to prepare Alternatives including:

- A "no net increase in *boundary area*" Alternative: if they expand boundaries on the front side, they must reduce them on the back side
- A "no net increase in *footprint*" Alternative: meaning no expansion, clearing, bulldozing, etc in any direction – not on the east, west, or back side
- A "preserve and protect the area's ecosystem" Alternative: meaning create an option that *best* preserves wildlife, habitat, and the ecosystem

2. Please also ask the Forest Service to highlight our Comprehensive Plan goals and Land Development Regulations during their "Issue Identification" phase.

Our 2012 Comprehensive Plan gives clear direction: "Preserve and protect the area's ecosystem in order to ensure a healthy environment, community and economy for current and future generations." One relevant policy is that "existing Planned Resorts should be limited to their existing footprint" (Policy 3.1.d). The same investors own Snow King and major private parcels in the Planned Resort area, and they are trying to expand their operational footprint in all directions – on Forest land, on Town land, and on private land. This massive increase in development and use clearly contradicts our Comprehensive Plan directive to protect our ecosystem. Please ask the Forest Service to not allow new development, roads, or chairlifts outside the existing operating footprint. Instead, they should encourage Snow King to improve terrain and amenities only *within* their existing footprint.

Our current Land Development Regulations have many relevant points as well. Under Planned Resort Zones (4.3.1) we read that "The intent of this development type is to:"

LDR Text	Our analysis
Encourage recreational activities that rely on indigenous natural attributes of the area, contribute to the community's character and economy and have a long-standing, beneficial role in the community	Ziplines can be built anywhere, go against our community character, do not have a long-standing or beneficial role – and are opposed by a large segment of our community.

Ensure that resort plans incorporate a mix of land uses, promote alternative modes of transportation, and provide a pedestrian-oriented community in order to alleviate traffic-related impacts	See discussion of impacts, below.
Ensure resort plans are consistent with the Comprehensive Plan, and therefore, are beneficial to the community	See Comp Plan 3.1.d: “should be limited to their existing footprint” above. Also, “protect and preserve the area’s ecosystem” vs. major habitat destruction with new roads, chairlifts, and trails.
Enable long-range planning for infrastructure, capital facilities, and community land use patterns by establishing a level of predictability in the maximum potential size and character of each resort area	The current investors want to remove the predictability we have had for decades by drastically changing the size and character of this resort area.
Ensure a balance is maintained between tourism and community that promotes social diversity but does not cause undesired shifts away from rural, western community character	This proposal will mark a clear end to “Jackson Hole, Last of the Old West.” Ziplines, downhill bike parks, and massive event centers on top of Josie’s Ridge are widely undesired and clearly not “rural, western community character.”
Produce resort plans that make significant contributions toward protecting attributes of the community that are considered critical to the community’s long-term health, welfare, and well being	This new plan will harm our community by destroying wildlife habitat – directly contradicting our core Comprehensive Plan goal to “protect and preserve the area’s ecosystem.”

3. Please ask the Forest Service to analyze the impacts from all projected uses, and require that Snow King commit in legally-binding documents to fully mitigate all impacts *before* getting approval to build any new projects. Please ask the Forest Service to analyze these and similar key questions:

- How many skier days does Snow King host today – and how many will it host after boundary, trail, and lift expansion?
- How many people ride the Summit lift now and how many people do they expect to ride the new gondola – in winter, and in summer?
- How many people do they expect to ride the zipline, every day, and total?
- How many employees does Snow King have now – vs. after building all these projects?
- How much parking does Snow King use now – vs. after building these projects? How many new parking spots will this development require, and where will they put those spots?
- How much more impact will there be on utilities – water, sewer, garbage, etc?

With gratitude for your work on behalf of our community,



Skye Schell

Executive Director

Jackson Hole Conservation Alliance

Protecting the wildlife, wild places, and community character of Jackson Hole.

685 S. Cache St. • P.O. Box 2728 • Jackson, WY 83001 • (307) 733-9417 • info@jhalliance.org • JHalliance.org

September 4, 2018

Dear Fellow Jacksonites

I am writing to oppose some of the proposed developments on Snow King (Town Hill) Specifically:

1. Zipline is not a reflection of our towns love of outdoors, nature activity,

2. Proposed expansion to the east of present development, cuts further into natural wildlife area,

3. New road across the face of the hill. Isnt there a road on back of hill for use in Leeks canyon?

Snow King is a back drop for our unique town, I oppose spoiling the look and feel of this special hill.

Sincerely,

(resident since 1957) Ruth Hirsch

Copies to:
U.S. & W. Dev.
Teton Co. Commission

Box 975
Jackson, WY 83001

September 14, 2018

Mary Moore
Bridger-Teton National Forest
Jackson Ranger District
PO Box 1689
Jackson WY 83001

Dear District Ranger Moore,

My letter of September 3 incorrectly reported the grade of the Leeks Canyon Road on the backside of Snow King. The section that reads "has a grade of 11 to 12 percent, except for a short section near the bottom of 14 per cent", should read: has a grade of 10 to 15 percent near the top and from elevation of 7280 feet to 6800 feet has an average grade of 21.3 percent with no section steeper than 26 percent.

I continue to point out that this road was used for the construction of the top terminal of the original and current Summit Lift.

Sincerely



Rod Newcomb
PO Box 2465
Jackson, WY 83001

Cc:
Jackson Town Council
Teton Co Commission
Jackson Planning Commission
Teton Co Planning Commission
JH news and Guide

From: Mary Neal
To: [Snow King Engagement](#)
Subject: Snow King expansion
Date: Tuesday, September 18, 2018 10:16:53 AM

18 September 2018

To Whom It May Concern,

I am very concerned about the discussions regarding expansion of the Snow King footprint. Most people who have chosen to live in Jackson Hole or choose to visit profess a deep appreciation for its natural beauty and wildlife. But it seems that more and more that "we" continue to profess this appreciation while simultaneously sacrificing habitat for growth. This sort of hypocrisy is appalling and really quite shameful.

We have already seen the negative impact of greater mountain bike use of the Cache Creek drainage and I am strongly opposed to expanding the Snow King boundary into the wildlife habitat and historic migration routes that surround the current footprint of the resort.

Thank you for being thoughtful, responsible, and forward thinking in your consideration of this excessive growth proposal.

Sincerely,

Mary Neal, MD

.change begins with an individual. w.b.neal 3

~ Please consider the environment before printing this email or its attachments ~

From: Skye Schell
To: planningcommission@jacksonwy.gov; [Snow King Engagement](#)
Cc: [Town Council](#); [Tyler Sinclair](#); [County Commissioners](#)
Subject: What's the deal with the Snow King base area amendment?
Date: Tuesday, September 18, 2018 5:55:46 PM
Attachments: [Town Planning Commission Snow King base comments - Alliance.pdf](#)

Dear Town Planning Commissioners (and other interested decision-makers):

Thank you for the opportunity to comment on the base area masterplan amendment from some of the investors behind Snow King. We appreciate your time and effort, and have prepared the attached comments for your review.

Our top request is that you please help the Town Council hold the investors to the "quid pro quo" deal we made in 2000 - instead of letting the investors get out of all of their responsibilities as they appear to be attempting. I've tried to outline the situation clearly in these comments - please let me know if they make sense of if you have any questions or other perspectives.

Thanks,
Skye

--

Skye Schell
Executive Director
Jackson Hole Conservation Alliance

office (307) 733-9417 x1
www.jhalliance.org
fb [JHConservationAlliance](#)

Help Build [Safe Wildlife Crossings for JH!](#)

September 18, 2018



Dear Town Planning Commissioners:

Thank you for the opportunity to comment on the Snow King base area master plan amendment. We believe Jackson Hole can be a national model of a strong community living in balance with nature, and Snow King can be the greatest example of this balance: a ski hill built on our community values of protecting wildlife and providing access to nature on our public lands. We want Snow King to succeed as our Town Hill, not an amusement park covered in new condos at the base.

We appreciate that the Town, County, and Forest Service are all working together to make holistic decisions about the future of Snow King. Within that context, please understand that **the base area master plan amendment you are currently reviewing is entirely about future private real estate development – and the developers are proposing a radical shift from the deal our town made in 2000.**

In 2000, our town made a deal with Snow King to allow dramatically more commercial and lodging development at the base – 915,000 square feet, the equivalent of almost 10 Marriotts or two Four Seasons – in exchange for that development serving as the “financial and operational platform” for the ski area¹. Essentially, local government created many millions of dollars of commercial property value through an upzone, and gave it to the investors. In total, that development equates to 550 new condos or 1100 new hotel rooms – about half of it still latent. Nearby condos are currently selling for \$1.5-2 million, so 550 condos means \$800 million to a billion dollars of condo revenue. A small portion of that revenue was supposed to – and easily could – support the winter skiing operations.

The investors agreed to use some of the additional revenues from the increased lodging and commercial development to fund “community-oriented activities” like operating the ski area. The Resort Master Plan was crystal clear on how this would work:

“The Snow King ski area provides a venue for the junior ski racing programs, adult ski racing as well as recreational skiing and snowboarding, both day and night. ... It must be noted that many of our community partnership activities mentioned above often come at a high cost to Snow King. Resort operation of lodging and other facilities provides the financial and operational platform and the resources to support these and other community-oriented activities.” [172-173]

This is normal for ski resorts – most don’t make their money on lift tickets, they make money on lodging, real estate, and commercial development at the base.

So, Snow King’s investors agreed to create the Snow King Resort Master Association (SKRMA). The simplest way to understand SKRMA is that it’s like a Homeowners’ Association (HOA) for everyone who owns land or does business at Snow King. SKRMA was empowered to charge dues on all the property owners. According to the Resort Master Plan:

“SKRMA will act as a pseudo improvement district and be entitled to assess and collect dues and assessments from all property owners, renters, resort guests and from any

¹ *Snow King Planned Resort District Master Plan [2000]*, page 172-173.

entities performing management functions, owning property or obtaining revenues within this Planned Resort District. These dues are intended to cover all of SKRMA's costs including various mitigation plans, constructing and maintaining any improvements that are its responsibility including landscaping, roads, utilities, employee housing, parking, pathways, recreation, district promotion, common signage, transportation, marketing and any other aspects associated with the proper and successful implementation of this Master Plan and its goals and objectives." [171]

The deal was clear: the community gave Snow King's investors additional commercial value and revenue; in return, the investors agreed to use part of that revenue to pay for community benefits. Unfortunately, Snow King's investors never carried out their end of the deal. They never levied dues through SKRMA to fund the "community-oriented activities" with those dues. According to the Wyoming Secretary of State's website, SKRMA stopped even filing its paperwork, so the State dissolved it in 2014.² (Snow King has since re-filed SKRMA's paperwork.)

It gets more complicated. When our community made the deal with Snow King in 2000, the same investors owned everything: the ski area, the hotel, and the vacant land at the base, so it would have been easy for them to set up SKRMA. But over time, the investors made short-term business decisions to sell off key parcels like the hotel and the new condos, sacrificing part of their "financial and operational platform" for fast cash. As a result, there are now more owners at the SKRMA table, making it more complicated to get agreement on how to levy and spend dues – but that doesn't change their responsibilities.

We hoped the investors would try to fix this situation through the amendment in front of you. Unfortunately, they're doing just the opposite. **The new investor group wants to delete their responsibilities from that deal with the Town, and instead set up a new deal in which intrusive on-mountain amusements like a zipline serve as the "financial platform" for the mountain.** They want to do this by changing the base master plan text as follows (see the "track changes" version, PDF page 366 in the P18-208 transmittal memo):

Current text	Proposed text
Resort operation of lodging and other facilities provides the financial and operational platform and the resources to support these and other community-oriented activities.	"operation of lodging, conference, and on mountain activities provide the financial and operational platform and the resources to support these and other community-oriented activities."

However, they want to keep the remaining 500,000 sf of commercial development they received from the Town in 2000. We believe that the investors need to decide whether to have their cake or eat it, but not both. Either they follow through with the 2000 master plan deal and use the development and commercial revenue to support the ski hill, as promised, or we should undo the deal entirely (and remove the massive future commercial development potential) and they can use new zipline revenues to support the ski hill.

²WY Secretary of State website:

<https://wyobiz.wy.gov/business/FilingDetails.aspx?eFNum=142033254045148183251016013178103047250038006104>

Here are two simple options:

	Town: Base master plan	USFS: On-mountain
Option 1: stick with deal	Follow through with 2000 deal: use revenues from the base to support ski area, keep 500,000 sf of latent development	Don't need to build new amusements to generate revenue, since revenue comes from base
Option 2: new deal	Undo 2000 deal: don't use base revenues to support ski area – and remove 500,000 sf of latent hotel/condo/commercial development	Build new amusements to generate on-mountain revenue to support ski area, since no revenue from base

Before our community gives Snow King's investors even more economic benefits on our Town Hill, we and our Town Council need to hold them accountable to the deal they already agreed to. *Before* we approve anything new, Snow King's investors should get together with the other resort property owners and agree on a legally-binding SKRMA funding structure, dues, and what those dues will go to. They should commit (in binding documents, with bonding) to keep the lifts spinning, maintain free uphill public access to our public lands, build workforce housing, and invest in transit and parking for their new summer traffic – with the dues from their commercial and lodging revenues.

How this relates to decisions on Town land

The investors also want to take over more Town land in Phil Baux Park, to land a private gondola and zipline. The Parks & Rec director and board both rejected a zipline on Town land, and the board also rejected the proposed gondola location. Whatever Parks & Rec *does* approve should be part of a comprehensive negotiation about the entire future of Snow King – public and private land. Please work with your Parks & Rec colleagues to come up with a joint recommendation for:

1. Re-negotiating the base area masterplan [you recommend, Town decides]
2. Re-negotiating Town lease agreements for Phil Baux Park, the almost 30 acres of ski area the Town owns, half the ice rink building, etc [Parks & Rec recommends, Town decides]
3. Allowing new amusements like ziplines [Town recommends, Forest Service decides]

Please look at all these processes holistically and comprehensively, so that our community can best negotiate a great outcome for our Town Hill.

Please let me know if we can be of assistance.

Sincerely,



Skye Schell

Executive Director

Jackson Hole Conservation Alliance

Protecting the wildlife, wild places, and community character of Jackson Hole.

685 S. Cache St. • P.O. Box 2728 • Jackson, WY 83001 • (307) 733-9417 • info@jhalliance.org • JHalliance.org

From: Frederick Reimers
To: planningcommission@jacksonwy.gov; [Snow King Engagement](#)
Cc: [Town Council](#); [Tyler Sinclair](#)
Subject: Snow King
Date: Wednesday, September 19, 2018 9:16:16 AM

Dear Town Planning Commissioners:

Thank you for the opportunity to comment on the base area masterplan amendment proposed by Snow King. I appreciate your time and effort.

1) Please recommend the Town Council hold Snow King investors to the "quid pro quo" deal made in 2000. They appear to be trying to get out of their responsibilities from that agreement. Savvy investors such as these were surely aware of the conditions under which they were investing, and nothing has changed that should extenuate those circumstances. With the concessions allotted then, the principle investors should easily be able to profit from their overall investment, and therefore support the ski hill.

2) Snow King's representatives have made much in their several latest public appearances of Steamboat's Howelsen Hill. Having watched a few, it is important that note that Snow King's assertions are misleading. As a former Steamboat resident (2001-2004) and journalist, these assertions were simple to check with a few phone calls to Steamboat town officials.

—Snow King has claimed that the town of Steamboat, which owns it's local, small, Snow King-like ski hill, tried to find a private company to run the operation but that no one would do it because it loses \$600,000 annually. What he isn't saying is that the reason the town rejected the RFP from private equity-owned Steamboat Ski Resort is that it would jeopardize the ski jumping facility, which trained several local olympic medal winners and is considered as essential to the town's character as Grand Teton national park is to Jackson.

According to the guy I talked to, the community told the town they wanted to continue supporting the hill - and the ski jump facility - despite any loss because - his words here - *"they did not want to see it become like, a Disneyland, you know."*

Ultimately, an agreement was reached that splits responsibilities between the town and the local ski club, which primarily uses the hill. Most are happy about it.

<https://www.steamboatpilot.com/news/our-view-howelsen-agreement-worth-the-wait/>

—They may claim that, unlike in Steamboat, Snow King hasn't been subsidized by the Town for 80 years. With the discounted land leases and snowmaking system assistance, that's obviously untrue.

Frederick Reimers
Jackson, WY
541-520-4873
frederick.reimers@gmail.com

From: Sue Muncaster
To: comments-intermtn-bridger-teton-jackson@fs.fed.us; [Town Council](#); [County Commissioners](#)
Subject: Snow King Mountain Improvements
Date: Thursday, September 20, 2018 11:41:04 AM

To Whom it May Concern,

Thank you for the opportunity to comment on the proposed improvements on Snow King Mountain. I'm writing as a Town of Jackson citizen, mom, ex-international guide and ski patroller, hiker, environmentalist, and employee of Snow King Mountain. My husband and I joined the Snow King team 4+ years ago as the founders of the Treetop Adventure Aerial Adventure Park and I now serve as Sports and Recreation Business Manager.

In general, I am very supportive of the Snow King Phase 2 plan as proposed and do sincerely believe that over the past three years the ownership has made significant compromises in the proposal based on public comment. I also know that improvements to the infrastructure on Snow King are critical to keeping the mountain financially viable and visitors and employees safe. I also believe that Snow King serves many diverse user groups and that Snow King Mountain is the right place to concentrate human recreation. I also stand behind the Teton County/Town of Jackson Comprehensive Plan mission to "Preserve and protect the area's ecosystem in order to ensure a healthy environment, community and economy for current and future generations."

What I've learned during my time at Snow King is that enjoying the outdoors means dramatically different things to different people. I believe that there are opponents in our community who would like to keep this resource for only those with the endurance and skill to ski or hike the mountain. The reality is that to attract multiple generations, demographics, and abilities to recreate or sightsee on the mountain Snow King should offer a wide range of activities.

I support the road to the Summit located on the front of the mountain with the requirement that old roads are filled in. Every ski area has roads that cross ski runs - in Vail, for example, the roads crossing International are what make the world-class downhill course world class! Without the road on the front side of the mountain, there would not be a reasonable "easiest" run down - something that's essential for both skiers and rescue personnel and employees like snowmakers and lift operators. The road on the backside of the mountain, I believe, would be most disruptive to the secluded tranquil environment back there and impact wildlife. It would also increase in-town traffic with workers having to drive all the way through town and down toward South Park to come up the back side for construction purposes.

Ziplining, while not my personal favorite activity, is wildly popular because it's an opportunity for someone who's a little more subdued by nature to challenge themselves and broaden their horizons with an exhilarating activity that's completely safe. We've also seen on the Treetop Adventure that there's nothing like a shared adrenaline experience to bring people together. You see it happen all the time where people encounter a brush with danger or are required to work together to overcome a challenge. People often like the idea of getting out to the outdoors, but aren't so keen on the sweat, blisters and achy muscles that come with it. The thing about zip lining is that it accessible to everyone - and this should be a requirement (ADA). I support a zip line that snakes through the

forest and has an educational component (flora/fauna) to it, not one that follows the gondola cables.

I strongly support the proposed beginner area at the top of the mountain as well as the downhill mountain bike trails - both because my kids and I personally love those activities, but because I believe they are financially critical additions to the project.

I am concerned about the increased use of the mountain and loss of the tranquility and wide-open spaces that make Snow King so special, and do believe that over-use will degrade the environment and, eventually, reduce the economic value of the resource. In this I definitely stand with the Comp Plan. I believe that the USFS, through the scoping process, could identify some kind of reasonable capacity on users to help mitigate this (i.e. capping the capacity of the restaurant at the top at 200 not 500, or capping the user days at the yurts or seasonality of the biking). This would be not unlike limiting the number of fishing boats or rafts on the river to ensure an excellent experience for guests.

As for "community good" I know, because I talk to every scout, school, church, therapy, and Coombs kid who comes here, that Snow King contributes more than \$100,000 annually in free or reduced price activities, cash donations, and prizes for fundraisers to locals. This will only increase with development and financial stability.

The Mountain Sports Training Center is appealing - but makes the most sense to me as a public/private entity. As for the observatory and planetarium? Those are just frosting on the cake - my favorite part of the plan because of the awe they will inspire.

In closing, thank you for your close consideration of this project and I do believe that the public input is key to making this the best project it can be.

Sincerely,

Sue Muncaster
PO Box 6404
295 Nelson
Jackson, WY 83002

From: Pat Butts Pat Butts
To: [Snow King Engagement](#)
Subject: Snow King Issue
Date: Friday, September 21, 2018 1:41:42 PM
Attachments: [Snow King Engagement.pdf](#)

While I'm no longer a resident of the Town of Jackson, I lived for many years on Lodge Pole Lane in Cache Creek and feel passionately about the aggressive behavior of the Snow King owners who want to take advantage of the town and surrounding forest land. I am hopeful the Town of Jackson will step forward and negotiate a fair agreement (fair to the tax payers and not a give away to Snow King) if they allow Snow King to further occupy tax payer properties, especially in light of Snow King's disregard for local skiers, hikers, and residential neighborhoods.

I am attaching my comments to the Forest Service for your records.

Pat Butts
307-353-2864

September 21, 2018

Ms. Pat Butts
365 E Bustle Creek Drive
Alta, Wyoming 83414

Bridger Teton National Forest

Jackson Ranger District
PO Box 1689
Jackson, WY 83001

Attention: Mary Moore, District Ranger

Re: Snow King On-Mountain Improvements Projects

First, thank you for extending the public comment period on this very important issue of the Snow King On-Mountain Improvement Projects. Those of us who have lived in the area for a number of years appreciate the partnership that has existed between the Forest Service and the public in maintaining the quality of life for our ecosystem.

I have just completed a summer working at Headwaters Lodge and Cabins at Flagg Ranch as a reservation agent. You might wonder why that would have an impact on the current issues in Jackson. It's simply this: living in a travel trailer in the camp ground here has brought me closer to Nature and to appreciating the intricacies of our ecosystem—the interrelationships of the plants, animals and people. Working with the summer visitors has reminded me of the great value we enjoy in this area because of the wonders of the natural life this area exhibits. Seeing people relax without their cell phones, their internet connections, their TVs and beginning to appreciate their natural surroundings calls to mind what brought me to Jackson so many years ago (1968). It's the natural wonders of the area that make this land unique.

The proposed Snow King expansion goes against everything that brings people to Jackson. In 2012 the people in the community spent long hours drafting a Comprehensive Land Use Plan which was adopted by the Jackson Town Council and Teton County's Board of County Commissioners. The recent publication of *Mosaic* reiterated the plan's Vision Statement: "Preserve and protect the area's ecosystem in order to ensure a healthy environment, community and economy for current and future generations." The current Snow King Expansion plan flies in the face of this vision, disregarding the documented wildlife (moose, deer, elk, cougars, bears, raptors, etc.) which will be displaced by the expansion. Already the increased utilization of the Cache Creek area by mountain bikes has hijacked the previous enjoyment of the area by hikers and horseback riders; allowing Snow King to expand commercial operations beyond their current footprint into the forest areas will further disrupt wildlife habitat and block known migration routes and winter range. Wildlife are our precious resource, not to be vanquished by commercial concerns for the bottom line. The wildlife and environment must come first.

From a practical standpoint, and as a former alpine skier, I can't see how the proposed road cutting across the north face of the ski hill can add to the safety or enjoyment of the winter skiers. The steep cuts necessary to extend the road for the stated purpose of servicing the uphill development will

compromise every existing ski run, totally eliminating the long, uninterrupted downhill runs that have made Snow King so valuable for an exhilarating ski experience, but also for the training opportunities that bring so many ski teams to the mountain. It appears Snow King is abandoning its original purpose of being one of the premiere ski slopes for expert skiers; skiing is taking a back seat along with wildlife for the pure commercial purpose of making a profit.

And finally, it's difficult for me to understand how adding mechanical activities like Zip Lines does anything for "preserving and protecting the area's ecosystem." How does a zip line enhance the appreciation of the natural beauty of the forest which is an important guideline for the Forest Service? The noise will distract from the natural environment, distract from the enjoyment of our visitors who come to experience the outdoors in its natural state, and greatly impact the adjoining residential areas, many of the homes in place prior to the current Snow King enterprise.

The value of our Jackson Hole community lies in the close partnership which exists between the many public agencies governing the surrounding wildlands and forests and the people who have chosen to live in the area—all working to maintain the integrity of the ecosystem that makes this such a special place. I urge you to consider the impact of the proposed Snow King Improvement Project on this very fragile environment and move to stop the commercial expansion in order to continue furthering the Forest Service mission of *sustaining the health, diversity and productivity of the Nation's Forests and grasslands to meet the needs of present and future generations*. Please honor the local community's 2012 Comprehensive Land Use Plan as you move forward in your deliberations.

Thank you for your consideration.

Sincerely,

Ms. Pat Butts

Cc:

Bridger Teton National Forest, Patricia O'Connor, Supervisor

Town of Jackson, Tyler Sinclair, Planning Director; Jackson Town Council, Teton County Board of Commissioners,

Jackson Hole News and Guide

From: Pat Butts Pat Butts
To: [Bob Lenz](#)
Subject: Snow King Issue
Date: Friday, September 21, 2018 6:01:22 PM
Attachments: [Snow King Engagement.pdf](#)

I've sent a letter to the Forest Service with a copy to Tyler Sinclair. Tyler said he would share with town and elected officials. I'm attaching a copy to this email just so you have your own copy.

Bob, we've known each other a long time. I was happy to see you were elected to the Town Council because I felt you would bring some perspective to the council from one who has lived many years in Jackson. I appreciate that new and younger people move to town and want to see things move in the directions they see as significant. I also realize that change happens. However, when did we decide it's ok to go against everything the area has stood for in pursuit of growth, profit, and personal gain?

It has been very difficult to follow the Snow King issue because what is being released for public consumption isn't what's going on behind the scenes. As a former business owner, I understand the need for making a profit. What I can't understand is the right of a business entity to prostitute the land to do so. Did you move to Jackson to have it turn into a Disneyland? I am so offended by the actions Snow King is taking (and probably still stinging from trying to take a walk up Cache Creek where I lived and raised my daughters and almost getting run over by mountain bike after mountain bike). What happened to appreciating the beauty and serenity of our natural surroundings?

I also understand that the Town and County have worked with Snow King over the years to try to keep it afloat. But perhaps that has to stop. Taxpayers shouldn't be giving a free lease to SK for operational purposes, allowing them to have use of city lands for a nominal fee while they impose increasing fees on local residents for utilizing what has always been the "Town Hill." They've forgotten about being neighborly so I think it's time the Town tightens the reins. They've treated their employees horribly for years; now they're sticking it to the locals. (Can you tell I'm a bit upset?)

Anyway, even though I don't live in the town anymore (I'm over in Alta and loving it), I am seeing Jackson shoot itself in the foot. If Jackson becomes anywhere USA with zip lines, scarfed up hillsides, and even higher prices, people will choose to go elsewhere for their vacations. And locals will have to do what I did--move somewhere else. I'm hearing resistance from tourists passing through Flagg Ranch regarding Jackson as a place to visit. Maybe the town doesn't care but eventually word of mouth will overpower advertising and good intentions.

You have an inside view on the Town Council so maybe you can help me understand this whole situation with Snow King but at the moment I think we're about to lose what has been an enchanting place.

Thanks for all the time you put in and the work you do.

Pat Butts

From: sagarling@rdeinc.biz
To: comments-intermtn-bridger-teton-jackson@fs.fed.us
Cc: [Town Council](#); [County Commissioners](#); sagarling@rdeinc.biz
Subject: Snow King Mountain Proposed Improvements
Date: Friday, September 21, 2018 7:51:54 PM

We are owners of a Grand View Condominium located behind the Snow King Resort, 551 Snow King Loop Road, Unit 5120.

We are in support of the Snow King Mountain proposed development for the area. We believe that the proposed development will improve the facility and expand the outdoor activities for the locals. The inclusion of the novice/easy and intermediate ski runs will be available for the community would provide the local residents the ability for immediate access without the driving trip currently required to go to Teton Village.

We understood that there has been mis-information being discussed about removing the ballfield, which we were informed that the ballfield area would be removed and replaced with a larger green area that would be able to accommodate a variety of sports and play activities.

The Town of Jackson would be remiss in not approving the improvements to the eighty year old facility.

To keep the facility vibrant, the improvements should have been incorporated throughout the life of the mountain, unfortunately, there was a lack of forward thinking and NOW the SK Mountain facility is playing catch up to meet the current demands of the outdoor sports/play activities enthusiasts.

This upgrade is greatly needed and would make SK Mountain facility a desired destination for locals, Wyomingites and our State visitors.

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From: Ryan McCartney
To: comments-intermttn-bridger-teton-jackson@fs.fed.us
Cc: [Town Council](#); [County Commissioners](#)
Subject: Snow King Improvements
Date: Saturday, September 22, 2018 10:14:10 AM

To Whom It May Concern,

I'm a Jackson resident, I manage the Snow King Mountain Sports School and I'd like to express my support for all of Snow King's Phase 2 initiative. Given my responsibilities at Snow King, I'd like to specifically focus on the proposals for additional beginner/intermediate ski terrain and an easy way down from the summit of the mountain.

The Beginner "Experience"

Locals programs aside, the overwhelming majority of our lessons are clients who have never skied or snowboarded. Unlike JHMR, we attract skiers & snowboards who are much lower on the ability level (racing programs aside). To that end, I'd like to walk you through the experience of a "never ever/beginner" lesson as it is currently executed at Snow King:

1. We start by spending approximately. 1-3 hours on the postage-sized Magic Carpet slope by the SK hotel. On a busy day (e.g. Saturdays, holidays) the learning environment is compromised with too many skiers/riders. Safety concerns/near misses take so much precedent over learning that the progression goes much slower than it would with adequate terrain. On a day without overcrowding issues, we spend more time riding the carpet than we do skiing due to the size of the zone. In all cases, there is no room for separation between the straight-lining 5 year old and the tentative 55 year old.
2. Once the client has passed some thresholds (e.g. linking wedged turns) on the Magic Carpet, we walk up two flights of stairs, then ski the appx. 15 foot slope behind Kings Grill/in front of Haydens Post deck. This is a huge jump in slope angle and not ideal, however, we have no better option.
3. If successful, we'll walk the two flight of stairs again, and hike up the ski slope above the Rafferty loading area. Hiking up a ski slope is not ideal and certainly a safety hazard, especially given the blind spot nature of this zone. By the time we make it to the flats, just outside the Grand View Lodge, clients will usually need a few minutes to catch their breath. A lot of times instructors need to carry the clients' skis/poles/snowboards up the slope, so they'll need to catch their breath as well. We'll then descend down the slope (two distinct pitches, one we've already skied in step #2).
4. If successful, we'll then hike the two flights of stairs again, and load the Rafferty lift. The "easiest way down," from the mid-point, is 90% cat track, not ideal given the intimidating downhill side of the cat track, inability to make large enough turns in controlling speed, other skiers/riders flying down the cat-track and dangers involved with the client navigating the switchbacks. Given the wooded areas around these switchbacks, I've seen numerous accidents throughout the years. In one case, just above where the ice wall used to be, one of my students gained too much speed, couldn't stop and accidentally went off a 5-foot drop. Had she exited this drop a couple feet left or right of where she exited, she'd have hit a tree and with the speed she was going, I truly think it would have been a brain damage or worse scenario. Since that incident, I now descend first, take my skis off, and serve as a human shield when the client is unable to stop. I'm a certified ski instructor with years of experience, I've tried many different

methods and safety tactics, but sometimes these incidents are unavoidable given the crux points on the "easiest way down."

The Results

- For Clients: Generally somewhere between a terrible and good experience, but never a great experience. Client is either too exhausted to continue skiing or too traumatized to put on skis/snowboard again due to something that might have gone wrong on their first chairlift run. For parents of students in programs, by far our largest complaint each year is "you haven't taken my student up the chairlift" or "he's been stuck on the Magic Carpet all season." As instructors, we put safety first and I encourage my staff not to take students up until they're confident that the student is ready. This has resulted in significant attrition, lost business and "I'll just take my kids to JHMR" comments.

- For Instructors: Often times a contributing factor to low morale. It's an exhausting lesson to give, it's frustrating given the nature of our beginner/intermediate terrain, it's problematic when the parents pressure you to over-terrain their students/compromise their safety and our success rate (e.g. no accidents, no tears, no fears) of 'first time up the chairlift' is usually around just 50%. This beating on the morale of my staff creates an inability to retain instructors year over year, thus diminishing the quality of our instructors and the customer experience we provide.

- For Snow King: Horrible retention rates. Clients are simply happy to survive their first lesson. Whether fatigued, exhausted, injured, terrified or whatever they're feeling, they simply don't have a propensity to buy a lift ticket or contribute additional revenue to SK at a future point in their trip. And while I don't encourage it, many of my instructors understandably recommend them to the beginner/intermediate terrain at JHMR.

Yes, this scenario is more common to the tourist than the local. On the local front, we'll have the same issues, but thankfully the success/retention rate is often much higher, at least for kids/juniors. I've worked with the Doug Coombs Foundation/Jackson's Latino community, all the local schools, most of the pre-schools, the Van Vleck House, the Boy Scouts and numerous other respectable organizations throughout this community. I've overseen the 292 kids in our seasonal programs last year. I've seen personal development, overcoming boundaries and thousands upon thousands of smiles. Yes, we need to make investments to better accommodate the tourist so that our winter operations can be sustainable. But make no mistake, Snow King is all about encouraging kids and families to get outside and explore our national forest and we only wish to grow this in the future.

The Solution

I'd beg you to consider Snow King's proposed terrain at the top of the mountain. I've skied all of it extensively and truly believe it's the key to a successful winter operation. As any National Ski Areas Association (NSAA) study will tell you, **an appropriate, accommodating and vibrant, beginner/novice area is the feeding ground and lifeblood of a successful ski resort.** On the proposal for ski terrain into Leeks, I've skied all this terrain in low snow years and at it's worst, it's still doable (granted I might have needed to bring my rock skis). But with grooming, snow making, and if needed in low snow years--committing to just a narrow trail or two, it would truly be a game changer for Snow King. On the beginner terrain in the flats, the opportunity to ride a gondi, see the inspiring views and potentially ski in the sun would do wonders for the learning environment we provide to our clients. I've been concerned that wind would be a deterrent factor but in exploring the area on high wind days, the forest that encircles the nature trail provides an extremely effective barrier in blocking our prevailing winds.

Regarding the road down from the Summit, I strongly support it belonging on the front side. Going through Leeks would require an added expense in getting our vehicles up the road, further congest town with our numerous trips, delay our response to safety issues/occurrences and put access to our own mountain in the hands of a private landowner. Should that private landowner decide to exponentially up the price of our access through his property, we'd truly be putting Snow King's future in jeopardy. On a more human note, enabling a beginner the ability to ski down the mountain on their first day would be a truly empowering experience.

The Future

Finally, looking at the Mountain Sports School from a broader perspective, we want to further help people access our national forest through a variety of activities. Thus the ability to employ a staff year round, in the field of sports instruction, whether ski/snowboard instruction, mountain bike instruction, Treetop Adventure Park guiding, zipline guiding or Yurt hosting, would help establish a more permanent workforce for Snow King. Relying on a staff of part timers, many who will work just one season and never return, truly jeopardizes our commitment to safety, client experience and overall revenue.

On a personal note, my well-being, livelihood and future in Jackson is very much tied to the success of Snow King's Phase 2 operations. It's my primary source of revenue, my career, my home to friends and family and my favorite piece of land on this planet.

Thanks in advance for your consideration in supporting all of Snow King's Phase 2 proposals.

Thanks,
Ryan McCartney

--

Ryan McCartney

Mobile: 440-487-9883

Email: rmccartney36@gmail.com

Dear Jackson Hole City Government,

Please share the attached letter of support for the proposed Snow King Mountain improvements with all applicable individuals.

Mike Herman

mlherman@charter.net

Cell: 817-966-4435

Attention: Snow King Mountain Resort On-mountain Improvements

As long-time owners of a Love Ridge/Grand View Condominium, we want to express our support for the proposed upgrades and additions to Snow King Mountain. The proposed improvements and enhancements are all very reasonable, necessary to keep the mountain safe and desirable as a year round recreational center.

The current Summit Lift, mountain top facilities, etc. leave residents and visitors with an undesirable memory of this town center piece. The Town of Jackson is fortunate that the Snow King Mountain ownership group wants to invest and improve “The Town Hill”. The proposed year-round reactional additions will help maintain Jackson as a desirable place to live and visit.

Ski mountains and the lodging associated with ski mountains now require year-round recreational activities to maintain their financial viability. The mountain ownership group’s investments are necessary to make Snow King Mountain economically viable.

As one of the oldest ski areas in the country and the first in Wyoming, Snow King Mountain is really one of the crown jewels of Jackson and it is imperative that it is allowed to continue. Clearly, it is unlikely that the “Town Hill” will continue to exist if the proposed improvements are denied. Please take applicable action to support the improvements.

Respectfully submitted,

Mike

Michael L. Herman

Owner

Grandview/Love Ridge Unit 362

From: Peg Kuechle
To: [Town Council](#)
Subject: Snow King Mountain Improvements Project
Date: Sunday, September 23, 2018 11:48:45 PM

We are writing in strong support for the improvements and master development plan that Snow King Mountain Resort has proposed. My wife and I have lived in Jackson for 13 years and think that the proposed improvements will significantly increase the outdoor recreation and education opportunities for the residents of the Town of Jackson and visitors. Almost all of our neighbors and residents we know in Jackson feel the same way we do and support the Snow King improvement project.

The proposed improvements include ADA accessibility, a wider road to the top of the mountain which will permit beginner and novice skiers to descend from the top to the base and additional beginner/intermediate ski terrain, thereby significantly expanding the number of people who will be able to enjoy these outdoor recreational activities.

My wife and I are in our 70's and are not able to ski at Snow King now because the terrain is too difficult. The proposed improvements would permit us to enjoy outdoor recreation near where we live. The Snow King proposal is also appealing to many people like us because it includes facilities that would promote a number of summer/year around activities such as a yurt camp, hiking trails, zip line, mountain biking trails and others.

Currently the mountain has limited recreational opportunities and as a result it is not financially viable. The proposal would make Snow King viable and sustainable in the future for the community's use and enjoyment and would also generate additional sales and real estate tax revenue. I understand that the proposal also includes improvements to Phil Baux Park and the Skating Rink.

A small but vocal group of people oppose the improvements and want to keep the mountain the way it is, restricting access to the few people who currently use it. I think this is short sighted, restrictive and under utilizes the 'Town Hill'. They also claim that the improvements will create noise and traffic, but ignore the noise and traffic currently created by the Farmers Market and concerts.

The Snow King Mountain Resort proposal would significantly expand the opportunities for year around outdoor recreation and education and permit local residents to use the Town Hill for human-powered recreation. I encourage you to approve the Snow King Mountain Resort's proposal. Thank you for your consideration of our comments.

Gerrit and Peg Kuechle
526 Lower Snow King Loop Drive
Jackson, WY
PO Box 11362 Jackson, WY 83002

Sent from my iPad

From: Robert Bell
To: [Snow King Engagement](#); [Town Council](#)
Cc: [Ryan Stanley](#); [Richard C Lurie](#)
Subject: Snow King Mountain Improvements
Date: Monday, September 24, 2018 1:20:52 PM

Dear Council Members;

As a home owner and full-time Jackson resident, I'm writing to you to express my full support for the improvements being planned for Snow King Mountain. In 2012, prior to purchasing my Love Ridge condo, my realtor outlined the major commitments and proposed changes to the Resort District specified in the Snow King Resort District Master Plan (Town Document # 0547419). I was delighted that future development had been blessed by the Town Council with the approval of that plan in 2000. While this Master Plan dealt primarily with residential and commercial construction – there was a definite commitment that the resort be “responsible for the monitoring and long term replacement of all facilities”.

After nearly 15 years of no capital improvements to Snow King Mountain, the new ownership group invested millions of dollars to replace the almost always broken Rafferty Lift and it's aging ski school hut with a very modern equipment and facility. In addition, they built a ropes course, mountain coaster, and on-mountain grill. The seldom used 18 hole putt-putt course was rebuilt along with the remodeling and landscaping of the open land at the western base of Snow King.

With the changes in ownership of the various major elements within the resort district, the foresight of creating the Snow King Master Association to implement, control and monitor the improvements and services was an important element of that original plan. That group has now offered a revised “plan” document which removes the mid-mountain lodge (and the loss of any associated revenue from such a facility), replaces an aging lift and adds several ‘activity’ based infrastructure changes – which will serve to make this resort district more appealing year round.

The face of Snow King Mountain today is carved up by several intersecting roads and very tight switchbacks. The new plan calls for a single road to the summit to permit summer summit access by vehicles. This more gentle path to the top, would provide a path for less than expert skiers to use more of the mountain during the ski season.

The current Summit Lift is old and in dire need of replacement. Upon arrival at the top of this lift – visitors and residents are greeted with aging infrastructure, rusting overlooks and dilapidated buildings. The new owners of Snow King Mountain are proposing a huge capital improvement project to replace the lift with a much safer gondola and make the top of Snow King a destination that compliments the best ‘view of the town and Tetons’. There are many ‘voices’ in town decrying these changes as land and/or money grabs – the loss of the baseball field, the break up of Phil Baux park, the takeover of more ‘town’ property, etc. I have spoken to Ryan Stanley several times about these charges and in EVERY case he makes it perfectly clear that the ownership and investors are more than willing to make changes to the proposed plan. For example, each potential landing site of the gondola offers distinct advantages and disadvantages for the ownership group and the users of the park area. In addition, Ryan makes it clear that the ownership is willing to commit additional capital to the project to create a truly first class “permeable border between the town and the mountain.” Those changes will require rethinking the best use of all the land at the base of the mountain which could

potentially result in an even larger green space accommodating soccer, lacrosse and other outdoor activities enjoyed by many town residents.

I feel it is imperative that the new owners be given the opportunity to make Snow King Mountain a profitable affair. Please carefully consider the opportunity that is being presented and the potential benefit to the entire community and approve the proposed changes to the Resort District Master Plan.

Sincerely,

Bob Bell

5230 Snow King Loop Rd

#5230

Jackson, WY 83001

307-699-9897

Gratitude turns what we have into enough.

From: Rose C
To: marymoore@fs.fed.us
Cc: [Jim Stanford](#)
Subject: Proposed Snow King Expansion
Date: Monday, September 24, 2018 9:11:03 PM
Attachments: [Screen Shot 2016-05-08 at 6.04.08 PM\[68\].png](#)
[Screen Shot 2016-05-08 at 8.26.37 AM\[11\].png](#)
[25CFAE07-A672-4E14-B778-59DD434DDCE2\[11\].png](#)
[340862B7-3F41-4CFF-BADE-DE18115A5B82\[11\].png](#)
[3D6C2597-B090-4675-BF08-14FD6C6B5593\[11\].png](#)
[1F30CF5E-8922-4530-9160-7ADE5ACB586A\[11\].png](#)
[513630BC-7C36-4FFC-8CB8-53FB43192879\[11\].png](#)
[5F8ED953-FEFF-40F3-8DE5-FA892157B641\[11\].png](#)
[Screen Shot 2016-05-08 at 8.33.26 AM\[11\].png](#)

Hello Ms. Moore,

I am an eleven year resident of Jackson Hole, Wyoming.

I wanted to make my voice known that after reading many of the articles over the years, watching the pages speak out on social media, listening to all of the radio shows, being present at town meetings, & attending private Snow King presentations -- that I am very much against the zipline and the road cutting up the face of Snow King. I'm also not a fan of another restaurant at the top of the mountain (that will be tough the staff), but if they plan to create a Planetarium for the local children -- then I can see how food and beverage will be needed.

I fully agree with Vice Mayor Jim Stanford that "we have enough carnival activities as it is on Snow King." It is clear that there have already been many impacts to our community, with what they have implemented & slipped through indicating it as their "private property." To be honest, I have been appalled at how Mr. Stanley and Mr. Golightly have been approaching their private meetings to the public -- saying things like, "other mountains never need approval to do this, why do we?" "The mountain will shut down if you don't let us make these changes." "We don't see there being any changes to the parking or traffic." I heard these things with my own ears, this is not hearsay.

I used to work in big business Ms. Moore, & to be honest -- it sounds like a big business push + a pull the wool over your eyes. I have always fought big business in New York when they didn't show integrity / weren't being honest & I have a feeling Snow King isn't being completely truthful here. Their approach completely turns me off & wishes someone else owned the mountain with the community's real character in mind. However, I realize we cannot make motions to change that.

I hope you will fight for the character of our amazing community when it comes time for the final decision.





From: shane rothman
To: [County Commissioners](#); [comments-intermtn-bridger-teton-jackson@fs.fed.us](#); [marymoore@fs.fed.us](#); [Snow King Engagement](#); [poconnor@fs.fed.us](#); [Town Council](#)
Subject: Snow King Mountain/2011 SAROE
Date: Monday, September 24, 2018 10:58:40 AM

Hello County Commissioners, as well as all cooperating agencies,

Thank you all for your work and collaborative efforts as a cooperating agencies.

I look forward to seeing much more sensible alternative plans in regards to Snow King Mountain, as a result of Teton County and the Town of Jackson's request.

Concerning the letter to be submitted to the USFS in the near future, please further consider addressing the USFS's prerogative of "adding jobs". I think all of our local cooperating agencies should agree that the BTNF district within Teton County deserves special consideration in regards to this, and perhaps our local government should directly contact the USFS to request updates and exemptions to specific clauses within the 2011 Ski Area Recreational Opportunity Enhancement Act.

Many other mountain towns with similar growth issues should be willing to support special considerations to update the SAROE, although I wouldn't expect any private corporations operating on public land to advocate for changes. Local governments are the public's best hope to help convey and address these conflicting priorities and prerogatives, which have significantly contributed to the negative environmental and socioeconomic impacts of rapid growth.

Failure to address this will likely result in further negative impacts to growth management issues, including workforce housing supply, affordability, and ecosystem stewardship. Please help to ensure that future developments prioritize the environment and local community priorities, first and foremost. This issue is much bigger than just Snow King Mountain, but our rather small ski area serves as a perfect example of how future impacts can spread far outside of the permit boundaries. Taking an active leadership role to address this can help ensure that future decisions on public land can be made in balance with the surrounding environment, as well as community priorities, nationwide.

Thank you all for your time and consideration,
Shane Rothman
Jackson WY

From: Jessica Rutzick
To: comments-intermtn-bridger-teton-jackson@fs.fed.us
Cc: [Town Council](#); [County Commissioners](#)
Subject: Snow King Improvements
Date: Monday, September 24, 2018 10:59:33 AM

I am writing in support of SnowKing's proposed improvements. The mountain is a community asset, but it needs to be updated with new, safe improvements, such as the gondola, the planetarium and training facility. Expansion to the south side will draw new visitors to experience Snow King. Bike trails will improve the existing experience for bikers. The zip line will be low impact and draw new visitors as well as provide income the mountain needs to stay open. The proposed improvements will make this ski area viable for our children and the next generation of skiers who will grow up on Snow King. Sincerely,

Jessica Rutzick

Jessica Rutzick & Associates, P.C.

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Scott Sanchez Snowking 2018

Scott Sanchez
PO Box 3738
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Jackson WY 83001
307 690 0792
scottsanchezflies@hotmail.com

I'm very attached to Snowking and a big part of my life has been spent there since 1984. Running, hiking, skiing, uphill skiing, mountain bike riding and photographing. My son learned to ski there, some of my best powder days have been there. I fondly remember the old Snowking shack. Lunches at the Rafferty Shack.

Snowking, the users, the town need each other. Also, the land mix requires the cooperation of multiple entities to function and be successful. Jackson not just the City of Jackson needs Snowking and Snowking needs us. Where would ski racing and the Ski Club and the High School team, Doug Coombs Foundation be without the Snowking venue? With improvement and changes at Teton Village not there, what about the Town Downhill or Margarita Cup? What about the year round use.

There is already a Comprehensive Plan and Resort District. Are the Town and County willing to maintain and enforce those? Six months ago, I was more adaptable to more changes on the mountain, but with Snowking Mountain's parent groups activities on other properties, I'm more cautious.

Snowking Mountain is a business whether you want it to be or not. It needs to make money. What is the balance of making Snowking Mountain economically viable while maintain the historic character and public access to activities. Unfortunately, the standard formula for ski resorts is to break even or lose money on the mountain and use it as an advertisement to sell real estate and services. I've been bummed out over the years as trails and access have changes, but at the same time realize that there are more of use using the resource.

What improvements give the most economic return and the least impact. My guess is that the only thing that will truly make money is the gondola with a restaurant and million dollar weddings. More lifts, bigger boundaries, extensively increasing ski runs will not increase their profit.

We don't need the road and it is a major intrusion. Apparently, there is a potential easement through Lockhart's property to use the Leeks Canyon road. That was how the initial lift work was done.

Tube park where is it going and what precedence was set by having that in the Park?

Gondola should not take over Phil Baux Park. That is of too much public value. It can be landed on leased or owned property. **It has to be landed on private or lease!**

Where does an affordable family ski resort fit in the mix. This is a big part of what I think of as a local hill.

Subsidized rent on public land has agitated many people. But do subsidies allow for less changes? An avenue that needs to be look at.

In the perfect world. Snowking Mountain and Hotel would be in the same hands and the Mountain would function as an advertisement to fill the Hotel. Snowking Hotel needs to part of the solution on parking since they are the direct beneficiary of Snowking Mountain events.

How many of use Snowking Mountain? All. How many of us have for paid activities at Snowking Mountain? How much have you paid for having Snowking there to use? I'm willing to pay a user fee for uphill ski travel since we use it because it is convenient, groomed avalanche controlled and it has snowmaking as long as that fits in the future plans. However, summer hiking should remain free.

If we sacrifice the boundaries of Snowking are we willing to not build more trails and development in adjacent wildlife areas. We have built enough.

How will the current historical summer hiking and biking trails and use be affected by changes. Will it be restricted. New trails for downhill bike or existing ones?

While there are desires for development that are community beneficial buildings, a structure is still a structure whether for profit or not. It looks the same on the mountain. We don't need an observatory. At the public meeting in January I was overwhelmed by the number of request for activities and amenities that people wanted on Snowking. If all those were accommodated it would be a circus and Snowking Mountain wouldn't have reaped the financial benefit.

What happens if the additions don't make Snowking economically feasible. Is the Town, County and ski club willing to have a non profit ski hill like Bridger Bowl in Bozeman.

Do we need Phase 1.5 not 2.

From: Jeb Stuart
To: comments-intermtn-bridger-teton-jackson@fs.fed.us; [Town Council](#); [County Commissioners](#)
Subject: Snowking Development
Date: Monday, September 24, 2018 5:29:48 PM

Dear Town of Jackson,

I have been living in Jackson for about 15 years now. Snowking is my backyard and very dear to my heart.

I am writing to inform you of my SUPPORT for the developments proposed by Snowking. I know that there is push back, but I feel that future always poses change, and change can be difficult.

I feel that Snowking Mountain has been very accommodating in making sure all voices are heard. The changes proposed will be great for both visitors and locals alike. Without this development I fear for the future of our beloved town hill.

Thank you for your time!!

Jeb Stuart
Sales Manager

p: 307.200.6113 ext 628
f: 307.201.1478
m: 802.578.3713

Stio® | 1725 High School Road, Suite 310, PO Box 1188, Jackson, WY 83001
jstuart@stio.com | www.stio.com

From: Stephen Sullivan
To: comments-intermtn-bridger-teton-jackson@fs.fed.us
Cc: [Town Council](#); [County Commissioners](#)
Subject: Support of Snow King Improvements
Date: Monday, September 24, 2018 12:12:22 PM

Dear United States Forest Service, Jackson Town Council and Teton County Commissioners:

I am writing to voice my support for the proposed enhancements and investments to Snow King Mountain.

As an avid weekly user of Snow King mountain (example, I skinned the King 55 times last winter), the former President of Friends of Snow King (FOSK), a 30-year Jackson resident, a longtime Jackson business owner, and father of three avid skiing/skating/skinning/hiking/biking children, it is my opinion that the now almost ten years of public comment on the future of Snow King is enough. I believe that every voice that has wanted and needed to have a voice has been heard and that the current plan of installing a new gondola, lodge/restaurant at the summit, additional terrain enhancements, more mountain bike trails, a zip line experience, and the potential expansion of the Snow King Sports and Events Center to include a second sheet of ice represent a solid foundation of infrastructure (and safety!) improvements so that this local amenity has a chance to succeed.

I feel that I am uniquely qualified to make this recommendation as I had a crash course in the ski area business as one of the founders, and then President of FOSK, a non-profit group that unsuccessfully attempted to acquire Snow King almost nine years ago. With the support of the LOR Foundation FOSK was able to commission the Snow Engineering Group (SE Group) to provide us an overview of the investment we'd need to make Snow King a successful (breakeven) non-profit business. The SE Group's report to FOSK was similar, but actually went beyond, the scope of improvements that Snow King ownership group is proposing today. FOSK also completed an inordinate amount of due diligence on the business of Snow King and I myself reviewed all of the financials in detail. Simply said, being in the ski area business is tough financial sledding - the variables of the micro and macro economy, weather, the cap-ex costs of the equipment, the staffing expertise and expense, insurance, maintenance, makes it a seriously daunting undertaking.

I honestly consider it nothing short of a gift to the State of Wyoming, Teton County and Town of Jackson that the current Snow King ownership group wishes to undertake further renovation and modernization of the amenity. Quite frankly, I am thankful. I also believe that the Snow King Ownership Group has acted in extremely good faith and allowed more public comment than, as a business owner, I would ever have had the patience to engage in. I'm super perplexed as to why some some local parties (BTW...none of whom I've ever seen on my ritual morning skins up the King - and the leader of one of these groups I know for a fact has never set a foot on the mountain) are so vehemently opposed to simple safety and progress.

I would encourage all parties to move the Snow King ownership's plan forward in as expedited a manner as is possible, and am in full support of their proposed initiatives. Without your support the future of our local town hill is nothing short of economically dire and I shudder to think of the consequences to our community.

Thanks and Best,

--

Stephen Sullivan

Founder/CEO

p: 307.200.6113 ext: 610

f: 307.201.1478

m: 307.413.0025

Stio® | 1725 High School Road, Suite 310 . Post Office Box 1188 . Jackson, Wyoming
83001 ssullivan@stio.com | www.stio.com

From: Zahan Billimoria
To: comments-intermtm-bridger-teton-jackson@fs.fed.us
Cc: [Town Council](#); [County Commissioners](#)
Subject: snow king
Date: Tuesday, September 25, 2018 11:16:55 AM
Attachments: [PastedGraphic-6 copy.tiff](#)

dear electeds,

i have spent months carefully considering the question of snow king's future development. snow king is the single most important recreational amenity in my world. I'm a mountain guide who's livelihood depends on my access to the public lands in GTNP, but no place is more important to me, in my daily life than snow king. its where i go summer and winter to clear my head, to connect with nature. its where my kids play and ski, where my wife meets her friends to get a hike in. in short i love snow king.

no place makes jackson hole feel special and unique to me, than my home hill - snow king, I'm a passholder, i ski there are much as i can. if our valley were to loose one ski area - i would let go of JHMR before i would let go of snow king.

As a town resident i am deeply opposed to the way in which this ownership is pursuing efforts to turn this precious local place into an amusement park, and constantly making decisions to box out the locals. the notion of paying a private entity to walk on public land is wrong in my view (uphill access fee). i say this though it doesn't affect me personally, as I have a pass, i just think it is wrong. If there is one place where people from every walk of life can find a little solace in their lives, a little escape from the pressures of work - its a walk up snow king - summer or winter. its where people go to learn how to backcountry ski - an otherwise intimidating and complex sport, we mustn't take that away from them.

I want Snow King to be successful, i want them to thrive - but they are going about it the wrong way, and they don't have my support. I am opposed to any effort to grant them further access to build zip lines, gondolas. They need to make right with the locals of jackson who are most invested in this little hill, before we can support their future plans.

thank you for reading my comments, i really appreciate it.
please vote no, on the proposed development.

Zahan Billimoria
(208) 709 0858



Mountain Guide & Coach
[samsaraMTNtraining](#)

From: Richard Burns
To: comments-intermtn-bridger-teton-jackson@fs.fed.us
Cc: [Town Council](#); [County Commissioners](#)
Subject: Supporting Snow King Proposal
Date: Tuesday, September 25, 2018 2:52:51 PM

Gentlemen - as property owners in Teton county and within the city limits of Jackson we want to express our support for Snow King's plan, and ask that you approve it. Best -

Richard & Karen Burns

"All men die, not all men really live" William Wallace

Sent from my iPad

From: Mary Silvernell
To: comments-intermttn-bridger-teton-jackson@fs.fed.us
Cc: [Town Council](#); [County Commissioners](#)
Subject: Support Snow King Mountain!
Date: Wednesday, September 26, 2018 3:21:55 PM
Attachments: [image003.png](#)
Importance: High

Good Afternoon,

I am writing to you as a leader in the state of Wyoming's tourism industry. I am the Executive Director for the Campbell County Convention & Visitors Bureau in Gillette and Wright, Wyoming.

As someone who promotes Wyoming's tourism assets to visitors, it is important that we continue to invest in the future of Wyoming's oldest ski resort, Snow King Mountain Resort in Jackson Hole. Snow King needs improvements to become a sustainable ski area for both the town of Jackson, and the state of Wyoming, for all sorts of people- adults, kids and families, to enjoy for generations to come.

The proposed improvements, such as replacing the forty year old Summit Lift with a safe gondola for year-round access, is one example of what is needed as part of the investment in our state's tourism.

If added, beginner and intermediate downhill bike flow trails will introduce many more to the sport of mountain biking, and will make the mountain more accessible by creating year-round activities.

A new zip-line experience could actually help pay for some of the improvements requested, and would expand even further the reach to more people to experience the outdoors at Snow King.

With the investment into Snow King's improvements, it can continue to serve as a regional racing hub for communities all over Wyoming, Colorado, Montana, Utah and Idaho.

I hope that you will consider this request to support Snow King Mountain!

Thank you so much,
Mary

Mary Silvernell, Executive Director
Campbell County Convention & Visitors Bureau
PO Box 1393
Gillette, WY 82717
(307) 299-2838 Mobile
(307) 686-0040 Office
www.visitgillettewright.com
Facebook: Visit Gillette-Wright Wyoming

Monumental Logo-GW



From: Tim Bradshaw
To: comments-intermtn-bridger-teton-jackson@fs.fed.us
Cc: [Town Council](#); [County Commissioners](#)
Subject: Support for Snow King
Date: Wednesday, September 26, 2018 10:05:04 AM

Snow King is an important aspect of the Town of Jackson providing outdoor recreation for local and visiting kids and families. I support the proposed expansion plans to provide more activities and services in the town.

Tim Bradshaw
[AllTrips.com](#): Connecting People to Outdoor Destinations
tim@alltrips.com
307.690.4269

From: Walt Esquivel
To: comments-intermtn-bridger-teton-jackson@fs.fed.us
Cc: [Town Council](#); [Snow King Engagement](#); commissioners@tetonwyo.gov
Subject: Snow King Mountain Resort On-mountain Improvements Project
Date: Wednesday, September 26, 2018 11:07:44 AM

To: Mary Moore, District Ranger, PO Box 1689, Jackson, WY 83001
Copy to: Town of Jackson Council, Teton County Commissioners

Reference:

<https://www.fs.usda.gov/project/?project=54201>

"Snow King Mountain Resort proposes to update facilities and develop winter & summer recreation opportunities- includes permit boundary expansion, guest service building at summit, additional lifts & ski runs, bike park & trails. Comments due 10/4/18 by email to: comments-intermtn-bridger-teton-jackson@fs.fed.us"

Dear Ranger Moore,

I am a resident of Texas but have lived & worked numerous jobs in Teton County for six months of each year since 2014.

Although I do support Snow King's current operations, I do NOT support its proposed expansion into federal, county, &/or town areas.

(1) It is my position that Snow King should continue operating within its currently existing area with no further expansion.

(2) It is also my position that should Snow King desire to expand into federal, county, &/or town areas and as part of the process of wanting to do business on public lands, Snow King should be fully transparent & disclose past & current financial documents along with anticipated future financial documents. It has been mentioned that Snow King wants/needs to expand its current operations into public lands & areas in order to remain financially solvent; if that is the case, the public should have ALL the facts presented by Snow King in order to more properly weigh the options. I feel that without the past & anticipated future financial info from Snow King being made available to the public, that Snow King is not being transparent with the public.

Thank you for the opportunity for the public to voice our thoughts & opinions on this important matter. Have a wonderful day.

Sincerely,

Walt Esquivel, MBA, MA; Captain, U.S. Marine Corps (Veteran)

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From: Vicky McCartney
To: comments-intermtn-bridger-teton-jackson@fs.fed.us
Cc: [Town Council](#); [County Commissioners](#)
Subject: Snow King
Date: Wednesday, September 26, 2018 10:15:32 AM

To whom it may concern.

I fully support Snow King and their Phase 2 proposals. Specifically I support and believe the following:

- Improvements to Snow King Mountain are about making the ski area viable for the next generation of local skiers to grow up skiing on their town hill.*
- Snow King is all about the kids and families that get outside and play together on the mountain and they seek only to enhance that tradition.*
- Additional beginner/intermediate ski terrain and an easy way down from the summit of the mountain.*
- Skiing on the sunny south side, and in a beginner ski zone at the summit adjacent to a new multi-use building at the summit.*
- Replacing the 40 year old Summit lift with a safe gondola for year round access to the summit.*
- Building a planetarium and observatory at the summit for science and education.*
- Constructing a mountain sports training facility at the base for training athletes, including a climbing gym and a ski/snowboard/skate/bike training facility.*
- Beginner and intermediate downhill bike flow trails.*
- A zip-line experience that will help pay for the improvements above.*
- Continuing to support the tradition of ski racing on the King long into the future.*
- Ski areas around the world are adapting to changes in the climate, demographics, and trends in an effort to continue to keep the tradition of skiing alive into the future just*

I have stayed in the area and personally skied Snow King several times. I believe the above improvements would be an asset to the area.

Victoria McCartney

From: Abiligy Company
To: marymoore@fs.fed.us; comments-intermt-n-bridger-teton-jackson@fs.fed.us; poconnor@fs.fed.us; [Snow King Engagement](#); tssinclair@jacksonwy.gov; [Town Council](#); commissioners@tetoncountyywy.gov; planningcom@tetoncountyywy.gov; [Steve Ashworth](#); jlove@jhnewsandguide.com
Subject: Comments on the SK Agenda
Date: Wednesday, September 26, 2018 11:55:37 AM

To Whom It Should Concern;

I would like to offer my perspective of someone who was born and raised in Jackson, moved away, but still frequently visits the area, and regularly introduces friends & family to the special place in which I grew up.

I learned to ski on our town hill, Snow King, in the early 1970's. I can remember as a four or five year old riding the chairlift to the top of the mountain for the first time (unbeknownst to my mother) and having to navigate my way down the entire mountain, but I did it! In the summer months we would enjoy horseback riding and hiking the trails of Snow King.

Jackson has changed enormously since I was a kid, and there are many who have witnessed change over a longer lifespan than mine of nearly 50 years. What has always made the valley, and the area so unique and so special is the small, quiet population of humans nestled into the large, wild, and natural habitat of such abundant wildlife.

The proposed Snow King agenda with it's boundary expansions, creation of a giant scar across the mountain in the form of a road, ridiculous sized summit facilities, and tourist trap zip lines is an insult to the integrity of Jackson Hole!

The people in power within the Town of Jackson Government should be doing everything possible to protect what is left of the special and unique co-existence of humans and wildlife, yet all too often it is the wildlife that pays the consequences, and suffers from the actions of people. I feel strongly that this is not only my opinion, but that of visitors who are drawn to the area, as well as people who call Jackson Hole home.

Allowing Snow King to move forward with any of the proposed agenda would be a devastating blow to the impacted wildlife, and a degrading mark for the special town of Jackson. Please listen to the people, both residents & visitors, and think of the animals, and vote down the Snow King Plan.

Lastly, I would like to thank the Forest Service for extending the deadline for Snow King Scoping comments.

Sincerely,

Shannon Meeks
Abiligy Company, LLC
Pinehurst, NC

From: Kudar Motel Front Desk
To: [Tiffany Stoltz](#); comments-intermtn-bridger-teton-jackson@fs.fed.us; [Town Council](#); [County Commissioners](#)
Subject: Snow King On-mountain Improvements Project
Date: Thursday, September 27, 2018 11:39:46 AM

Dear USFS, Town Council, Commissioners, and Community Stakeholders,

The citizens of the Town of Jackson should feel proud of Snow King Mountain's collaboration with community members, downtown Jackson businesses, local nonprofits, and local municipalities for leading an honest, public process for the improvements proposed in Snow King's master development plan on National Forest System lands.

Our family business will have another opportunity to show our support for the proposed enhancements at the public comment period at the Town of Jackson Master Plan review meeting come November. As an 80-year lodging business in the Town of Jackson, we support the improvements and enhancements as proposed. The plan fosters stronger economics, helps to grow sales tax revenue, and will improve the business climate year round for all.

We are confident our community and stakeholders will work together to support Snow King while finding solutions to objections. At this time, we hold no objections to the plan. Our congratulations to Snow King Mountain Resort's entrepreneurial spirit and commitment to sustainability. And a gracious thank you to Bridger-Teton National Forest - Jackson Ranger District for their diligence throughout the environmental review process. This is what makes Teton County so great!

Sincerely,

Michael and Serese Kudar
Kudar Motel and Cabins
260 N Cache St
Jackson WY 83001

From: Tyler Barker
To: ["comments-intermtn-bridger-teton-jackson@fs.fed.us"](mailto:comments-intermtn-bridger-teton-jackson@fs.fed.us)
Cc: [Town Council](#); [County Commissioners](#)
Subject: Snow King Improvements
Date: Thursday, September 27, 2018 4:17:34 PM
Attachments: [image001.png](#)
[image002.png](#)
[image003.png](#)
[image004.png](#)
[image005.png](#)

To Whom It May Concern:

This letter is in support of Snow King Mountain's desire to continue to improve on-hill facilities which will directly benefit our community. Additionally, as the President of the Board of Directors for the Jackson Hole Ski & Snowboard Club, Snow King Mountain's improvements will continue to provide and improve on one of the best skiing and snowboarding training venues in the Intermountain West- a true community value to not only the student/athletes of the JHSSC but also to the Jackson Hole High School Alpine Ski team which hosts high school races for teams from across Wyoming.

Additional beginner and intermediate ski/snowboard terrain that accesses both the south side and summit will add valuable terrain for visitors and locals alike. To achieve this goal, replacing the outdated Summit Lift is require to safely transport guest to these new areas of the mountain.

Snow King Mountain's desire to construct a multi-use training facility will not only provide an indoor climbing facility that is sorely lacking in the region but also allows users of this facility to use public transportation to get to said facility. There are very few venues in our community that allow such ease of access for all ages and users.

Winter sports facilities need to continue to evolve shoulder/summer season business offerings in order to compete in a challenging economic landscape. Hurdles include a changing climate that has made snow conditions somewhat uncertain, aging ski demographics, and changes in sports trends.

Sincerely,

Tyler T Barker
vp, regional managing director



PO Box 564/3385 Cody Lane, Teton Village, WY 83025

(O) 307.739.4160

(C) 307.690.4729

tyler.barker@tetonresorts.com



From: Nate Bybee
To: comments-intermtn-bridger-teton-jackson@fs.fed.us; marymoore@fs.fed.us; [Town Council](#); [County Commissioners](#)
Subject: Snow King Improvements
Date: Thursday, September 27, 2018 4:56:22 PM

Hello,

I would like to voice my support for the proposed enhancements and investments to Snow King Mountain. We are very fortunate to have this 80 year old ski area right in our backyard. However without significant changes and updates I do not see how the King can continue to survive.

I welcome a new gondola that would provide safe access to the summit and the building of a planetarium and observatory. I also think that enhancing beginner/intermediate ski terrain and adding an easy way down from the summit would make Snow King more accessible and help it attract more paying winter visitors. I really enjoy the time I spend at Snow King which is only a few blocks from my house and look forward to sharing that with my future children. Snow King needs an opportunity to evolve in a very different environment than the one that existed even 10 years ago, so I simply ask that you help give them that opportunity. For the sake of the community, the ski area and our future.

Thank you,
Nate Bybee

From: Peter Long
To: comments-intermtn-bridger-teton-jackson@fs.fed.us; marymoore@fs.fed.us; [Town Council](#); commissioners@tetonwy.org
Subject: Snow King Improvements
Date: Wednesday, September 26, 2018 11:42:35 PM

District Ranger Moore, Jackson Town Councilors and Teton County Commissioners;

I am writing to express my strong, unequivocal support for Snow King Mountain Resort's Phase II proposal.

For generations Snow King Mountain has been the "locals' ski hill." It is a staple of the community. Like many Jackson Hole natives, I learned to ski on Snow King, and I appreciate the mountain's continued commitment to providing families with accessible, affordable and first-class recreation.

It is no secret that in its current condition Snow King is living in the past. For years, the hill has operated at a loss, and without smart investment to modernize its features and services Snow King will likely not survive.

The improvements put forward in the Phase II plan are intended to make Snow King a sustainable part of our community for future generations. They include infrastructure upgrades to make the mountain safer and more accessible; terrain additions designed to cater to beginner and intermediate skiers and snow-boarders; and training facilities that will serve local athletes and youth alike.

The plan offers many new amenities, like zip-lining and bike trails, that will attract visitors—which is not only good for Snow King, but also for Jackson Hole's business community at large. And, at the same time, these enhancements will draw in more diverse usership, allowing more people to experience the area's outdoors.

Ski resorts around the world are adapting to keep up with shifting demand, including those in and around Jackson. Snow King must do the same if it is to remain—or, perhaps rather, become—a competitive ski attraction.

Understandably, residents do not want progress to come at the expense of Jackson Hole's unique character. But there is no reason to believe the Phase II plan does not align with the good of the Town or County. Snow King's leadership has carefully planned the development, including close consultation with stakeholders, to ensure the plan bolsters the valley's reputation as a premier destination.

Having grown up in Jackson Hole, I have witnessed a lot of change over the past thirty-plus years. Never has Jackson lost its uniqueness. Sadly, many of those who most vocally oppose change, whether it be at Snow King or elsewhere, simply want to close the door behind them. That is unfair to future generations – to kids like mine, who I hope one day will have the opportunity to call Jackson Hole home.

I encourage you to consider Snow King Mountain Resort's Phase II plan based solely on merit—and not on thinly-veiled campaigns to shut down any kind of development. If you do, you will find that Phase II is a prudent framework to ensure Snow King remains Jackson Hole's local ski hill.

Thank you for your time and consideration. Please contact me if I can provide clarification or any further information.

Kind Regards,
Peter Long

--

Peter Long
P.O. Box 6995
Jackson, Wyoming 83002
(215) 913-8839

From: Sam Petri
To: [Town Council](#)
Subject: Great letter to USFS - thank you
Date: Thursday, September 27, 2018 4:01:39 PM

Dear Mayor and Jackson Town Council,

Sam Petri here of Pine Drive. You may remember me because over the last few months I have made public comment about Snow King Mountain Resort's On Mountain Improvements Project Proposal.

I am writing to say thank you for listening to my concerns, as well as the concerns of others in the community. Everyone commenting on this proposal loves Snow King Mountain and everyone wants it to succeed.

I am very impressed and pleased with [the letter you have drafted](#) to be sent to the USFS. I believe it speaks to all parties involved - Snow King Mountain Recreation, the Town of Jackson organization, all patrons and users of Snow King Mountain, and the community at large.

In your letter I am particularly pleased that you address concerns with the road, the placement of the gondola, and the proposed zip line. In my opinion, these three proposals are perhaps the most impactful to our wildlife, our shared public lands, and our community character.

I also liked all of your bullet points - all of them.

Thanks so much for listening to the community and for crafting this letter to the USFS. I truly appreciate it.

All the best,

Sam Petri
307-690-7064

From: Zach Witt
To: comments-intermtn-bridger-teton-jackson@fs.fed.us; marymoore@fs.fed.us; council@jacksonwy.gov; commissioners@tetonwyo.org
Subject: Snow King Improvements
Date: Thursday, September 27, 2018 7:41:56 PM

I would like to lend me support for the further development of Snow King Resort. The expansion will be great asset to the community and tourists alike. We live in a town fueled by tourism and to not expand on something that would benefit the local community would be a travesty.

Zach Witt

From: Thomas Woods
To: comments-intermtn-bridger-teton-jackson@fs.fed.us; marymoore@fs.fed.us; [Town Council](#); [County Commissioners](#)
Subject: Snow King Improvements
Date: Friday, September 28, 2018 11:41:07 AM

I support the expansion plans for Snow King Mountain.
This is the first place I always think of in Jackson hole and
the Forrest Services support for their plans is appreciated.

Thomas W. Woods P.E.

This e-mail and any files transmitted with it are confidential and are intended solely for the use of the individual or entity to whom they are addressed. If you are NOT the intended recipient and receive this communication, please delete this message and any attachments. Thank you.

From: Ted Kyle
To: comments-intermtn-bridger-teton-jackson@fs.fed.us; [Town Council](#); [County Commissioners](#)
Subject: Snow King Phase 2
Date: Sunday, September 30, 2018 2:05:47 PM

Ladies and Gentleman of the US Forest Service, Town Council and County Commission

I am writing today in support of the Snow King Mountain Phase 2 plan. I have lived in Jackson since 1992 and have worked for Snow King since 2015. Snow King Mountain is, as you know, a privately held business that provides significant recreational and educational benefits to residents and visitors alike. Much like other ski areas and guiding services, we operate on a combination of public and private land. However I don't recall anyone asking to see their books when Barker-Ewing or Snake River Anglers asked for more river permits, or when JHMR decided to build a lift right to the GTNP boundary. And I don't remember there being much public outcry when 3 Creek or Shooting Star proposed developing pristine habitat and other than more second homes for multi-millionaires, what public benefit do they provide?

The Phase 2 plan, when completed, will give the community something to be proud of, and something that locals and visitors alike will enjoy.

Contrary to some well publicized opinions, Snow King is where a lot of beginner and intermediate skiers learn to ski. At the ski shop we explain to people everyday that Elk Horn isn't a beginner trail and that there really is no easy way down from the summit. The most significant benefit of the new summit road, which has been ignored by some detractors, is that it will provide a great route down from the top for beginner and intermediate skiers. Kids and new skiers will be able to learn on the new beginner slopes up in the sun on natural snow and then enjoy a long mellow route down the mountain. The new summit road will replace, not add to, the existing road so it won't disturb the continuity of skiing anymore than the existing road does now. Likewise, after completion and regrowth, there is no reason the new road will be any more visible from the north than the existing road, which you can't see at all.

Using a gondola to reach the summit opens up possibilities that a chairlift never could. People with disabilities can come up and enjoy the view from the summit and cold or windy weather won't stop people from coming up. Likewise, events at the summit, including use of the new observatory can be accessed quickly and comfortably. Have the gondola base located where it can be easily accessed and where it disrupts the flow of skiers as little as possible just makes good, logical sense. However, if the community wants to make it harder for disabled people to reach the gondola and wants to perpetuate the existing skier bottle-neck in the base area, then it could be placed further up the hill but why?

Snow King has offered to improve and modify the green space at Phil Baux Park based on community needs. Each and every plan that has been presented has been a direct result of requests from Parks and Recreation and/or public comments. If the community doesn't want more green space, doesn't want a new amphitheater, doesn't want a better location for the People's Market, doesn't want a new kids pump track, that's fine. The park could be left just the way it is if that is what the community would like.

If you choose to use the term "amusement park" to describe the summer operations at Snow King then you really need to visit other mountain towns where ski areas are trying maintain a viable year around operation. Zip lines are a typical part of these summer operations and the

zip line at Snow King will help to fund the parts of Phase 2 that are not likely to generate much revenue in the short term.

Some people have decided that Snow King is to blame for increased crowds and traffic in Jackson but that idea just doesn't make sense. Several million visitors pass through Jackson every year on their way to or from GTNP and Yellowstone. Hundreds of thousand fly into Jackson to ski at JHMR. Each of those attractions has posted record visitation in the last five years. Snow King attracts a few percent of the people who are already coming here to visit the National Parks and JHMR. The vast majority of people who spend the day at Snow King are drawn to Jackson for other reasons. Our hope, when Phase 2 is completed, is to attract a slightly larger percentage of the people who already visit Jackson Hole, but even in the most optimistic scenario Snow King will never be a major driver of Jackson crowds.

The Snow King investors are ready and willing to invest in Snow King Mountain. Let them make the improvements that will make the whole community proud of Our Town Hill.

Ted Kyle

307-690-0748

<http://snowkingmountain.com/>

Leslie Petersen
PO Box 568
Wilson, WY 83014
307-733-2016 or 307-413-5004

September 27, 2018

To: council@jacksonwy.gov
commissioners@tetoncountywy.gov
planningcommission@tetoncountywy.gov
planningcommission@jacksonwy.gov

Re: Snow King proposed development

Dear Council members, Commissioners and town and county planning commissions:

Over the past few months, I've tried to be a dutiful citizen and follow the discussions about this major proposed change to our community through every medium available. I attended the large public meeting at the end of the Stakeholder meetings and filled out the form that we were given as best I could.

Like everyone else in town, I want to see Snow King succeed, but I'm not willing to see our beautiful town turned into a cheap amusement park in order for that to take place.

It is an aggressive proposal and I feel like the whole thing is built on a betrayal of all of the work that went into the Snow King Resort Master Plan in 2000. Our governments and our citizens worked hard on a compromise that gave Snow King an upzone of nearly a million square feet of development at the base in exchange for their promise to run the mountain in the future. Current Snow King owners then sold off some of that development potential and did not follow through on the commitments made. As you all know, the ideas and commitments were well expressed in the language in the detailed Master Plan.

As we say in the west, a deal is a deal. The community gave Snow King investors additional commercial value and a great stream of potential revenue and they, in turn, agreed to use part of that revenue to pay for community benefits. Now they have come back to the community asking for simply outrageous expansions and to cheapen and commercialize much of our community character while generating huge amounts of growth and destroying wildlife habitat.

I believe that the Jackson Hole Conservation Alliance has done really good work in coming up with their proposed balanced vision for the Town Hill's future and I support their vision. I am especially opposed to boundary expansion, clear cutting of new runs and the big new road proposed up the face of the mountain. We must insist on free public access to Snow King. We should not compromise Phil Baux Park or the ball park. At the least, if town land is used for money generating needs of Snow King, the town should be paid in either dollars or substituted land.

I also can't bear the thought of a huge zip line that runs all the way down the mountain. The amusement park aspects of that are particularly galling, but I would be accepting of a lesser zip line in order to generate revenue. Similarly, I think the restaurant at the top, the observatory and the wedding site are things our community could live with in order to generate revenue for Snow King.

In the face of continued global warming, I do not believe it makes sense to try to use the south side of the mountain for skiing, especially when those open slopes are critical winter wildlife habitat. An improved road will need to go up that way if the north facing road cuts are not allowed and I can't see a way around that.

Anyone who has read and understands our County Comprehensive Plan can see that the current proposals are simply contrary to all we have struggled to preserve over many years. Others have previously pointed out all of the contradictions between both the goals and the regulations of our County Comprehensive plan and this massive proposal. A central tenant of our plan is to insure that we will not lose the wildlife and wildlife habitat that make Jackson Hole so rare in the world today. I urge you to put the wildlife impacts at the forefront of your thinking about this.

Thank you for your consideration of this point of view. I believe it is shared by most people in the community in spite of fancy ads and well paid public relations firms.

Sincerely yours,

Leslie Petersen

leslie.petersen@wyoming.com

307-733-2016 or 307-413-5004

From: Tim Walker
To: [Town Council](#)
Subject: Improvements for Snow King
Date: Sunday, September 30, 2018 8:50:42 PM

To Whom It May Concern:

I grew up in Jackson and always appreciated the opportunities Snow King provided to young kids there. From downhill races, opportunities to ski in town after school to the tube park and mini-golf, it was, and remains, a place for locals recreate and enjoy.

Snow King's Phase II Development plan will not only help preserve many of these opportunities, but approve and expand. A gondola to replace the summit lift is essential. And more beginner and intermediate ski terrain is important to young and older people who want to ski in town. A zip line will provide an additional recreational opportunity to enjoy. This proposal is well-vetted by the community and ready to be approved and move forward.

Thanks for listening.

Tim Walker

From: Geneva Chong
To: [Town Council](#); [Tyler Sinclair](#); [Snow King Engagement](#)
Subject: Town of Jackson comments to the USFS re Snow King
Date: Monday, October 01, 2018 4:20:04 PM

Dear Mayor and Council,

Thank you for preparing the draft letter you are voting on tonight to submit by the October 4 deadline.

As a member of the Snow King Stakeholder Group I am pleased overall with your draft. Please note, however, that I commented previously regarding the Comprehensive Plan language regarding “no resort expansion” and I would like to see that specifically referenced.

Further, the first time I read Snow King’s submission to the USFS was the first time I saw any numbers related to expansion of Snow Making using Town water. This could have a massive impact on our community, and I feel needs to be considered in detail as a community impact.

Finally, with significant new staff at the USFS, I think it would be valuable for them to have a review with Tyler Sinclair regarding the Snow King Resort Master Plan of 2000, which includes a mechanism to support mountain operations (SKRMA) and plans for beginner skiing within current boundaries. This discussion could also highlight alternative, front-side roads within current boundaries provided by the Snow Engineering Group to Snow King (2014?). Alternative road routes within current boundaries were a significant component of the Stakeholder discussion but are not recognized by Snow King in their proposal, and they could inform USFS no-expansion alternatives.

Thank you for considering my comments and please contact me with any questions.

Best,

Geneva Chong
Town of Jackson, Snow King Stakeholder Team
307-699-0330

From: Mahtisa Djahangiri
To: [Town Council](#)
Cc: [Snow King Engagement](#)
Subject: Scoping Comments to the USFS regarding Snow King
Date: Monday, October 01, 2018 2:08:42 PM

Hello Town Council,

My name is Mahtisa Djahangiri and I am a Jackson resident. I am writing to express my support for your letter to the Forest Service. I am concerned about how the proposed developments will compromise the community character of own Town Hill that I love so much. I especially appreciate that your letter includes concern for the visual impacts to our community, prioritization of environmental sustainability and impacts to wildlife. Thank you for being thorough in your letter and for holding Snow King accountable to sustainable development.

Thank you,
Mahtisa Djahangiri

From: Paige Fisher
To: [Town Council](#)
Cc: [Snow King Engagement](#)
Subject: Snow King
Date: Monday, October 01, 2018 4:54:57 PM

Hello Town Council,

My name is Paige Fisher and I am a resident of Jackson. I am writing to express my support for your letter to the Forest Service. I am concerned about how the proposed developments at Snow King will compromise the community character of our Town Hill that I love and utilize so much. I especially appreciate that your letter includes concern for the visual impacts to our community, prioritization of environmental sustainability and impacts to wildlife. It would be a shame to lose a wild space that is used by so many Jackson residents and has truly become part of many people's daily routine be altered or disappear. Thank you for being thorough in your letter and for holding Snow King accountable to sustainable development.

Sincerely

Paige Fisher

--

Paige Fisher

Teton Science Schools, Journeys School Preschool Faculty
Returned Peace Corps Volunteer
Ecuador 2011-2013

From: Benja Glatz
To: [Town Council](#)
Cc: [Snow King Engagement](#)
Subject: Comments to the USFS regarding Snow King
Date: Monday, October 01, 2018 4:42:04 PM

Hello Town Council,

My name is Benja Glatz and I am a resident of Jackson, WY. I am writing to express my support for your letter addressed to the Forest Service with regards to the Snow King Expansion plan. I am very concerned with the proposed development and how it will affect our community. Our sustainability efforts have come very far and I am concerned with the negative impacts that this plan will have on our ecosystem. I appreciate and support those concerns in your letter and I hope that you hold Snow King accountable for our communal vision towards sustainability in the Tetons.

Best Regards,

- [Benja Glatz](#) -
Guide/ Educator
847.525.3334

From: Special Delivery Jones
To: [Town Council](#)
Subject: Snow King Mountain Resort On-Mountain Improvements
Date: Monday, October 01, 2018 7:14:07 AM

To Whom It May Concern:

I encourage you to please move forward with the proposed changes to Snow King Mountain Resort. While the mountain is a fantastic community asset, it is need of critical updates to improve safety and better meet the needs of locals and visitors. I've been visiting Jackson since I was a kid and have family who live there. I proposed to my wife at the base of Snow King after an afternoon of snow tubing nearly ten years ago. Snow King needs to have the ability to grow and evolve to keep pace with ski resorts and stay competitive.

The proposal from Snow King Mountain Resort will help not only the resort, but add to a fun, affordable and walkable downtown Jackson experience. Please approve as quickly as possible.

Thank you for your consideration.

Dan Kuipers

Sent from my iPhone

From: Crissy Codi
To: comments-intermtn-bridger-teton-jackson@fs.fed.us
Cc: [County Commissioners](#); [Town Council](#)
Subject: Snow King Improvements
Date: Tuesday, October 02, 2018 11:23:33 AM

I am a strong supporter of the improvements at Snow King.
It is important for the town and community as well as continued success of the Ski and Snowboard Club. Other ski areas around the world adapt, grow, and develop based on needs and advancements and trends, so there is no reason Snow King shouldn't also think towards the future! Continuing to support the tradition of ski racing on the King long into the future is a critical. I fully support a mountain sports training facility for athletes, including a climbing gym and a ski/snowboard/skate/bike training facility. This would be great for the town and great for the ski club.

--

Crissy Codi, M.A.
Resource Development Manager
Jackson Hole Ski & Snowboard Club
PO Box 461
100 E Snow King Ave
Jackson, WY 83001
Primary/Mobile (303) 827-5850 Office (307) 733-6433
www.jhskiclub.org



"Building Champions in Sport and Life Since 1938"

From: Chris Means
To: comments-intermtn-bridger-teton-jackson@fs.fed.us
Cc: [Town Council](#); [County Commissioners](#)
Subject: Snow King Improvements
Date: Tuesday, October 02, 2018 5:41:13 PM

To Whom It May Concern:

I want to share my support for Snow King's proposed improvements. I see tremendous benefits to the community through these improvements and I hope that you will too.

As a small resort town Snow King is a central point in our community. It's a gathering place for all. It's an outlet to escape the congestion in town. It's a place where we can hike with our dogs and enjoy the trail systems through US Forest Service land. It's the most convenient way to enjoy winter sports without the traffic, the parking issues, and the long lift lines experienced elsewhere. It's the best place in town to watch fireworks over the holidays. Truly it's a place that has special meaning to so many of us, and that's why so many of us want the best for Snow King.

Compared to neighboring resort towns such as Park City, we have nowhere near the recreational complexes and sports training facilities that others do but thankfully we have Snow King. I have watched as buses of students, including my own children, come to visit Snow King to participate in educational and athletic programs. I can only imagine their excitement if there was a sports training facility for aspiring athletes to learn and to compete at Snow King, or a planetarium and observatory atop the Summit where they could further their studies and exploration. Snow King is the hub of activity within our community, a place our youth gravitate towards, and it makes sense to enhance it for them.

I want to see Snow King replace its old Summit Lift with a new gondola. Obviously, it would be safer, warmer, and faster, all of which would make it more enjoyable. Understandably that comes at a cost, and the solution to help offset that cost is a zip line which I fully support and would enjoy as well.

Most of us who pursue winter sports at Snow King are not at a beginner level and we know there is no easy way down. Perhaps if there was, Snow King could be more accessible for those of all ability levels. As Snow King prepares for it's 80th winter season, let's give beginners something to celebrate and provide an easy way down.

I am reminded of a fact that I found intriguing. Ski areas operating on National Forest System (NFS) lands contribute about \$26 million dollars annually to the U.S. Treasury, and that among Forest Service activities only the timber program contributes more. An investment in Snow King is an investment into our community, and it directly benefits the NFS lands which we all enjoy.

Let's support Snow King's proposed improvements and move forward with something that so many of us can enjoy and will benefit from for generations to come.

Sincerely,

Chris Means

From: Anne fletcher read
To: [Snow King Engagement](#)
Subject: SKMR On-Mountain improvement projects
Date: Wednesday, October 03, 2018 8:29:22 PM

I am writing to address the proposed development and changes to the Snow King resort.

We have lived to the east of Snow King on Upper Cache Creek drive for almost twenty years. During that time I personally have hiked, skied and biked trails around Snow King sometimes daily, during the spring, summer, and fall. Both of our children grew up learning to ski at Snow King, as did nieces and nephews who visited from Australia over the years. I love the local hill and am in favor of trying to keep it viable as a business, literally in my backyard.

That being said, my access to the trails of Snow King is on Bridger Teton NF land. And on that land, our backyard and the slopes of Snow King, I have daily wildlife sightings, including bear, fox, weasel, deer, grouse, and more.

The primary consideration with any development must be the impact on the wildlife and wild places. Already squeezed by development throughout the valley, the forest service land, abutting town should be protected at all costs. It is both important for the movement and protection of the wildlife, and also makes an enormous contribution to the visitor experience in Jackson. I believe that in places like Jackson, the protection of wild places adjacent to towns provide an example of how we can and should all live. With so many people visiting our town, from all parts of the world, we have the opportunity to lead by example and this at times means that we do not or cannot pursue commercial interest at the expense of all else.

In the interest of protection of the forest land, and town assets such as the ball-field at the ski hill base, I would encourage any further development of the Snow King base area to be focused entirely on their private lands rather than town or USDA FS land. Any ski lift/gondola development should be sited on lands already owned by Snow King. I strongly oppose the idea that the lift should be put on the current ball field. The only argument I have heard for siting the gondola on the ball field is to accommodate bus loads of sightseers; surely a short sighted reason to remove a ball field, skating rink, venue for occasional concerts, site of the weekly 'people's market' amongst other long time community uses for this small piece of open land in our town.

In addition the proposed road cut on the north facing slopes, that is to give access to the summit area should not be allowed. There are a number of reasons I oppose this road cut. To name them, and in no particular order: the uphill side of the road cut on a slope of this steepness will mean there is an incredible drop off on the uphill side, thus severely impacting the ski runs this road will bisect. It will be an ugly scar zigzagging across the slope, visible from afar. It is unnecessary, as there is a road that accesses the summit area from the backside of the mountain. It will impact wildlife living and moving along the north slopes, as there will undoubtedly be fairly regular traffic along this road, particularly in winter when wildlife are most stressed and vulnerable.

I would ask that the town also ask for fair market reimbursement from Snow King for the use of town land in the future.

Thank you for taking my comments into consideration.

From: Mike Adams
To: comments-intermtn-bridger-teton-jackson@fs.fed.us
Cc: [Town Council](#); [County Commissioners](#)
Subject: Snow King Improvements
Date: Wednesday, October 03, 2018 9:02:44 AM
Attachments: [image001.png](#)

Dear Bridger Teton National Forest,

My name is Mike Adams & I've been a member of the Jackson Hole Snow Devils for the past 25 years. I was born & raised in Jackson in 1973 & have seen this area grow immensely as I have never left. Snow King Mountain is where I learned to ski when I was 2 years old. Bill Brigg's taught my brother & I how to ski on Rafferty which led to both of us ski racing through the Intermountain program then through Jackson Hole High School racing teams. What memories! My family has also been involved with the World Championship Hill Climb for the last 25 years. Both my wife & I have raced in the event which was an extreme experience! Having said all this, we support the improvement's Snow King proposes for the future of the "Town Hill". What a venue this would all be not just for the locals & their families but for all to enjoy! Please be in support of the improvements Snow King Mountain Resort is wanting to provide.

Thank you,



Mike Adams
cell: 307.413.2629
office: 307.733.7477
P.O Box 11911
Jackson, WY 83002
mike@rchjh.com

From: Josh Bertsch
To: comments-intermtn-bridger-teton-jackson@fs.fed.us
Cc: [Town Council](#); [County Commissioners](#)
Subject: Support Snow King Expansion
Date: Wednesday, October 03, 2018 4:47:30 PM

Hello,

I'll keep it brief... I believe that Snow King is a vital part of the Jackson Hole community, and supporting it's expansion should be a no-brainer.

Regards,
Josh

From: Suzie Blissmer
Subject: Snow King Mountain Resort On-mountain Improvements
Date: Monday, October 01, 2018 6:54:57 PM

To Whom It May Concern:

When it comes to mountain resorts, we need to ensure both safety and the protection of our wildlife and natural resources. Snow King Mountain Resorts Phase II proposal meets both of these goals. It's been carefully considered by the community and the resort to ensure minimal impact to the area while still putting in place a safer gondola and an access road so important to quick emergency response.

I visit Jackson with my family frequently, and have family who visit Snow King frequently. I share the belief that Snow King has been a good neighbor in the Jackson community and have done their due diligence in this approval. I ask that you consider moving this proposal forward immediately.

Thank you.

Suzie Blissmer

From: Chris Brown
To: comments-intermttn-bridger-teton-jackson@fs.fed.us
Cc: [Town Council](#); [County Commissioners](#)
Subject: Support for Snow King Mountain Improvements
Date: Wednesday, October 03, 2018 2:38:38 PM

Good Afternoon,

I write today on behalf of the Wyoming Lodging and Restaurant Association in strong support of the planned improvements to Snow King Mountain. The visitor economy in Wyoming represents our state's second largest industry. In 2017 8.7 million domestic and international visitors spent \$3.5 billion in Wyoming generating \$188 million in state and local taxes. The hospitality and tourism industry is Wyoming's largest private sector employer of full and part time non-farm jobs providing employment to more than 32,000 in 2017. The majority of this significant contribution to Wyoming's overall economy occurs during the warmer months from about Memorial Day to Labor Day. Any opportunity that we have to grow a thriving visitor economy during the winter or shoulder seasons should be taken advantage of. In 2017/2018 winter visitors in Teton County spent significantly more than their summer counterparts spending an average of \$402 per day vs \$278 per day in the summer months. Enhancing and improving Snow King Mountain builds out additional recreational opportunities for both locals and the visiting public during the slower winter months when local businesses are working to attract every single guest through their doors. We respectfully request that you please support the proposed improvements to Snow King Mountain. If you have any questions please feel free to reach out to me directly. We sincerely appreciate your consideration.

Best Regards,

Chris Brown, IOM
Executive Director
Wyoming Lodging and Restaurant Association
P.O. Box 1003
Cheyenne, WY 82003
(307) 634-8816 ext. 207
(307) 221-1736 cell
(307) 632-0249 fax
chris@wlra.org



The WLRA is committed to improving the business climate and profit of the lodging, restaurant and tourism industry. Through government affairs, education and the communication of information we help our members deliver a quality product to the

consumer.

From: Dana Buchwald Park
To: comments-intermtn-bridger-teton-jackson@fs.fed.us; marymoore@fs.fed.us; [Town Council](#); [County Commissioners](#)
Subject: Snow King Improvements
Date: Monday, October 01, 2018 2:56:07 PM

Hi All,

As a valley resident I'm against most of the Snow King "improvements."

Is Snow King entitled to up-using public lands for their profit? Is a gondola completely necessary?

From: Jay Carpender
To: comments-intermtn-bridger-teton-jackson@fs.fed.us; marymoore@fs.fed.us; [Town Council](#); [County Commissioners](#)
Subject: Thoughts on Snow King's Plans
Date: Tuesday, October 02, 2018 5:46:51 PM
Attachments: [image002.png](#)

United States Forest Service,
Bridger Teton, Jackson, WY

Interested parties:

While I do not live in Teton County now, I lived there between 1976 and 1983. During that time I did work with representatives of the Forest Service, and the skiing community, as Director of Operations at then Snow King Inn and Resort. At that time, the management group at Snow King had just completed work in putting in a “new” chairlift on the east side of Snow King Mountain to service the new Alpine Slide and was in the process of replacing the “Neil Rafferty built chairlift” with a new lift (the Summit Lift) that would traverse Snow King Mountain vs the existing one that looked like a continuation of Cache Drive (I always called it Cache “Street”) up Snow King Mountain. My thought at that time was that more should be done to make Snow King Mountain, “The Town Hill”, better.

I had ridden a snow cat with Neil Rafferty, and remember his love for the mountain and his desire to do “more” with it, particularly to develop better access to the backside, or that area of the mountain that the town could not see—and that side that might have more family friendly skiing and easier trails.

Having visited Austria, I am more aware that if local partners collectively combine their resources to invest in their mountains with a significant transportation system (i.e. a tram works that serves as both a method of transportation and a ski lift), then the world will beat a path to ride it, and experience the incredible scenery visible from riding on it. If more people could access the mountain with the most incredible view of the Tetons anywhere, then the commerce of the area could realize a significant quality increase and offset in funding, and also cash flow for operating expense.

Please use my remarks to indicate my support for the suggestions made to improve Snow King Mountain.

Sincerely,
Jay Carpender
Management Accounting Administration Real Estate
1680 S. Marion Street
Denver, CO 80210
jay@carpender.biz
303-722-4227



QuickBooks Accounting Professional
Licensed Real Estate Broker
Notary Public
Registered Preparer for the Internal Revenue Service

From: Sarah Celestine
To: comments-intermtn-bridger-teton-jackson@fs.fed.us
Cc: [Town Council](#); [County Commissioners](#)
Subject: Snow King Improvements
Date: Wednesday, October 03, 2018 10:41:39 AM

Dear BTNF,

I am writing in support of Snow King Mountain Resort's proposed improvements to our town hill. I am writing as a Jackson resident, Snow King employee, and someone that learned to ski at Snow King. As an accountant for the mountain, I think these improvements will really help make the mountain viable for the next generation of skiers to enjoy this amazing ski hill. When I moved to Jackson to work at Snow King I got the opportunity to learn to ski, which was intimidating due to the lack of beginner terrain. I think it is important to help get people into the sport of skiing, and having more fun beginner terrain is key to that. I personally would really enjoy many of the improvements Snow King is proposing such as, new ski runs, gondola, training facility for climbing and skiing, downhill biking, and more. Thank you for all your time on this important project.

Sincerely,
Sarah Celestine

--

Sarah Celestine
Accounting Manager

SNOW KING MOUNTAIN RESORT, LLC
575 S. Willow St | PO Box 1846
Jackson, WY 83001

From: Katie DeMaria
To: comments-intermtn-bridger-teton-jackson@fs.fed.us
Cc: [Town Council](#); [County Commissioners](#)
Subject: Phase 2
Date: Wednesday, October 03, 2018 4:16:25 PM

Hi there,

I have recently caught wind of the expansion proposal and just wanted to share my enthusiasm with you. With all the traffic Jackson sees, we are way overdue for an upgrade/expansion of Snow King. The proposed developments hit the nail on the head for not only what the mountain needs, but the town of Jackson as well. My husband and I are so excited for these improvements and enhancements coming to our town. We just wanted to show our support for this new project!!

Best,

Katie Duckstein

From: Hans Flinch
To: comments-intermtn-bridger-teton-jackson@fs.fed.us; [Snow King Engagement](#)
Subject: Fwd: ATTN: Snow King Mountain Resort on Mountain Improvements Project
Date: Wednesday, October 03, 2018 1:33:06 PM

- > Dear Forest Service,
- > I am a Jackson resident and a frequent user of the Snow King area. I typically find myself recreating on that part of town / BTNF roughly 3-5 times a week. I am very supportive of the resort and would like to see them be a financially viable entity.
- >
- > That being said, I have some very real concerns about their proposed master plan on Forest Service land. I believe that if all of their proposals were allowed it would change the character of this part of the forest and town fundamentally. I would like the Forest Service to say no to the following proposals by Snow King:
- > 1. The additional expansion east into the cache creek drainage and the accompanying 16' wide road cut.
 - > -this would negatively impact valuable wildlife habitat especially for wintering large game
 - > -this would also negatively impact the existing ski runs. Advanced skiers do not want their run interrupted by a 16' wide road. A good expert ski run is steep and continuous, and SK is lucky to have plenty of that. These runs need to be cherished.
- > 2. The zip line
 - > -this would create a nuisance in town and to wildlife on forest land
 - > -SKMR already operates the mtn coaster during early evening hours in the summer and has the tree top adventure park. This is plenty of development in the area and additional traffic will create more human activity and noise that will disturb wildlife
- > 3. The proposed expansion west
 - > -any western expansion would impact a buffer that exists between the winter wildlife closure and the resort. If this wildlife closure is so valued for wildlife that certain trails are closed for significant parts of the year, there is no reason that a ski run should be allowed in that same zone. A ski run would attract a significant more amount of traffic than backcountry skiers or hikers would.
 - > -further more, with regards to expansion, there is plenty of work that could be done to existing skier runs to make them more enjoyable and a better attraction. For example, the lower half of bear claw is un skiable in a low snow year due to small trees and deadfall. This run could be cleared heavily and it would be a great top to bottom run. Same with many runs over by the new Rafferty list. SKMR should improve the existing ski runs before cutting new ones.
- > 4. Restaurant at the Summit
 - > -I have no problems with a restaurant being put at the Summit, provided that hours are severely restricted so as to not disturb wildlife or Teton County's dark sky ordinances. These hours should be monitored as SK has ran the Cowboy Coaster outside of their permit hours
- > 5. Gondola
 - > - I have no problems with a gondola replacing the summit lift provided that the landing is not placed on town land or a new road be built to accommodate the construction. The base should be placed where the current landing of the summit lift is and SKMR should negotiate to use the existing Leeks Canyon road to construct the gondola.
- > 6. A backside lift and a bike park / beginner ski area on the back side
 - > -SKMR should work with the forest service to construct additional cross country bike trails on the backside before building a bike park with a lift. If it can be proven that XC mountain bike trails can exist in this area without negatively impacting wildlife, then a lift served bike

park can be explored. Given the sensitivity of the construction of the Skyline Trail, I have a hard time understanding why the FS would allow a full lift served bike park without incremental steps being taken. Perhaps these trails should be seasonal as is the Skyline trail?

- I do not believe that the beginner area needs to be relocated to the top of the mountain. The current magic carpet is a great location. You can drive right up to it, park and have the kids skiing in 5 minutes. A gondola ride will add an extra step to this that is unwelcome and will drive people away. Also, it's frequently very windy and cold on top, more so than at the bottom. Temperatures and inconvenience will drive people with small children from paying for this magic carpet.

> 7. Star gazing observatory

> -I have no problems with an observatory assuming that it is designed with the dark sky ordinance and sky lining in mind. It would be ironic if an observatory negatively impacted sky watching in JH.

Prior to any developments being approved, I would like to see SK include a renewable energy development in their master plan and a commitment to use 100% renewable energy. I'd also like to see them commit to a locals season pass (100\$ sold in person for one week a year would guarantee a boost in pass sales and that the people who were buying were locals). I guarantee that if they offered this type of pass, no one would purchase the uphill pass because they would all buy this one instead. In lieu of this, the uphill pass should be eliminated and winter uphill access should be free.

>

> I believe that the scale of the proposal that SK has presented is unnecessary and inappropriate and will be a detriment to the BTNF's ecosystem, wildlife and the community that uses it the most. SK is a gem because of its charm, character and steep, uninterrupted skiing. Skiers choose to go there because of these qualities, not because of a zip line and management is fooling itself by thinking that more runs will allow them to steal business from JHMR.

> Thank you for your consideration of these comments. I appreciate the opportunity and know that you will consider the health of the forest and negative impacts to wildlife and the community when you consider SKMR's proposal.

>

> Please feel free to contact me if you have any questions or would like clarification.

> Thank you,

> Hans Flinch

>

> Hans N. Flinch, MLA

> 1170 Brangus dr.

> Jackson, WY 83001

> Hnflinch@gmail.com

>

>

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Hans N. Flinch, MLA

Cell: (919)-949-1319

From: Sean Gelber
To: comments-intermtn-bridger-teton-jackson@fs.fed.us
Cc: [Town Council](#); [County Commissioners](#)
Subject: Snow King Improvements
Date: Wednesday, October 03, 2018 10:49:57 AM

Dear Bridger Teton National Forest,

From someone who often recreates on Snow King Mountain. I have carefully looked over their phase two proposals and I would like all of it to happen. An easy way down for skiers from the summit, and a gondola would be great. Downhill biking and a zip-line experience would be great as well. Skiing on the backside of Snow King would be amazing! I thank you for your work on this project and I urge you to move these improvements forward so that Snow King can be here for future generations.

Sincerely,

--

Sean M. Gelber
seangelber@gmail.com

From: Mike Hammer
To: comments-intermtn-bridger-teton-jackson@fs.fed.us
Cc: [Town Council](#); [County Commissioners](#)
Subject: Snow King Support
Date: Wednesday, October 03, 2018 11:11:50 AM

Our three Jackson-born kids grew up skiing on Snow King. One went on to earn a spot on the US Ski Team and returned later to coach on the King. Our daughter is now a pro-skier. The third was also a ski club coach. And I spent many years as an Alpine Official and worked lots of races on Snow King, including two Nationals. As Interim Executive Director and now as Director Emeritas of the Jackson Hole Ski and Snowboard Club, I followed the development of Snow King's plans.

A viable Snow King open seven days a week during the winter and improvements that can sustain these operations are critical for the club's success, for the success of the next generation of local skiers. I support the Snow King plans.

Thank you,

Michael Hammer

From: Tom Holland
To: comments-intermtn-bridger-teton-jackson@fs.fed.us
Cc: [Town Council](#); [County Commissioners](#); [Catherine Holland](#)
Subject: Snow King Improvements
Date: Wednesday, October 03, 2018 8:29:01 AM
Attachments: [ACAlogo.png](#)

Dear Bridger-Teton National Forest,

My name is Tom Holland, and my wife, Catherine, and I are the owners and directors of Wilderness Ventures, LLC dba Wilderness Adventures. In this role, we are also permit holders with Bridger-Teton National Forest. We have been proud to be the permit holders not just through Wilderness Adventures, but also in our time as directors of Teton Valley Ranch Camp. In such roles, we have been proud to work with the forest to have the best interests of future generations in mind. We love to inspire the next generation to be advocates and caregivers of our favorite outdoor locations. It is with this mindset that I write to you today in support of Snow King's efforts to improve the mountain for the benefit of not just our community but also the future generations of outdoor enthusiasts.

I have read much of the opposition that has surfaced in regards to Snow King's proposals for expanded use of their permit. Much of it comes from individuals who seek to preserve the forest as is, protecting it for future generations to have them be inspired by these wild spaces. Logically, I agree with these individuals that inspiring future generations should be at the heart of this decision. However, I would argue, as someone who has committed his life to inspiring future generations and who works each summer with thousands of children in forest lands all over the United States, that inspiration and education can come in many different forms. Additionally, as we at Wilderness Adventures partner with Snow King to deliver not only our day camp services (Base Camp) but also services to our trip and travel summer camp program, we take pride in knowing that their improvements will be made with these future generations in mind.

This past summer, we had over 275 local children, ages 6-11 join us at Snow King for Base Camp. 95% of these campers were Teton County residents. These children were taught the value of wild lands through our programming, but were limited in their involvement on the mountain due the nature of the Summit Chairlift. A gondola would provide a safe alternative to exposing these kids to the wild spaces that exist atop Snow King. In my role, I also carefully consider risk in all activities with our youth and families. Beyond the accessibility that it would provide, a gondola would also help to mitigate risks in winter and summer as emergency personnel would have an easier way to get down the mountain.

Additionally, we believe a yurt camp would offer the option for greater learning to happen for kids and adults alike. The expanded leadership education that can happen for children in overnight programs is proven and would be an amazing addition.

Challenge is also critical aspect of our outdoor education. Kids today need to be challenged in new ways. Following that challenge activity they then must look back on what they just accomplished and celebrate that achievement. A zip line can do this for children. We work with zip line providers all over the United States and we know that this tool is much more than a few minutes of fun. It is a chance for a child to face their fears and take a risk in a safe environment.

I have always found our partners at the forest service to be fantastic in assisting us to provide exceptional services to youth in our outdoor educational programming; thank you for this. By granting these improvements, you will once again be assisting in this process.

Thank you for your kind consideration.

Sincerely,

Tom Holland

--

Tom Holland
President/CEO



Wilderness Adventures
Do Something Wild

t. 307-733-2122

f. 307-739-1934

w. wildernessadventures.com

PO Box 2768 - Jackson, WY 83001 - USA



From: Scott Horn
To: comments-intermttn-bridger-teton-jackson@fs.fed.us
Cc: [Town Council](#); commissioners@tetowyo.org
Subject: Snowking
Date: Wednesday, October 03, 2018 3:51:22 PM

Dear Bridger Teton Adminiistrators -

This letter is intended to express my support for plans to improve Snow King. As a former ski resort executive I know how important it is to upgrade and improve the resort in order to provide a viable product and experience for the guest.

Snow King is a valuable part of our community and is so important, particularly to the children and families of Jackson. The Jackson Hole Ski Club depends on Snow King and the club will be greatly enhanced if many of the improvements move forward.

I will not go into detail regarding the specifics of each proposed improvement. But, I am supportive of most because they allow for a sustainable resort, improved guest experiences and a for a healthier town of Jackson.

Please move forward with the Snow King plans.

Scott D. Horn

Scott D. Horn
[PO box 547](#)
[Wilson, WY 83014](#)
[307 690 1920](#)

From: Sara Woods
To: comments-intermtn-bridger-teton-jackson@fs.fed.us; marymoore@fs.fed.us; [Town Council](#); [County Commissioners](#)
Subject: Snow King Improvements
Date: Wednesday, October 03, 2018 4:43:11 PM

Dear U.S. Forest Service Officials,

I love working in East Jackson, at the base of Snow King. I am supportive of the improvements and investments Snow King has proposed for our Town Hill. I look forward to more opportunities to enjoy our public land with the amenities that Snow King will provide, especially the plans for the summit. I look forward to exploring the planetarium and restaurant at the summit. I appreciate all the community benefits that Snow King offers. I love the safety and accessibility of skinning up Snow King with my dogs before work, and hiking up Snow King with friends in the summer, just blocks from my house. I look forward to more memories on Snow King for years to come.

Best,
Sara Beth Judson

From: Julie Klomparens
To: comments-intermtn-bridger-teton-jackson@fs.fed.us
Cc: [Town Council](#); [County Commissioners](#)
Subject: Snow King Improvements
Date: Wednesday, October 03, 2018 5:34:37 PM

Dear BTNF Staff -

I am writing in support of Snow King moving forward with their proposed plans to see sustainable operations for the "Town Hill".

Snow King Mountain is an incredible community asset year round, but in particular during the winter when it provides:

- a home base for the Jackson Hole Ski & Snowboard Club's 200+ after school skiers, an 80 year old organization this year!
- a home base for additional school children enrolled in Snow King's ski school
- access to skiing for local families and visitors that can not afford to ski at Jackson Hole Mountain Resort
- easy access to uphill skiing

Thank you for your time working on this amazing community amenity.

Sincerely,

Julie Klomparens

From: Jeff Moran
To: comments-intermttn-bridger-teton-jackson@fs.fed.us
Cc: [Town Council](#); [County Commissioners](#)
Subject: Writing in support of Snow King proposed improvements
Date: Wednesday, October 03, 2018 1:41:01 PM

To whom it concerns,

I am writing in support of **all** of Snow King Mountain's proposed future improvements. I have been an east Jackson resident for 18 years and an employee of the Jackson Hole Ski & Snowboard Club for 14 years. I believe both personally and professionally that moving forward with all of the proposed improvements is vital to Snow King's longevity and will be a positive addition to the Jackson Hole community.

I believe the proposed improvements will:

- Make Snow King viable for future generations of local skiers and snowboarders.
- Enhance and continue the tradition of Snow King being a place where kids and families can affordably recreate together.
- Make Snow King more accessible for the general public and greatly increase and enhance beginner and intermediate ski/snowboard opportunities in Jackson Hole.
- Create safer, year-round access with a gondola to the summit.
- Create an unique and much needed mountain-sports training facility that would benefit athletes of all ages in Jackson Hole.
- Continue to support the tradition of ski racing on our Town Hill long into the future which is a vital component to the JH Ski & Snowboard Club's future success.

I believe Snow King leadership has gone above and beyond with their community outreach and their willingness to modify plans as opinions are voiced. I believe many people in our community don't understand that the success of Snow King is not an a la carte proposal. If Snow King Mountain is not allowed to move forward with their proposed improvements, our entire community will suffer a great loss.

Thank you for your time and consideration of my position.

Best,
Jeff Moran

From: Michael Morrison
To: comments-intermtn-bridger-teton-jackson@fs.fed.us
Cc: [Town Council](#); [County Commissioners](#)
Subject: Snow King Improvements
Date: Wednesday, October 03, 2018 11:38:16 AM

Dear Bridger Teton National Forest,

Snow King Mountain is an amazing place favorite resource of mine in Teton county. I believe it's important that we allow Snow King to expand their product line and upgrade their facilities to allow them to continue to operate. I truly believe Snow King is taken for granted in this community as a "free" benefit to all locals. Unfortunately, I surprised SK still exists today. If not for investors willing to lose capital, we would not be able to skin, hike, bike, ski, and enjoy the great resort. I urge you to move forward with the improvements and allow Jackson locals and tourist to make use of an amazing piece of this community before it's gone for good.

Sincerely,

Michael Morrison

From: Jack Nunn
To: comments-intermtn-bridger-teton-jackson@fs.fed.us
Cc: [Town Council](#); [County Commissioners](#)
Subject: Snow King Development
Date: Wednesday, October 03, 2018 8:22:01 PM

Please record my support for the Snow King Mountain improvement. It is not often that a community icon will be saved by private funding. We should do all we can to endorse and enhance the potential for success of Snow King.

It would be a tragedy to lose that community asset, it is already part of the community and its expansion will insure Snow King will remain, full of life and a vital part of the culture of Jackson Hole.

Please support Snow King Mountain Expansion!

Jack Nunn
Wilson, WY

From: Daryl Peightal
To: comments-intermtn-bridger-teton-jackson@fs.fed.us
Cc: [Town Council](#); [County Commissioners](#)
Subject: A letter in support of Snow King Phase 2
Date: Wednesday, October 03, 2018 12:25:12 PM

I write to you all today to ask for your support & vote in favor of moving forward with the Phase 2 development plans for Snow King.

I wear two hats as it pertains to Snow King. First, as a mom of kids in the Jackson Hole Ski Club. The proposed improvements to both the facilities & the lift/gondola are monumental in the safety & training of the kids in this program. This program has been committed our town, our athletes & to Snow King for over 80 years. It gives our kids an amazing opportunity to ski on weekday afternoons & evenings in less than ideal conditions. Upgrading the locker rooms, training facilities, offices, timing booth & tuning space would allow this club to take our skiers to the next level. On the hill, terrain improvement, safer, updated lifts & a gondola to the top of the mountain would keep our kids safer & open up the terrain to all levels of skiers.

My second hat is as a downtown business owner. We own Cafe Genevieve. As you are all well aware, tourists that come to ski JHMR do not need to come to town to dine & shop like they did 7-10 years ago. Teton Village is a completely self sufficient entity which greatly effects business in downtown Jackson in the winter. Until you spend a day volunteering for the Jackson Hole Ski Club during the week, & see how many ski racers they bring to town, do you realize how vital Snow King is to the vibrancy & success of town business in the winter. By upgrading these facilities & making this a viable & approachable 'town hill', we will only be able to attract more winter business, a time of year we actually NEED the business.

I believe that you all will approach these 'improvements' one-by-one in the process so that we carefully assess the environmental impact each will have. I ask you to consider how much town needs Snow King and how much Snow King needs town. We need one another to prosper & provide these kids and this club with a safer, updated hill & facility.

Thank you so much for your time.

Best,
Daryl M Peightal

Sent from [Outlook](#)

From: Tom Putnam
To: comments-intermtn-bridger-teton-jackson@fs.fed.us
Cc: [Town Council](#)
Subject: Improvements at Snow King
Date: Wednesday, October 03, 2018 2:06:46 PM

To the Commissioners

I wish to express my support for the proposed improvements to Snow King mountain in Jackson. My family are long time users of Snow King. Our son, his wife and two sons, ages 9 and 11 live in Jackson not far from Snow King and we have enjoyed the mountain in many different ways. It seems to me that the plan is in keeping with the goals of Jackson Hole while not placing a burden on the community. We hope you will approve the plan.

Very best regards,
Tom Putnam

Tom Putnam
Email: tputnam@mcmxi.com
Cell: 603 264-3912
Please send all Mail to:
Thomas P. Putnam
P.O. Box 323
Keene, NH 03431

From: john@igneousskis.com
To: [Tyler Sinclair](#); [Snow King Engagement](#)
Subject: Snow King Planning
Date: Wednesday, October 03, 2018 11:16:52 AM

Hi Tyler,

You may remember me from work I did a while back on the Snow King Rebirth Project, where I was proposing a mountain sports facility at the base of Snow King. I still think that is the right idea for a larger vision of Snow King, but I disagree with Snow King Resort's current expansion plans.

In my opinion, Snow King will ideally stay within their current boundaries, not create a new road, and not build a zipline. I'm all for creating an integrated community solution at Snow King that includes a new lift/gondola, peak restaurant/observatory, climbing gym/ski fitness area at the base, but I see no reason to compromise the values we have in the Comprehensive Plan by creating an amusement park atmosphere and encroaching on habitat. I will be writing a similar letter to the Forest Service directly. I think we need a small footprint/high-ceiling climbing gym. A right-sized climbing gym will be small, not large. Enclosure was way too large for a community this size, as confirmed by the wall-builder I consulted heavily on the Snow King Rebirth Project. Smaller gyms have a better community feel because they're busier.

I think we should move Jackson Hole gymnastics out of the private market in to the publicly subsidized market, much like ALL other sports. An integrated gymnastics and mountain sports facility (foampits, trampolines, skate ramps) could accomplish this. It should not contain a gym, which would encroach on far too many local business owners and trainers.

Snow King does not need to expand their boundaries, they need to better use and maintain the slopes in their current boundary. I do not feel comfortable having Snow King bear the responsibility for building a climbing gym or training facility, that should be on public land and managed by non-profit, similar to the Ice Rink, or Vertical Harvest.

Thank you,
John Reed

From: Christian Santelices
To: comments-intermtn-bridger-teton-jackson@fs.fed.us
Cc: [County Commissioners](#); [Town Council](#)
Subject: Snow King Improvements
Date: Wednesday, October 03, 2018 7:08:24 AM

I moved to Jackson in the spring of 1998. One of the first things I did was to hike up Snow King Mountain and look across the valley at my new home. Since then I have spent countless hours on Snow King, hiking with my kids in a backpack, skiing with them now on the mountain, and working as the Operations Manager and developer of the Treetop Adventure at Snow King. My life is intimately entwined with this place and its meaning for our community. And as such, my livelihood going forward is also entwined with its success.

I want to express my support for continued improvements on Snow King Mountain. A gondola to the top with a restaurant would do so much to make Snow King viable into the future. These two amenities by themselves would provide a safe way up, and if needed, down, as well as a way for everyone to enjoy the view from the top. Using the low angle, sunny terrain on the South side of the mountain would also be a great way to get beginning skiers started. A zipline tour snaking its way down the mountain, as opposed to a high-speed, straight down zipline, would be a fun alternative and quieter affair.

I know that a road on the front side has been controversial. But it is also an essential way for beginner to intermediate skiers to actually ski down the mountain, and really would mean tying in to existing roads in place. Add to that the need to have support vehicles in the summer time with easy access to the top. Using the road for access up Leeks Canyon will add traffic to town roads and pollution to the air.

Thanks for your time, and I hope that we can make the improvements Snow King needs to stay viable into the future.

Sincerely,

Christian Santelices

From: Gary Shaw
To: comments-intermtn-bridger-teton-jackson@fs.fed.us; [Town Council](#); commissioners@tetoncountyny.gov
Subject: Support for the Snow King Observatory and Planetarium
Date: Wednesday, October 03, 2018 5:54:17 PM

Dear US Forest Service, Jackson Town Council Members and Teton County Commissioners,

I wanted to voice our support for the proposed public observatory on Snow King. We come to Jackson from Boston for 2 months each year and every time we bring along our 6"reflector telescope to take advantage of the one of Jackson's greatest natural resources - it's dark skies.

The proposed facility will greatly enhance science education in the area and help stimulate young people to consider careers in science and engineering and help keep the US at the forefront of innovation and discovery - a position we risk losing if young adults continue the trend away from these vitally-important areas.

The instruments proposed for the new facility are serious ones, not small backyard telescopes. The public outreach for this project will bring thousands of people into exciting visual contact with the incredible structures in the Universe. The educational opportunities alone justify support for this project but, beyond education and career inspirations, the sheer beauty and marvel of the night skies awaken all of us to how vast the universe is, how small a part we are within it and how important it is for us to share a common vision to take care of our planet and feel a common bond with one another.

I hope you'll grant approval to this project in your official capacities and also support and enjoy it personally.

Respectfully,

Gary C. Shaw

From: megtozzi@mac.com
To: comments-intermt-n-bridger-teton-jackson@fs.fed.us
Cc: [Town Council](#); [County Commissioners](#)
Subject: Snow King Improvements
Date: Wednesday, October 03, 2018 8:53:42 AM

Dear Forest Service Employees, Town Councilors and County Commissioners,

I am writing to you today as an 18 year resident of Teton County, JH Ski Club Supporter, and parent of three children, to express my support for Snow King and their proposed plans for Phase 2. My husband and I have seen firsthand what a tremendous benefit Snow King is for adults and children of all ages. Two of our kids are avid ski racers, and as a family we spend many winter days and nights at Snow King. It is an invaluable resource, that we are all lucky to have right in the heart of town. Without a plan for the future of Snow King itself, the future of the JH Ski Club would also be in jeopardy.

We want Snow King to become a viable business entity in the wintertime, and that involves adding infrastructure and modernizing the Town Hill. The current investor group needs your support in order to maintain winter operations for Snow King. I am in support of Snow King's plan providing for the addition an indoor training facility and upgrading lighting and snowmaking. I know that the controversial items seem to be a proposed zip line, and road to the summit and the placement of the new gondola. I believe the the road is a critical piece of the plan for access, as well as an easy way down for skiers, so Snow King can appeal to a wider audience and send beginners to the top for lessons. The zip-line is the economic driver for the plan, and will provide a much needed winter revenue stream. Finally, putting the gondola in the parking lot at the base helps open up the base area and also provides much easier access for older and younger skiers.

Thank you for time and attention to this important decision.

Regards,
Meaghan Tozzi

From: [Tyler Sinclair](#)
To: [Tiffany Stolte](#)
Subject: FW: Snow King On-Mountain Improvements Projects
Date: Wednesday, October 03, 2018 2:07:57 PM

From: Denise Tsuruda-Dobell <denisetsuruda@gmail.com>
Sent: Wednesday, October 3, 2018 1:59 PM
To: Tyler Sinclair <tsinclair@jacksonwy.gov>
Subject: Snow King On-Mountain Improvements Projects

October 3, 2018

Ms. Denise Tsuruda-Dobell
4250 Hufsmith Hill Rd.
P.O. Box 4283
Jackson, WY 83001

Town of Jackson
P.O. Box 1727
Jackson, WY 83001

Attention: Tyler Sinclair, Planning Director, Town of Jackson

Re: Snow King On-Mountain Improvements Projects

Thank you for extending the public comment period on the Snow King On-Mountain Improvements Projects. It is a very important issue to our town of Jackson. I appreciate the effort that the Forest Service has extended for the partnership with the public to maintaining the quality of life for our ecosystem.

I have lived in the valley for many years, and I have appreciated the benefits of the "town hill." The changes I see will not only be detrimental to our way of life, but negatively impact the beauty and wildlife that brought me here.

As a mother of a son who first experienced outdoor winter sports on Snow King, I am concerned with the expansion plans that would move beginner skiers and programs to the top of the hill. When my son was young, I was very excited to have him experience skiing and snowboarding right in town at the base of Snow King. I was able to take him to the base of Snow King, ride the rope tow on his own, and experience affordable lessons with his peers. My son is now a young adult, but when he was young, I was grateful to be able to share my love of skiing with him in a comfortable and affordable venue. This would not be possible if the beginner slopes were located at the top of the mountain. I do not believe that my son would have been able to wave goodbye at the base, travel to the top by himself, and have a good experience with skiing.

The proposed building of the new road across the north face of Snow King and expanded ski area boundaries will cut into pristine wildlife habitat as well as compromise every ski trail with steep and dangerous intersections. It will leave a scar that will require major cutting through steep forest. This expansion goes against the 2012 Comprehensive Land Use Plan which was adopted by the Jackson Town Council and Teton County's Board of County Commissioners.

I hope everyone involved with making decisions about the future of Snow King will consider the historic value that the area brings to our community. This historic value will be diminished if expansion is only for profit.

Thank you for your time and consideration.

Sincerely,

Ms. Denise Tsuruda-Dobell

Cc:

Bridger Teton National Forest, Patricia O'Connor, Supervisor
Bridger Teton National Forest, Mary Moore, District Ranger

Jackson Town Council; Teton County Board of Commissioners

From: Jamie Turner
To: [Tyler Sinclair](#); [County Commissioners](#); [Town Council](#)
Cc: marymoore@fs.fed.us
Subject: Snow King Improvements
Date: Wednesday, October 03, 2018 2:29:04 PM

To Whom It May Concern,

I would just like to voice my support for the improvements being recommended for Snow King Mountain. As an 18 year resident of Jackson I think the improvements being submitted would be a great boon to the town as well as Snow King. Admittedly, I was skeptical of developing the tree top course and the mountain coaster, but I feel that they have been tastefully done and add a lot to our community and the visitor experience. I believe the improvements being discussed would also be done with the same concern and care. These are great ways for families, community members and visitors to get out and enjoy the outdoors. Snow King has been withering on the vine for years and the fact that someone has come along and is willing to invest in it and bring new life and energy to the resort is fabulous- we should be taking advantage of this. Their plan to enhance the mountain will benefit community members, business owners and visitors alike: new mountain biking terrain, new skiable terrain, investing in ski racing, and an enclosed gondola to a summit planetarium are thoughtful and sensible ways to help this mountain thrive. I have witnessed the changes at Teton Village which 18 years ago was a ghost town in the summers to a fun, active, thriving place to spend time. Why not let Snow King have the same opportunities?

Thanks for listening.

Jamie Turner

jturner@onewest.net

From: Alicia Etcheverry
To: comments-intermtn-bridger-teton-jackson@fs.fed.us
Cc: [Town Council](#); [County Commissioners](#)
Subject: Snow King improvements
Date: Thursday, October 04, 2018 10:28:04 PM

Hello Bridger Teton National Forest and Town of Jackson,

My name is Alicia Etcheverry. I live in SE Idaho and am supportive of Snow King Mountain's proposed development. As an employee of Pine Creek Ski Resort, a fellow Wyoming ski area, I value how our network of ski resorts draw people to the outdoors to explore and appreciate nature.

I was taught to ski as an adult and fell in love with the mountains. The combination of freedom and being surrounded by nature's wonder is unlike anything else. Since becoming a skier and firsthand finding out how passionate I could become about a sport I once ignored, I am passionate to help other people discover the same for themselves. Those who learn to love and respect nature will treat the natural resources more responsibly.

Developing Snow King Mountain would bring others to discover the liberation and connection to nature I now feel. **Developing beginner and intermediate terrain** makes it accessible for first-timers intimidated by the expert terrain that others enjoy so freely.

- Winter recreation is vital for mental health in cold climates. Let's improve Snow King Mountain for the novice kids, adults, and seniors and give them something to look forward to in winter. Socially, psychologically, and physically, skiing improves people's lives. Challenging yourself to progress is a continuous process of self-validation and achievement. People who don't experience success in other aspects of their lives can succeed at skiing and feel increased self-worth.
- Our world's tragic norm consists of increased screen time and isolation with a false sense of connectivity. Fast-paced outdoor recreation such as skiing and mountain biking offers a bonding activity counter to today's norm.

The economy of Jackson would greatly benefit to have an improved visitor experience at Snow King.

- I write to you on a rainy October day after watching 3 busloads of tourists brave the Summit Lift in bouts of rain. A gondola to replace the Summit Lift would enhance the experience of the tourist coming to Jackson, and draw them into the center of town. After returning from a trip to the town of Jackson, international tourists will rave about the Snow King experience complete with an enclosed gondola car that fits more than 2 people, and tasty food atop the mountain in the heart of town center.
- Wedding venues charge a premium and Snow King offers the prime location for such a high-dollar event. The revenue would benefit the entire town of Jackson with spillover money spent in town from visiting wedding guests.

After spending nearly 2 weeks in Jackson Hole recently, I found a juxtaposition in how outdated many features of Snow King are compared with the modern town development abound. Snow King's winter mountain seems slightly forgotten in contrast with the bustling

upkeep and renovation of Jackson town square.

I advocate revitalizing Snow King while maintaining its authenticity and character. Please support the efforts to expand the terrain responsibly and add amenities that will continue to fund development projects.

Thanks for your time,
Alicia

COPIES TO: Town of Jackson
Jackson Town Council
County Board of Commissioners

October 4, 2018

Bridger Teton National Forest
Jackson Ranger District
PO Box 1689 Jackson, WY 83001

Atten: Mary Moore, District Ranger
Patricia O'Connor, Bridger Teton NF Supervisor

Dear Mary and Patricia,

I am writing to you regarding the Snow King Proposals for expansion and more development.

I moved to Jackson in 1972 and have owned my house on Aspen Drive since 1979.

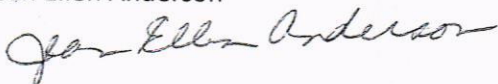
The proposals for expansion and more development on Snow King Mountain are wrong. They are wrong for so many reasons. They are wrong for the pride the townspeople have in their Town Hill. They are wrong for the wildlife that traverse the area. They are wrong because they defy the Comprehensive Plan which was long in the making but a relief for the community because it protects us. It is wrong for a new road to cut through the mountain. Not only will it change the view of Snow King from as far as 30 miles away, but it will also interrupt the ski runs and consequently discourage many skiers. It is wrong to build a long "easy way down" because it will disrupt wildlife habitat and also dangerous because it will be lined with forest and groomed for beginners and intermediates and experts will have a ball skiing too fast and either running into slow skiers or the trees trying to avoid the slow skiers. It is wrong to build a gondola that will need the space of the baseball field which has been in use for 50-60 years.

It is wrong because it would be a folly to invest money in the little town ski hill which will never provide a return on that investment. Snow King is too cold, too shady, too steep to entice out-of-town skiers. A family of four is not going to spend \$30,000 for a week of skiing at Snow King. They would go to Teton Village where there is sun, diversity of runs, more people and more fun. Snow King Mountain will never be more than what it has always been—the beloved Town Hill.

Since the investment to make Snow King bigger is not realistic (the developer should be required to prove how they think it is realistic), then the pursuit of profit from real estate is most likely their goal, as is in most ski areas. This is WRONG. It is against common sense to alter, at a financial loss, forever Snow King Mountain at the detriment of the citizens of Jackson Hole so that the proposed developer can make some money selling real estate. If they are savvy developers, they can take their money and invest it in a needed project somewhere else.

Please do not accept these proposals for expansion.

Thank you,
Sincerely,
Jean Ellen Anderson



From: Tracy
To: [Snow King Engagement](#)
Subject: Snow King Resort Mountain Improvement Project
Date: Thursday, October 04, 2018 3:39:51 PM

From: Tracy <tbaiotto@yahoo.com>
Date: October 4, 2018 at 2:11:42 PM MDT
To: comments-intermtn-bridger-teton-jackson@fs.fed.us,
commissioners@tetonwyo.org, council@townofjackson.com
Cc: Theresa Baiotto <tbaiotto@yahoo.com>
Subject: Snow King Resort Mountain Improvement Project

Dear Forest Service,

As a Jackson resident who frequents the Snow King Resort area with my family, friends and our visitors, I am very appreciative of the unique amenity Snow King Resort offers to our town, county and area. Snow King Resort is an integral part of our community and culture. It contributes to not only the livability of the town and area, but also the charm visitors so admire.

At this critical juncture in our community's evolution, I sincerely urge you to carefully evaluate the proposed Snow King Resort master plan (improvements/expansion proposals) from a macro perspective, considering long term impacts upon the various stakeholders of the area. I feel it is vital that we balance the many interests of our community – wildlife, residents, businesses, visitors.

I am fully supportive and understanding of the need for Snow King Resort to be a viable business. However, the proposed scale of the Snow King Resort seems unnecessary and inappropriate, and I have serious concerns regarding many of the proposals:

I am against the proposed expansion into the Cache Creek drainage along with the 16 foot road as it would negatively impact valuable wildlife habitat as well as existing ski runs.

I am against the gondola in Phil Baux Park. This would negatively disrupt a key community gathering space enjoyed by so many.

I am against the zip line which would be a nuisance to local residents as well as wildlife on forest land.

I am against the expansion west. There are many, many improvements which can be made to the existing area prior to considering expansion.

I am against adding a backside lift to add a bike park and move the beginner ski area. The beginner ski area is currently in an ideal location from a user perspective – considering temperatures and convenience for small children. Also,

it seems that a wildlife study is essential prior to expansion in this area.

I appeal to you now. We must choose our future – what we want our community to be and for whom. I hope you will see the value preserving the best of what we have as we move into the future.

Thank you for your time and consideration.

Sincerely,

Theresa Baiotto
[1170 W Brangus Dr, Jackson WY](#)
tbaiotto@yahoo.com

From: Whitney Ballard
To: comments-intermtn-bridger-teton-jackson@fs.fed.us; [Snow King Engagement](#); [County Commissioners](#)
Subject: Snow King Mountain Resort on mountain improvements
Date: Thursday, October 04, 2018 4:28:04 PM

Dear BTNF Decision Makers-

First and foremost, I want to thank the forest service for extending the comment period. In doing so, I believe it has given the community a chance to look deeply into the proposed changes and effects, and has given everyone a better opportunity to voice their concerns.

I am a daily Snow King user, whether it's hiking, snowshoeing, or skiing. I feel the greater Snow King area is an amazing community asset, and I care immensely for it. I am fortunate to live on the boundaries of the forest, and I am thankful for so much of the wildlife that I have shared it with. Winter is my favorite time to hike the trails, not just because of the lack of human presence, but also for the abundance of wildlife that I have observed. I am strongly opposed to all expansions, including the new access road. Not only will the mountain be scarred, but the loss of habitat for all of the species that struggle to make it their home will undoubtedly be effected by future human impacts as well. There is enough stress for much of the wildlife, but the cutting down of hundreds or even thousands of trees and a heavier human presence will no doubt add to their struggle. I fear that a new road could be dangerous to maintain. Not only will it cut through avalanche paths and have steep road cuts, but it would also bring inexperienced skiers to a dangerous forest filled with tight trees, rocks and of course, wintering wildlife. The snowpack is usually thin and uninviting, and new ski trails may hardly be of use for most of the season, forcing wildlife out in search of safer habitat. This is only my perspective, as I know there are many others with more knowledge who also feel this road is unsuitable and potentially dangerous.

I cannot support many of skmr's proposed "upgrades." The steepest, fastest zipline in the U.S isn't appealing, and certainly isn't something this community needs. I've never heard anyone say they'd rather go on a zipline than enjoy this amazing natural environment. We already got stuck with a coaster, please don't stick this community with a crazy zipline, too.

I also object to Snow King's down hill mountain bike plans. If it is approved, it should be done on already impacted private lands near the Rafferty lift. There is no reason to impact the public trail system with paying Snow King visitors, the trail system has already seen increased activity and this would only make it less appealing to regular users. I also fear that it would rarely snow enough to cover these cut trails, and that skiers would be further challenged by new the obstacles. I also would not feel safe for my dogs being anywhere near more bikers, and I appreciate the fact that I do not have to worry about them getting run over while using Snow King, because sometimes I don't want to take them in the forests due to a potential wildlife encounter.

Part of the appeal of Snow King mountain is its old ski hill feel, something current ownership and management consider unappealing for Jackson. Unfortunately, I believe the days of affordable day tickets and season passes are numbered, certainly to help pay for the substantial projects that skmr is proposing. I fear that with many of the new plans, it will forever change our town and our beloved town hill in a negative way. Please consider my perspective, and the many other comments that find certain proposals to be unnecessary and unwanted. We all love Snow King, but not what the investors are trying to do to our town hill and community. The impacts are far too great, and a more balanced future is needed than what they have proposed.

Thank you!
Whitney Ballard
Jackson, Wyoming

Rec'd 10.8.18
Scanned + EM'd

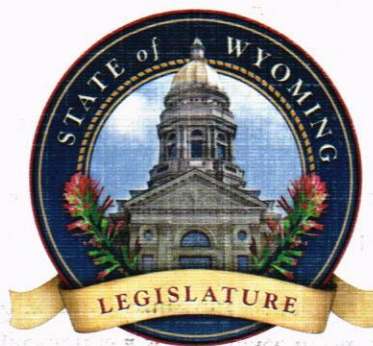
Senator **Eli D. Bebout**

Senate President

Management Council & Senate Rules & Procedures, Chairman

Wyoming Senate: **Senate District 26**

P.O. Box 112 • Riverton, WY 82501



business (307) 856-0375

email Eli.Bebout@wyoleg.gov

October 4th, 2018

District Ranger Mary Moore
Bridger Teton National Forest
Jackson Ranger District
Post Office Box 1689
Jackson, Wyoming 83001

Dear Ranger Moore,

Thank you for the time and work that you and your office continue to give to the Snow King Mountain Phase 2 Master Plan review process. Jackson is a special place in our state and the Snow King Mountain Resort has an iconic history here in Wyoming, being one of the first ski resorts.

Now in its 80th year, Snow King owners are proposing much needed investment in this jewel of a small-town ski resort. These proposed investments will allow Snow King to bring much needed infrastructure changes to the mountain. These include expanding beginner skiing, replacing the Summit lift with a gondola, and diversifying its offerings to locals and visitors alike.

Improving access and availability of winter sports to Jackson locals, Wyomingites, and visitors is essential to continuing to bring up the next generation of skiers. Snow King's proposed investments will continue to see great dividends in budding athletes, affordable family winter activities, and the financial sustainability of the resort.

Investments will allow Snow King to become a stronger regional and national hub for youth and junior racing, winter sports tourism, and an affordable place to vacation for families and individuals. Snow King will continue to be the heart for local athletes to train, kids to learn to ski, and locals as well as visitors to recreate.

Amenities such as a gondola to the summit, restaurant and meeting space, new beginner and intermediate terrain, additional snowmaking, zip line, planetarium and observatory will provide much needed infrastructure to a Wyoming ski resort in need of investments and stewardship.

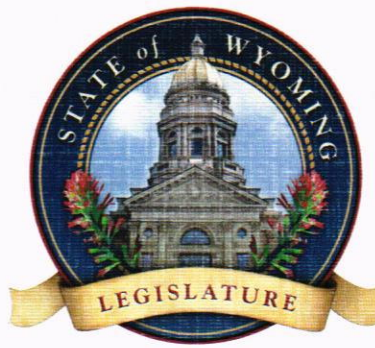
Senator **Eli D. Bebout**

Senate President

Management Council & Senate Rules & Procedures, Chairman

Wyoming Senate **Senate District 26**

P.O. Box 112 • Riverton, WY 82501



business (307) 856-0375

email Eli.Bebout@wyoleg.gov

I support Snow King's Phase 2 plans for proposed amenities and infrastructure. These investments are exactly what the 80-year old ski hill and community need in order to keep winter sports, ski racing, and ski culture thriving in the heart of downtown Jackson and in Wyoming.

Snow King needs support for their plans in order to ensure the sustainability and continued support of the local hill for another 80 years. I look forward to seeing these amenities and a thriving Snow King Mountain Resort in the very near future.

Sincerely,

A handwritten signature in black ink, which appears to read "Eli Bebout". The signature is written in a cursive style.

President Eli Bebout

CC: Town of Jackson, Teton Board of County Commissioners

From: Craig Benjamin
To: comments-intermt-n-bridger-teton-jackson@fs.fed.us
Cc: [Town Council](#); commissioners@tetoncountywy.gov; [Snow King Engagement](#)
Subject: Attention: Snow King On-mountain Improvements Project
Date: Thursday, October 04, 2018 8:59:41 AM
Attachments: [Comments on Snow King On-mountain Improvements Craig M. Benjamin.docx](#)

Dear District Ranger Moore,
Thank you for the opportunity to comment on the environmental review process for improvements proposed in Snow King's master development plan on National Forest System lands.

Please see my comments below and attached, and let me know if you have any questions or would like any additional information.

Thank you,
Craig M. Benjamin
Jackson, WY

Bridger-Teton National Forest - Jackson Ranger District, P.O. Box 1689, Jackson, WY 83001 –
Attention District Ranger Mary Moore

Dear District Ranger Moore,
Thank you for considering these comments in regard to the environmental review process for improvements proposed in Snow King's master development plan on National Forest System lands.

More importantly, thank you and Forest Supervisor O'Connor for your excellent work ensuring this proposal is thoroughly reviewed and the community is effectively engaged in this review process.

This is an issue in which I am both personally and technically familiar. My son plays Jackson Youth Hockey on the ice at Snow King. I run up/down/across or bootpack/skin up and ski down on the trails and ski runs of Snow King 3-4 days a week, all year. My kids proudly climb and conquer the boulders at Phil Baux Park and love to go tubing. And I've attended too many concerts to count with friends and family on the ball field. I could go on, and on, as all of us who live in Teton County could, about what Snow King means to me and my family and its importance to both me personally and to our community.

I also know this issue inside and out from a technical perspective. From 2013 to 2017 I worked for the Jackson Hole Conservation Alliance, first as Community Engagement Coordinator, and then for over three years as Executive Director. In this role I had the responsibility to lead an organization working to ensure (among other programs and campaigns) that major development proposals align with our community's vision and values and serve to protect Teton County's wildlife, wild places, and community character. Given this responsibility, I

worked with our staff and partners to learn everything we could about the details of this proposal, the rules and regulations that govern its potential implementation, the stakeholders engaged, and how we could help ensure it did in fact make our community a better place should it move forward in some fashion. I've even read the entire Snow King Resort Master Plan.

I must state clearly that while this past experience gave me valuable and hopefully helpful insight into this proposal, as I no longer have any formal affiliation with the Jackson Hole Conservation Alliance, **my comments represent only my view, and not that of any other person, entity, or organization.**

In addition, as I now work professionally in a role where I focus on policies at the state and federal levels in Idaho, Nevada, Utah, and Wyoming, I have not had the capacity to follow this issue in depth over the past year.

Therefore, **I respectfully request that you give special consideration to comments from people and organizations – like the Jackson Town Council, Teton County Board of Commissioners, the people who served on the Stakeholder Group (especially those not representing for-profit entities that stand to profit from proposed improvements) and the Jackson Hole Conservation Alliance** – who have had the capacity to give this important issue the attention it deserves.

First, please formally note that nearly two decades ago, the owners of Snow King Mountain Resort received copious development rights in exchange for an agreement to provide significant community benefits supported by profits from development – including the continued winter operations of Snow King Mountain Resort – all legally codified in the Snow King Resort Master Plan. **If the owners of Snow King Mountain Resort wish to renege on their responsibilities as detailed in the Snow King Resort Master Plan, the Town of Jackson and Teton County should consider revoking Snow King's corresponding development rights.** In the West, a deal is a deal, and if Snow King Mountain Resort wants a new deal, then we need to make appropriate adjustments to the old one. One way to achieve this end would involve formally partnering with the Town of Jackson and Teton County on a re-zone process for the lands contained in the Snow King Resort Master Plan area that would run parallel and in coordination with this environmental review process.

Second, **please consider an alternative with zero net increase in acreage.** The only item in the purpose and need of this proposal that merits considering expanding the acreage of the ski area is to improve beginner and intermediate terrain. This may be possible to without increasing the acreage of the ski area, but we won't know this unless we analyze an alternative with this parameter. This alternative would have the added benefits of eliminating the harmful impacts from the proposed road, which would have serious negative effects on neighboring wildlife and habitat, the visual aesthetics of Jackson Hole, people living adjacent to the ski

area, and on the skiing experience. In addition, as I am on the Snow King ridgeline nearly every other day, all year, I am skeptical at best about the feasibility of skiing on both the upper ridge and the south side due to variable weather and poor (and often no) snow conditions from southern exposure. The Rafferty area may well serve as the perfect spot to improve beginner and intermediate terrain.

Third, **please analyze the impacts to wildlife and habitat from all proposed improvements.** In the area under review I have personally seen elk and their calves, deer and their fawns, moose and their calves, all sorts of raptors, and grouse. Please refer to Wyoming Game and Fish Department analysis, and consider both anecdotal and more thorough scientific analyses in your review regarding potential impacts to wildlife and habitat.

Fourth, **please carefully consider how this proposal aligns with the goals and policies outlined in the 2012 Jackson/Teton County Comprehensive Plan.** There are a number of specific policies directly relevant to this proposal that merit close attention for alignment.

Fourth, Phil Baux Park is the living room of our community. **Please do not consider any alternative that impairs Phil Baux Park in any significant manner.**

Fifth, **please ensure the alternatives appropriately improve public access to the trails on Snow King Mountain and ensure this access is free to the public year round.**

Sixth, **please do not consider any alternatives with zip lines,** especially those that go top to bottom. The community has overwhelmingly rejected this concept as they are not appropriate.

Seventh, **consider other options for road access to the summit,** like the existing road on the backside.

Eighth, **please consider the impacts to noise pollution from all proposed improvements.** Many of the proposed improvements, such as zip lines, would have significant noise impacts.

Ninth, **please consider the impacts to light pollution and how each proposed improvement aligns with the Town's Dark Skies ordinance.** While the observatory and planetarium at the summit represents one of the most widely supported pieces of this proposal, it won't function effectively if other improvements create significant light pollution. In addition, light pollution would impact neighbors and the visual aesthetics of the entire valley.

Tenth, **please analyze the impacts to all proposed alternatives in regards to their impact on the community on issues such as housing, parking, and traffic.** Snow King Mountain Resort has a responsibility to follow all applicable Town and County rules and regulations in these regards.

Finally, thank you again for considering these comments and your excellent work ensuring that this proposal is thoroughly reviewed and the community is effectively engaged in this review process.

Please do not hesitate to contact me if you have any questions or would like additional information.

Sincerely,
Craig M. Benjamin
Jackson, WY

CC:
Jackson Town Council
Teton County Board of Commissioners

From: BIERMAN Scott
To: comments-intermt-n-bridger-teton-jackson@fs.fed.us
Cc: [Town Council](#); [County Commissioners](#)
Subject: Snow King improvements
Date: Thursday, October 04, 2018 5:25:32 PM
Attachments: [image007.png](#)
[image008.png](#)
[image009.png](#)

Good evening Bridger Teton National Forest and Town of Jackson

I am writing in support of the new gondola at Snow King. The town hill is in great need of a new lift servicing the summit of the King, it is a long cold ride to the top and the aging infrastructure can be difficult and costly to maintain. With a new Gondola the King will be able to provide a comfortable and fast ride to summit to take in all the beautiful scenery that JH is known and access to the steep skiing that has built its reputation. The hill also needs some additional beginner terrain which could be beneficial to growing the sport of skiing and snowboarding. Additional activities and services could also be a huge draw for the numerous visitors that are looking for adventure. Weddings and corporate events would really take off adding additional tax revenues during the shoulder seasons as summer venues are already maxed out. As a long time local and having family still in the valley we would love to see the Legend continue a successful run being the iconic in-town hill!

Thank you.

SB
Scott Bierman
Sales and Business Development

O 970-257-4524

C 307-690-6197

2746 Seeber Dr. Bldg. A

Grand Junction CO 81506

www.Leitner-Poma.com



From: Jim Coleman
To: comments-intermttn-bridger-teton-jackson@fs.fed.us
Cc: [Town Council](#); [County Commissioners](#); info@snowkingmountain.com; bkrill@jhsclub.org
Subject: Snow King Comments
Date: Thursday, October 04, 2018 4:45:52 PM

Ms. Mary Moore
Jackson District Ranger
Bridger-Teton National Forest
Via email: comments-intermttn-bridger-teton-jackson@fs.fed.us

Dear District Ranger Moore:

My name is Jim Coleman. I have been a resident of Teton County for the past 14 years. For the last 10 of those years, my family and I have been involved with the Jackson Hole Ski & Snowboard Club in some fashion. My 17 year old daughter raced for the Club in her earlier years. I have been on the Club's Board of Directors for the past seven years and have skied for the Club's Masters program for 10 years. On average, I would estimate that someone from my family is at Snow King two to four days a week throughout the year.

I am in support of the improvements Snow King is proposing. The vast potential of the ski area is being held back by antiquated assets and a mindset that any change is detrimental. I would estimate that annually over 1,000 local kids ski or snowboard at Snow King. They deserve a modern product.

A gondola based in Phil Baux Park will open the congested base area and greatly enhance skiing and other events that can be held at Snow King. Additional lighting is critical for the enjoyment and safety of the many kids who ski there on weekday evenings after school (the lights should be off at 7:30pm each day and should not impact astronomic observation at the summit). Most importantly, facilities at the base of the ski area should be expanded and modernized. Over 400 kids are based out of the Ski Club offices at the base of Snow King. The Club is bursting at the seams to accommodate them – there simply isn't the room currently.

These improvements are years in the making. Our kids deserve to see them implemented. I believe that more delay is not in best interests of the average citizen of this county.

Thank you for the time you are taking to address this matter.

Sincerely,

Jim Coleman

Best Regards,

James A. Coleman | Levy Coleman Brodie LLP | Attorneys at Law | Post Office Box 7372, 1110 Maple Way, Second Floor, Jackson, Wyoming 83002 | phone 307.733.7057 | fax 307.733.7142 | mobile 307.699.2319 | jcoleman@jhattorneys.com

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From: Cherilynn Domer
To: comments-intermttn-bridger-teton-jackson@fs.fed.us
Cc: [Town Council](#); [Snow King Engagement](#); commissioners@tetoncountywy.gov
Subject: "Attention: Snow King On-mountain Improvements Project".
Date: Thursday, October 04, 2018 6:52:18 PM

Dear BTNF,

Please do not approve the Snow King On mountain Improvements Project. Preserve critical habitat for your wildlife! I live near the base of Snow King, and the improvements that have already occurred has negatively affected the quality of life of year-round residents. Traffic had increased drastically, and during the summer months, the mountain coaster can be heard by residents as far away as Hall and Redmond St.

Approving this project would cause irreparable harm to winter habitat for many native species and reduce the number of wild species. During the winter months when food and shelter are scarce, the land on the proposed project serves as critical habitat to many native species. During the winter months, I've seen mule deer, badgers, and numerous species of birds in the exact forested section of the hill that the proposal is asking to clear cut for recreational purposed. Avian species I've seen there include Great Horned Owls and Downy Woodpeckers. Woodpeckers depend on old growth forests for food and nesting. During the winter months, they feed directly on the trees in that area and use the old growth trees as nesting sites.

We also know from reports from the Wyoming Fish and Game, that cougars and wolves have been spotted in that region. The top-tier predators need a large space to roam. Please do not threaten them by infringing on their habitat.

The community of Jackson values wild places, and preserving natural wild habitat. Please vote NO on the Snow King On-Mount Improvements Project. It will not improve the quality of life for residents and the wild species that call that space home. It will only improve the coffers for those with a financial interest in this terrible idea and make Jackson Hole more like Disneyland than a wild and wonderful wilderness.

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Sincerely,
Cherilynn Domer

From: Pilar Furlong
To: comments-intermtn-bridger-teton-jackson@fs.fed.us
Cc: [Town Council](#); [County Commissioners](#)
Subject: Snow King Improvements
Date: Thursday, October 04, 2018 12:40:20 PM

Hello,

I support the current proposed plan for snow king's investment in the future of skiing, snowboarding, hiking and biking. Please be sure this vital resource continues to operate. Thank you.

Pilar Furlong

From: Alexandra Glinsky
To: comments-intermtn-bridger-teton-jackson@fs.fed.us
Cc: [Town Council](#); [County Commissioners](#)
Subject: Snow King Improvements
Date: Thursday, October 04, 2018 5:28:15 PM

I SUPPORT THE CURRENT PROPOSED PLAN FOR SNOW KING'S
INVESTMENT IN THE FUTURE OF SKIING, SNOWBOARDING, HIKING
AND BIKING

From: Tom Jordan
To: comments-intermtn-bridger-teton-jackson@fs.fed.us
Cc: [Town Council](#); [Snow King Engagement](#); commissioners@tetoncountywy.gov
Subject: multiple use vs wildlife habitat
Date: Wednesday, October 03, 2018 10:54:52 PM

Bridger/Teton National Forest,

The higher population density in the Town of Jackson has reduced the viable winter wildlife habitat in the valley during the past 45 years we have lived here. And while our family learned to ski on the King, and have enjoyed the prior developments, there comes a time when the negative impact of development outweighs the recreational and financial benefits of those interests.

As stewards of the National Forest, please consider that as the Town has an overall plan for increasingly higher density and development, when that encroaches the Forest, the character of the Forest is forever changed. Many people both locals and visitors enjoy seeing the wildlife and its proximity to town. Therefore, we are against further expansion of The Snow King recreational area.

Respectfully,

Tom and Becky Jordan
East Jackson

From: Jean Lewis
To: comments-intermtn-bridger-teton-jackson@fs.fed.us
Cc: [Town Council](#); [County Commissioners](#)
Subject: Snow King Improvements
Date: Thursday, October 04, 2018 1:33:18 PM

To Whom it May Concern,

I hope you will consider allowing for improvements on Snow King Mountain. As a central icon in our community, Snow King has been a big part of Jackson Hole for generations. As times change, and our valley gets busier (ineveitably this is the case if we like or not), it is important to consider making updates to the town hill.

That area of town is becoming engaged in a new way. We all see it with the new construction, new business's and the recent land acquisitions in the area. It would be lovely to keep the overall "town hill" feel of Snow King, but a bit of a facelift should be allowed and is need for safety as numbers increase. Especially for the hundreds of kids who spend afternoons at Snow King training and learning.

Thank you for your consideration.

Sincerely,

Jean

From: Adam Long
To: comments-intermtn-bridger-teton-jackson@fs.fed.us
Cc: [Town Council](#); [County Commissioners](#)
Subject: Snow King Mountain Improvements
Date: Thursday, October 04, 2018 4:28:10 PM

To whom it may concern,

The improvements that have been done and also projected to Snow King Mountain are adding value to the community of Jackson Hole and are increasing the offerings of what town has to offer to potential and already visiting tourists. Since our basis of all revenue and income in the town of Jackson as well as the surrounding area comes almost completely from tourism both winter and summer. The more that is offered the better to entertain and keep tourists coming back again and again. With clients that are always looking for something new and different to do while on vacation, as well as locals needing to entertain family and friends, these improvements to the mountain are giving other options than just the normal fishing, horseback riding, river float or whitewater, skiing ect. to these new and former tourists. I am for these improvements to the mountain and see the value it is adding to community, clients and myself.

Adam Long

From: Ryan McConnaughey
To: comments-intermtn-bridger-teton-jackson@fs.fed.us; marymoore@fs.fed.us; [Town Council](#); [County Commissioners](#)
Subject: Snow King Mountain Resort On-mountain Improvements Project
Date: Thursday, October 04, 2018 5:05:06 PM

I am writing to voice my support for the changes to the Snow King Master Development Plan. These changes will offer Snow King Mountain a wide variety of ways to be more financially stable, allow more access to the mountain year around and update critical health and safety needs of the area.

The gondola will modernize access to the mountain summit and allow for safe passage up year round and in all types of weather. Expanded ski areas will allow for younger and less experienced skiers to utilize the town hill, encouraging more people to get outside and enjoy public lands.

Additionally, new and expanded hiking trails and zip line attractions would allow for Snow King to be better utilized in the summer months.

Thank you,

Ryan McConnaughey

--

Ryan McConnaughey
C: 307.851.4330
www.PronghornAgency.com

From: Scott McGee
To: comments-intermtn-bridger-teton-jackson@fs.fed.us; marymoore@fs.fed.us; [Town Council](#); [County Commissioners](#)
Subject: Snow King Improvements
Date: Thursday, October 04, 2018 1:49:15 PM

Dear Stakeholders, and Public process facilitators,

Having served as the Mountain Sports School Director for the last 6 winters, I can speak personally to the difficulty of operating within a company that struggles to show a profit winter after winter. To that end, I'd like to make the following points.

1. Improvements to Snow King Mountain seem likely to make the ski area more viable.
2. Additional beginner/intermediate ski terrain and an easy way down from the summit of the mountain will improve the visitor experience, and provide better teaching and learning terrain.
3. Skiing in a beginner ski zone at the summit adjacent to a new multi-use building at the summit will provide an improved visitor experience and make the locals' experience even better.
4. Replacing the 40-year-old Summit lift with a gondola for year-round access to the summit is a significant community investment that will benefit town, community, local businesses and skiers/riders for a couple of decades.
5. Building a planetarium and observatory at the summit for science and education would be a great addition to Jackson Hole.
6. Constructing a mountain sports training facility at the base for training athletes, including a climbing gym and a ski/snowboard/skate/bike training facility would be great for the mountain athletes as well as kids in Jackson .
7. Beginner and intermediate downhill bike flow trails will provide a great local resource for mountain biking enthusiasts.
8. Continuing to support the tradition of ski racing and teaching snowsports on the King long into the future is a critical piece of this plan.

Investment in Snow King by the current owners seems contingent on being able to realize certain gains. Development of the mountain in the ways outlined above seems consistent with town values, contains impact within already impacted zones, and provides for an improved future for the mountain with minimal disruption or degradation of the mountain environment.

Thanks!

Best,

Scotty McGee

Former Snow King Mountain Sports School Director

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405 Aspen Drive #4 (UPS/FedEx)
POB 468 (US Mail)

Jackson, WY 83001

307 413 6552

"Life is what you make it."

From: Jeff Moran
To: marymoore@fs.fed.us; [Town Council](#)
Subject: Writing in support of Snow King proposed improvements
Date: Thursday, October 04, 2018 4:36:22 PM

To whom it concerns,

I am writing in support of **all** of Snow King Mountain's proposed future improvements. I have been an east Jackson resident for 18 years and an employee of the Jackson Hole Ski & Snowboard Club for 14 years. I believe both personally and professionally that moving forward with all of the proposed improvements is vital to Snow King's longevity and will be a positive addition to the Jackson Hole community.

I believe the proposed improvements will:

- Make Snow King viable for future generations of local skiers and snowboarders.
- Enhance and continue the tradition of Snow King being a place where kids and families can affordably recreate together.
- Make Snow King more accessible for the general public and greatly increase and enhance beginner and intermediate ski/snowboard opportunities in Jackson Hole.
- Create safer, year-round access with a gondola to the summit.
- Create an unique and much needed mountain-sports training facility that would benefit athletes of all ages in Jackson Hole.
- Continue to support the tradition of ski racing on our Town Hill long into the future which is a vital component to the JH Ski & Snowboard Club's future success.

I believe Snow King leadership has gone above and beyond with their community outreach and their willingness to modify plans as opinions are voiced. I believe many people in our community don't understand that the success of Snow King is not an a la carte proposal. If Snow King Mountain is not allowed to move forward with their proposed improvements, our entire community will suffer a great loss.

Thank you for you time and consideration of my position.

Best,
Jeff Moran

To the United States Forest Service, Bridger-Teton director:

You have, undoubtedly, received numerous letters with comments regarding the many positive and negative aspects of the proposed Snow King Mountain Resort (Phase 2) expansion. I am writing to express my objections to many of the aspects of the application. Before getting into individual specifics I would like to address the overall downside of an everything-and-the-kitchen-sink approach. The core aspects of the expansion (new road cut, expanded acreage and intensive use area, and additional snow-making & lighting) are nearly irreversible, should they turn out to have precipitated harm to the wildlife, forest land, and town character. Thus, if they are to EVER be allowed, they should be done only in an incremental fashion, and not wholesale. However, since the application leans toward making all of the "positive" features dependent on these critical infrastructure changes, it may not be possible to do so. As I see it, the prime focus of the Forest Service's analysis should be whether the application would expand the value to the nation, and not necessarily to a private business entity. The greatest attraction of Snow King mountain (and thus the Forest Service land) is its easy accessibility to residents and tourists alike. The relatively unspoiled quality of Snow King allows contact with the natural/wild terrain to people of varying physical/athletic skills, and allows a wide variety of challenges for each level of desired intensity.

There are individual aspects of the application that are problematic:

1. Increased snow-making will result in additional noise pollution (disturbing to both wildlife and people). It will likely increase the area where rime is found on residences at the base of the mountain. It will significantly increase the demand on town (potable) water. On the south side of the mountain, sunshine will cause melting (and subsequent freezing) that will make maintaining the slope(s) very difficult. The ensuing noise and pollution from groomers may also have a significant negative impact on winter wildlife corridors (the south side is especially sensitive).
2. Increased lighting will be another source of light pollution, possibly negating any potential benefit from installing an astronomical observatory on the peak. The lighting is contrary to the Dark Skies initiative, which promotes intelligent and discreet lighting to allow people to view the wonder of the night sky.
3. Building an enlarged restaurant and event space at the top of the mountain will significantly reduce the peaceful environment that currently holds, after one has hiked (or taken the lift) to the top. The non-commercial nature of the peak is one of its greatest attractions. With a more commercial operation at the peak, trash & noise concerns are also augmented. Running (continuous) mechanical operations into the evening and night will be another source of disturbance for wildlife.
4. Mountain bike trails are likely to lead to frequent injury, given the very steep slope of the hill itself. Additionally, if bikers are paying Snow King to access the peak, they will then be able to (over)use the trails that are currently maintained by Friends of Pathways and others.
5. Siting a beginner's area at the top of the mountain is particularly problematic. The top is windy and cold, and most areas issue discounted lift tickets for novices which limit their all-mountain access. Many people may not limit themselves to a "never-ever" slope at the top, and decide to investigate other trails. Every trail, but the access road, are expert level, and present a serious injury hazard for people who do not know yet how to handle steep terrain.
6. The proposed (new) road cut is being partially justified by offering it as a beginner/novice way down from the top. But it will be nearly 3 miles and narrow (16 feet) which may be fatiguing to the very individuals that it purportedly is serving.

There are other issues regarding Town land (at the base), and various other 'knock-on' effects (traffic congestion, parking, etc.) which do not directly impinge on the FS land, but I expect the EIS to address

these issues.

Regards,

Noah Osnos

Jackson, WY

From: Gretchen Randolph
To: marymoore@fs.fed.us; [Snow King Engagement](#); [Town Council](#); pmuloon@jacksonwy.gov; [Jim Stanford](#); [Bob Lenz](#); hmortonlevison@jacksonwy.gov; [Don Frank](#); [Mark Newcomb](#); srhea@tetoncountywy.gov; [Natalia Macker](#); [Greg Epstein](#); [Tyler Sinclair](#); planningcom@tetoncountywy.gov; [Steve Ashworth](#); poconnor@fs.fed.us
Subject: SKMR On-Mountain Improvement Projects
Date: Thursday, October 04, 2018 12:40:54 PM

Hello fellow citizens, public servants and government officials,

I moved here in 1965 and was privileged to be a part of a special and wonderful community. The changes and growth in the last 30 - 40 years has been very disturbing and disappointing to me. I would like you to know that I am extremely opposed to the SK proposed expansions for numerous reasons:

My main concern is the negative impact on the wildlife and natural environment.

Second - the negative impact on our 'small town' community. Our community character will be hugely compromised if we allow this development.

Third - holding to our master plan and holding investors accountable.

Fourth - the basic compromise to the good old ski hill itself. It's been a great, Olympic making and family hill since the beginning. Putting in roads, zip lines and more infrastructure not only minimizes the great ski hill, it also harms the nearby town parks and residential areas as well as our most important wildlife and spaces.

I could go on and on as many, thankfully have, but to keep this short and simple please just know that I am extremely opposed to this and hope that you listen and act responsibly on this major and very impactful issue.

Sincerely,
Gretchen Randolph
PO Box 857
Wilson, WY 83014

From: Beth Ricciardi
To: comments-intermtn-bridger-teton-jackson@fs.fed.us
Cc: [Town Council](#); [County Commissioners](#)
Subject: snow king mtn improvements
Date: Thursday, October 04, 2018 2:07:38 PM
Attachments: [Traveler_18_19.png](#)

Bridger Teton National Forest and Town of Jackson,

I feel we need to be open and support the plans that Snow King Mountain has proposed for revitalize the ski area, allowing more amenities to locals and visitors year round.

The proposed gondola, and lodge at the summit—adding beginner and intermediate ski terrain, and access for all disciplines and generations to enjoy skiing the legendary town hill, Snow King.

I believe most all of these improvements will draw more visitors! Additionally these improvements will serve our local community as well! Please support improvements to Snow King.

Sincerely,
Beth Ricciardi

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Circ Design / [media guide](#)

Beth Ricciardi / [Jackson Hole Traveler](#)

c. [720-291-8443](tel:720-291-8443) | beth@circ.biz

From: William Ross
To: comments-intermtn-bridger-teton-jackson@fs.fed.us
Cc: [Town Council](#); [County Commissioners](#)
Subject: Snow King Improvements
Date: Thursday, October 04, 2018 11:28:17 AM
Attachments: [ACAlogo.png](#)

Dear Bridger-Teton National Forest,

My name is William Ross and I am the Director of Wilderness Adventures' Base Camp. I am reaching out today because we have an amazing partnership with Snow King and I believe that some of the proposed enhancements would be beneficial for not only Snow King, but as well as for Base Camp and the Jackson community.

Base Camp is geared towards building community and the growth of local youth in Jackson. Areas of growth we emphasize are in building character, confidence, and knowledge of the local geographic area. With the local youth in mind, the addition of a gondola would be an improvement we would love to see. We would like to be able to send campers and families, safely, up the mountain to explore more areas that Snow King has to offer. Due to the nature of the current Summit Lift we have been unable to send our campers up to the top of Snow King. Not only would the gondola provide amazing access to the summit of Snow King but it would also be a safe way to transport families, tourists and campers.

Along with the gondola, having a planetarium and observatory on top would provide an amazing educational experience. The first thing that comes to mind is the campers at Base Camp having access to a facility like this will only promote inspiration in their minds. However, it will also teach not only the youth but also the families and tourists of our area about the importance of our National Forests, National Parks, State Lands and Wildlife Refugees that surround our region. People learn a lot when the information is given to them and they don't have to go out and seek it. Having a center dedicated to the teaching of our geographic region on top of Snow King is something we believe to be very beneficial. And from a tourist standpoint we need them to know how to properly care for the land we live in.

Where we live is special because of the access we have to the inspiring lands around us. Which is why the addition of a Yurt Camp on the south side of Snow King would be a large benefit for the community. Overnight programs for youth is a great way to get kids outside of their comfort zones and to immerse them in the area that we all appreciate. A Yurt Camp would provide a safe, fun experience for all.

For nearly 80 years Snow King has been the local ski hill. With larger resorts getting bigger, adding new features, and becoming more year round we have seen a decline in the local use of Snow King. As I stated above, building community is something we strive for at Wilderness Adventures, and the reason Snow King is important to us is because of

the community they build. Improvements to Snow King will continue the growth of the local community around a ski area that has been defined by its local following for years. We are proud to be part of the Snow King family and we want to see them succeed and continue to build the community we believe in.

Thank you for your consideration in these improvements.

Best,

William Ross

--

William Ross
Base Camp Director / Program Expert



Wilderness Adventures
Do Something Wild

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PO Box 2768 - Jackson, WY 83001 - USA



From: shane rothman
To: comments-intermtn-bridger-teton-jackson@fs.fed.us; [County Commissioners](#); [Snow King Engagement](#); [Town Council](#)
Subject: Snow King Mountain Resort On-Mountain Improvements: Discrepancies in Road System
Date: Thursday, October 04, 2018 11:32:09 AM

Hello BTNF officials,

Please consider the following message when making future decisions for this “complex puzzle of developments” proposed for Snow King Mountain.

One major discrepancy in SK’s proposed road/“beginner trail” is the fact that it does not feed back to the base of the Summit Lift. It is extremely unlikely that their lower terrain on the west side will ever have a beginner ski trail carved into it. This has been entirely overlooked by those who are proposing or advocating for an “easier” beginner route off of the Summit Lift.

-How are beginners going to be able to do consecutive runs from the top of a new Summit Lift without braving a descent of the much steeper final pitch?

-It is easily foreseeable that inexperienced users wanting another lap on the new Summit Lift will end up on the relatively tame Old Man’s Flats area, and then be forced to navigate their way down the steeper finale that is typically their most congested area. This pitch is frequently compromised by race events, practice areas, and terrain parks, which doesn’t leave much space for the wide turns that a beginner would require to safely descend. Conditions are typically hard-packed and icy, which would lead to increased stopping distances needed for intermediated and experts to avoid a collision with the unpredictable maneuvers of a beginner. Beginner use of this slope is currently rare and ill-advised, but would increase substantially with their proposals.

-Since the “beginner road” will direct these users towards the Rafferty side of the ski area, will inexperienced users then be expected to walk across the base area’s parking lots to go ride the much faster and “more comfortable” lift, in order to ski the longest run? (The Rafferty Lift takes about 6 minutes to mid-station and nearly 11 to the top, not counting the frequent stops. A high speed Summit Lift will likely be about 5 minutes, and will be the obvious choice for users to get the most “bang for the buck”.) These existing and permanent parking lots are typically very icy until mid March, and the proposed future base area developments leave no suitable route for skier connectivity of their two base areas. (I live on the Rafferty side but primarily use the Summit Chair, and navigate this route on foot after nearly every run, which entails riding through their beginner area, walking across parking lots/construction staging areas, crossing traffic at the parking lot entrance, walking uphill on ice that I have fallen on many times, and even taking a longer route by cutting through inside the SK Center instead of walking through Phil Baux Park or around the Ice Rink building’s north side which has no path or snow removal. This interesting customized path is not labeled whatsoever, and there is no way for visitors to determine the path of least resistance without practicing “trial and error” many times)

-Where should a visiting(or local) beginner skier park their car? If they park near the rental shop at the Hotel, they would be required to walk a long distance in ski boots towards a new Summit Lift. (The current beginner area’s visibility, accessibility, affordability, and calmer weather is much more appropriate and inviting, and also maximizes their time on the slopes, as well as limiting their risks.) This is why about 99.9% of ski areas in the world have a beginner area at the base, and why SKMR LLC’s ownership group shouldn’t have built so many buildings(including the new Kings Grill) on top of all their historical beginner terrain.

There is little convenience being considered for SKMR LLC’s plans to place beginners on the Summit. Although recently compromised during the last couple decades, the Rafferty Area has always been SK’s most ideal and convenient location for beginners, and could still be vastly improved. Since a large portion of this area lies on private land, I am concerned that the BTNF may be overlooking this solution as a “preferred alternative” to the ski areas “needs”.

I find it quite ironic that SKMR LLC has not improved/rerouted their steep(25% grade just below Rafferty mid-

station) and dangerous road system on their private lands to facilitate beginner usage and “safety” concerns. Their mid-mountain area on Rafferty contains accident prone activities such as the ropes course and Alpine Slide. I have witnessed frequent ambulance trips to this area, and can’t believe this road wasn’t addressed prior to the Rafferty Lift replacement and Coaster construction. This most heavily used portion of their access road MUST be addressed properly before any future projects take place. By doing so, this will solve plenty of SK’s safety issues, reduce the risk of accidents and liability, and drastically improve the mountain for beginners.

These lands can further serve their “purposes” sufficiently, and all cooperating agencies should find this solution appropriate. Do not allow SKMR LLC to avoid addressing this issue(their access road on private lands), which would cause further problems by encouraging increased vehicle/ATV/machinery use, and dispersing their beginner skier traffic throughout the steep ski area that doesn’t even have a clear plan or well-defined route to descend the final pitch to either Base Area.

Thank you for your time and consideration,
Shane Rothman
Jackson WY

From: shane rothman
To: marymoore@fs.fed.us; comments-intermt-n-bridger-teton-jackson@fs.fed.us; [Town Council](#); [County Commissioners](#); [Snow King Engagement](#)
Cc: [Prout, Janine - FS](#); [Wilmot, Jason L -FS](#); [Ibarguen, Derek -FS](#); poconnor@fs.fed.us
Subject: Snow King Mountain Resort On-Mountain Improvements: Wildlife
Date: Thursday, October 04, 2018 11:51:32 PM

To all whom this concerns,

Thank you for the response, Mary, and for the further information regarding reporting wildlife on Snow King Mountain. I will forward more images to the BTNF in the near future.

My girlfriend and I have lived adjacent to Snow King Mountain since November of 2009. We are well aware that we live on the edge of prime habitat for many species, despite the fact that a rollercoaster, Alpine Slide, and extensive "Aerial Adventure Course" also border our residence. I have spent every winter season since exploring every possible acre of the Greater Snow King Mountain Area on my snowboard. It is very rare for skiers to venture into any of these unpatrolled areas in the winter, and extremely rare for any humans to venture off the public trail system in the summer. **I have been educated greatly about this environment due to having the privilege to recreate on it. Since the BTNF is interested in certain species, I feel that it is my duty to assist them with my knowledge, in order to help ensure that this public land receives proper management.**

Of the key species that the BTNF has identified(*These species include Grizzly Bear, Canada Lynx, Wolverine, Mountain Lion, Bobcat, Gray Wolf, Northern Goshawk, Peregrine Falcon, Greater Sage Grouse, any owls, Bighorn Sheep, any bats, and any amphibians.*), I would conclude that an amphibian would be the most elusive on Snow King Mountain, but I think this area would otherwise be considered as an ideal habitat for all of the other species listed.

Here are the honest results of "my own personal Environmental Analysis", in regards to this list of species. Additional species are also included, followed by some additional emotional testimony...

I have documented a collared Mountain Lion inside the proposed eastern switchback on my trail cam, and see their tracks regularly during winters. They even use my old snowboard tracks to avoid deeper snow, and oftentimes I have even been a little scared out there. I've never actually encountered one up close though. There have been many carcasses that I suspect may have been their prey. I have heard their scary screams from my porch at 980 Snow King Drive, and they are much scarier than the spooky screams of a young or mature fox.

I wasn't too surprised to see a collared Grey Wolf appear on my trail cam in May of 2017, which was located adjacent to the Ferrin's Slide, right where the eastern switchback of the

proposed road would be. There were many carcasses(I counted 20 Elk that had died of starvation after eating the crowns of fallen pine trees)in that immediate area that Spring. I am sure that many other predators/scavengers came to help clean up the area, besides the numerous foxes, coyotes, pine martens, vultures, and ravens that I had documented.

Over the years, **I have seen Northern Goshawks many times, and know that a nearby nest had been documented by expert biologists prior to the approval of the “Aerial Adventure Course” and “Rafferty Lift and Trail Expansion”.** I continue to hear their squawks especially during late Spring, and have heard that there is a breeding pair nowadays. The large, dead old growth trees are obviously their ideal nesting habitat, and an abundance of these trees are located within the eastern switchback that SKMR LLC has proposed to clear for a few extremely short “intermediate trails”. I would consider the area inside this switchback to be the most ideal area for birds of prey to nest and hunt due to the open canopy and sporadic areas featuring many miniature meadows.

Greater Sage Grouse are very common during the fall throughout the forests and hillside residential neighborhoods of Snow King. My small dogs actually flush the birds out of our yard on a near daily basis during this time of year(peak autumn). I’ve even spooked them out from underneath the snowpack a few times while snowboarding off the radio tower summit towards the 5-way/Ferrin’s Trail. I have never seen a male display his mating ritual though. I have heard that people hunt them along Skyline Trail.

I have seen plenty of Great Grey Owls over the years on SKM, in my adjacent yard, and in the forests. I have noticed a significant decline in the nearby population however. I used to frequently encounter them while snowboarding outside the boundaries. I also used to always hear them nearby at night, but now it is much rarer, less than once a month. I have heard about Boreal owl sightings in the area, but haven’t been able to positively identify or document any.

I once documented 2 large healthy Bighorn Sheep migrating through the forest, which I was very surprised to see appear on my trail cam a few years ago. This was also inside the proposed eastern switchback, and during late Spring. I have heard stories about them foraging on the backside for an extended period of time. I will try to send this trail cam footage on in the very near future.

I have had bats spend the “day” tucked into the cracks in the exterior logs of my home, and obviously see them outside every night, crashing into our windows to collect the moths. While on the radio tower summit of SK for the total solar eclipse, a bat flew right in front of us. I know there are many tree cavities and rock outcroppings that are likely used as their daytime habitat, but have never discovered anything that I thought might house a significant population. I would suspect that SK’s abandoned cabin on the “Nature Trail” near the

Panorama House might be home to a population.

Prior to 2014, I had seen Great Northern Flying Squirrels a few times, at night, during winter, but haven't seen any since SK's "projects" were constructed in 2015.

I've also noticed that Fox sightings have become much less frequent. I attribute this to the recent loss of their undisturbed habitat (SKM employees don't leave any ground cover when they "glade", and then make burnpiles that typically don't get burned for multiple years and become home to small animals, and then they will try to burn as soon as the snow falls, which isn't good for the population of small critters), and also the increased human presence and vehicle/ATV traffic. I used to accidentally scare foxes when snowboarding into the area that has now been cleared for the extended Rafferty Lift. Foxes used to love that spot, it contained some of the darkest and densest areas of forest in the entire area.

From my observations, SK has a very healthy and increasing Mule Deer population. I haven't seen a deer carcass out there in about 4 years, which is surprising. They seem to be growing more abundant (so many fawns) and less susceptible to scattering when there is a human presence. They didn't seem to mind all of the construction on SK Drive this summer, and have become surprisingly tame. It is common to see multiple bucks, does, and fawns, all close together, even in people's yards. A couple years ago I almost stepped on a hiding newborn that probably weighed less than 15 pounds, and was by far the smallest deer I had ever seen. Judging by the high ratios of fawns seen in the area, it's easily surmised that these grounds are used for mating, birthing, and migrating, while also serving as one of the most ideal places for JH's Mule Deer to spend the winter. Last year, a buck with a deformity spent his summer near JH Golf and Tennis, but spent most of the winter on Snow King. The Jackson Hole News and Guide wrote a neat article about him.

It was very surprising to see a herd of about 30 Elk on SK in the winter of 2014-2015 (5+ deaths during a weak winter), and 30-40 more again in 2016-2017 (20+ deaths during a severe winter). In 2016-2017 these Elk were wintering next to the "S Chutes" at the very top for some reason. Eventually skiers and avalanche control work likely pushed them lower. They ended up scattered throughout the Eastern sections, and stayed there to forage on fallen pines, where many ended up dying. Most of these Elk seemed to be very young, and there were no bulls that perished. No Elk were seen here in winter 2017-2018, and I didn't see any carcasses of any other species either.

Black Bear activity has become increasingly common in the last few years, in Spring and especially in the Fall. I have hours worth of trail cam footage of bears visiting a carcass that is located exactly where the top of SK's previously proposed east side chairlift was supposed to be. This footage was mostly over the course of a 60 day period, but even contained face-offs and scuffles when 2 bears were present. I even got footage of a snowshoe hare visiting this

carcass. For the last few years, **I have been trying to get the BTNF to require SK to install bearproof garbage cans at mid mountain and the summit**, because their poorly trained, revolving door of employees always leave the trash cans outside, and I know that the management would never voluntarily make this expenditure. There have been many Bear incidents in my neighborhood and East Jackson that could've been avoided.

Besides Foxes and Mule Deer, Moose are definitely also the most commonly encountered wildlife, year round. They don't seem to mind recreational users much, but are definitely unpredictable when a vehicle approaches along any roadway. I know they would likely use SK's proposed road and be an unpredictable attraction for skiers with selfie cameras, before having to be frequently hazed away back down to the public trail system or neighborhoods. Moose will be an issue, and may even end up on the current ski area more frequently.

In my thousands of images of wildlife, I have only recorded 2 images of a Human over a 4 year span. One image was of the owl surveyors studying the forests during the middle of the night prior to Phase 1, and the other was just a random guy this summer who smiled and gave the thumbs up!

When I first purchased a trail cam, I really thought that I would immediately capture footage of every single species known to exist here. Despite all of the amazing footage, I have been somewhat disappointed that I have yet to document elusive species such as a wolverine, bobcat, fisher, lynx, or a grizzly bear(heard they've been nearby, and mistakenly identified a black bear on my trail cam once), but **I know that they are definitely out there somewhere along the Snow King Mountain massif's forested, north-facing refuge that stretches for miles, which also serves as a migration corridor for every animal that must bypass the town of Jackson's poor geographical location. These animals don't even have a waterway corridor to follow(Cache Creek is underground), and may soon have a major obstruction on Snow King's ridgeline corridor(A large and potentially busy restaurant/events venue). The forested "benches" of mid-mountain appear to be the preferred migration route for most of our animal species.**

I find it to be quite dumb that a few people think this area is suitable to be transformed for their skiing "needs". **I know the snow conditions will usually be terrible, and that they would quickly get bored of this new limited terrain after a few laps, and then they will go back to somewhere else much bigger, with much better snow quality.**

If an expansion is not approved, SKMR LLC will finally consider improving what they already have, which is at least 30 years overdue, and this terrain should have definitely been maintained prior to asking for any additional terrain. More improvements to their inbounds means less impacts to the surrounding area and the wildlife. Any clearing of the forest will result in increased usage and higher rates of speed by humans, which will

obviously negatively impact the wildlife.

I don't think I could ever be prepared to witness this expansion scenario, despite having already done so during the Rafferty Lift and Trail expansion, which should forever be considered as a mistake. There were better "alternatives" that were ignored, but in retrospect, **I think that everyone, including SKMR LLC, should agree that much more attention should have been given to the public comment received from people who are very familiar with the mountain's terrain, wildlife, fauna, and snow conditions.** That lift should have been installed to unload at the flat bench area on the "Cutoff" trail to the looker's right of the new route. Former BTNF employees Dale Deiter and Ray Spencer would likely admit that this was a mistake.

Please don't allow Snow King Mountain to make a way bigger mistake. I do not want their mistakes to jeopardize any future access to public lands, or require any new restrictions to any user group. This land can be managed by its users, and is not appropriate for commercial developments.

Thank you for your time and consideration,
Shane Rothman
980 Snow King Drive
Jackson WY

PS: Please refer to my other letters for more expansion concerns, which go far beyond the impacts to wildlife.

From: shane rothman
To: comments-intermtn-bridger-teton-jackson@fs.fed.us; [Snow King Engagement](#); [Town Council](#); [County Commissioners](#)
Subject: Snow King Mountain Resort On-Mountain Improvements: Collared Wolf
Date: Thursday, October 04, 2018 3:12:28 PM
Attachments: [PICT0385.m4v](#)

Hello BTNF officials,

Attached to this letter is trail cam footage from 5/8/2017. A collared grey wolf spent about 15 minutes at this Elk carcass, which happened to be one of at least 20 elk that had perished within about 200 yards of this site in the harsh winter of 2016/2017. (In the 9 seasons that I have spent as an almost daily user of SKM and neighboring resident, I've only seen Elk using this area twice, and both times featured a herd of around 30 animals that remained there for 2-4 months) The approximate site of this trail cam footage is adjacent to the Ferrin's Slide path, perhaps less than 50 feet away, and possibly directly on top of the proposed road. Almost the entire food chain of our area's ecosystem can be found here, year round.

After many years of enjoying the privilege to be able to recreate in this wild area, I have concluded that it is entirely inappropriate for any future commercial development.

This area has provided me with a strong educational first-hand experience that I do not take for granted, and has resulted in my strong advocacy for all public lands. I am thankful for both Snow King Mountain Resort's presence for serving the community with winter recreation, and for the adjacent public land that has provided me with a neighboring refuge where I can simply appreciate the untamed nature. In some respect, I could consider myself thankful that these proposals left me no choice but to learn everything possible about our local wildlife, public land management, Special Use Permits, the 2011 SAROE, the NEPA process, community priorities, and much more. I have listened and learned from all perspectives, which has further reinforced my beliefs that all future proposals must be carefully balanced to achieve a positive outcome.

I cannot imagine this approximate area being used as the switchback for their road system. The Cache Creek area has been carefully managed due to increasing human recreation, and I strongly believe that SKMR LLC's proposals will jeopardize the community's privilege of being able to recreate in this area in the future. If the BTNF were to allow an intrusion into this area to meet the "needs" of heavy machinery and vehicle/ATV access, typically "oblivious" inexperienced users, snowmaking, lighting, and grooming requirements, and more; then it would be an absolute travesty for the surrounding area to ever prohibit low impact recreational uses such as backcountry skiing/snowboarding, biking (including fat tire users in winter), hiking, and even dogs.

This area should remain open to the public, and closed to commercial development and machinery, forever. It can forever continue to serve the public by promoting ecological stewardship, good user etiquette, and low impact recreation, while preserving wildlife habitat. It is no coincidence that the majority of the users in this specific area are amongst the most educated citizens present on any public land. These appreciative users are simply the result of having such a "world class" educational ecosystem right in Jackson's backyard.

Thank you for your time and consideration,

Shane Rothman
980 Snow King Drive
Jackson WY

From: shane rothman
To: comments-intermtn-bridger-teton-jackson@fs.fed.us; [Town Council](#); [County Commissioners](#); [Snow King Engagement](#)
Subject: Snow King Mountain Resort On-Mountain Improvements: Downhill Biking
Date: Thursday, October 04, 2018 2:48:00 PM

Hello BTNF and local decision makers,

I have serious concerns about SK's desire to introduce Downhill Biking, and strongly believe that they are targeting the wrong areas for development.

First of all, the entire upper 2/3 of the frontside is far too steep for a typical bike trail. I am unaware of any lift accessed bike terrain that can compare. I cannot even comprehend how a safe switchback could be constructed. I also am well aware that the insufficient snowpack will not be able to safely cover even a singletrack trail, and would compromise and ruin the terrain for skiing purposes.

Secondly, the undeveloped backside is not a suitable location for a "bike park". These south facing trails and poor soils are not ideal, and hot summer temperatures would also contribute to an unsuccessful, costly business venture. It is also unreasonable to think that most users would refrain from using our "world class" public trail system to descend, and many of these users might end up trespassing private property in Leeks Canyon to reach their homes on the southern reaches of Town. Wildlife impacts would be certain, and the nearby Skyline Trail's development process has already been built with careful consideration to limit impacts. It is also highly unlikely that any of our respected and proven local trail/pathway nonprofit organizations would ever propose a non-primitive trail in the surrounding area, and SKMR LLC should hold themselves to the same level of respecting the environment.

Thirdly, introducing biking would likely result in the area prohibiting dogs, especially off leash. SKM's current footprint is our historical dog park, and also the best location available on public lands. Any restrictions would result in more dogs at all other trailheads, and require the many dog owners to likely have to drive somewhere else. It is not a good idea to force dog owners to use a path up Snow King that would be confined to the forests that are full of wildlife.

The "preferred alternative" for biking should a clear option for all parties: SKMR LLC can introduce biking on their private land off the mid-station of Rafferty. These lands are already heavily impacted, require no management from the BTNF, contain their most suitable grades, have the least impacts to wildlife, will be family and spectator friendly, could easily host races and events, and they could even ban off leash dogs with no public outcry. They also have the right to move massive amounts of soil to build these trails, which could also facilitate beginner/intermediate skiing and terrain parks to improve year round use.

SK attempted to introduce biking in this area about 5 years ago and even built a trail, but then built their Coaster directly on top of key portions. To facilitate this, SK should remove their noisy 1978 Alpine Slide, which would also reduce noise complaints and improve their public image, which has suffered due to their expansion of untraditional outdoor recreation activities. This idea is by far the most suitable way to introduce biking, and must be considered for "Phase 1" of this concept. If SKMR LLC proves that they can take care of this 25 acre area, perhaps a reasonable expansion onto public lands could be considered in the distant future.

I was very disappointed to see that SKMR LLC did not include any downhill bike trails in their most suitable area, and cannot support any of their plans for biking elsewhere until they can become proven stewards and operators. Their lack of experience and poorly proposed plans leaves me with zero faith that they know what they are doing.

As background, I worked for JHMR to build their trails prior to their opening. It is not a small endeavor, and the maintenance is endless. The sport is prone to serious accidents. I am a novice/intermediate downhill biker, and I honestly would prefer to use their chairlift to poach our public trail system, and would have no interest in biking on the backside, or be exposed to serious injury on the steep upper frontside. There currently is no suitable route for bikers on their Rafferty side, even their access road is too steep with loose rocks to ascend or descend, and I have witnessed many accidents and bikers that simply chose to walk their bikes down portions of the road instead. When

biking down to town, I prefer to take the steady grade of the Alpine Slide, and I even try to ride back up it on the way home. Until there are signs posted that prohibit this, I will continue to use the Alpine Slide as my safest option. Hopefully someday I will be able to navigate down on a more suitable grade, even if I have to pay for a bike pass.

Thank you for your time and consideration,
Shane Rothman
980 Snow King Drive
Jackson WY

Sent from my iPhone

From: shane rothman
To: tchpb@tetonwyo.org; [Snow King Engagement](#); comments-intermtn-bridger-teton-jackson@fs.fed.us; [County Commissioners](#); [Town Council](#)
Subject: Snow King Mountain Resort On-Mountain Improvements: Historical Preservation
Date: Thursday, October 04, 2018 1:37:25 PM

Hello BTNF and local decision-makers,

Snow King Mountain is one of the last significant historical sites remaining in Jackson, and by far our most recognized landmark. Nobody has ever written a book about its amazing history, but the Teton County Historical Preservation Board did write a detailed report prior to “Phase 1”, and found that a few buildings are eligible for designation, as well as the whole mountain itself. Please make sure to review this comprehensive document, and advocate for the inclusion of preserved and restored educational landmarks: <https://www.tetoncountywyo.gov/DocumentCenter/View/2808/Snow-King-Area-Report-PDF>

“In order for a property to be listed on the National Register of Historic Places, it must have documented historic significance and retain historic integrity, so that its significance can be seen and understood. There is no doubt that the Snow King ski area is significant in Jackson Hole history and culture. This preliminary evaluation has determined that the property also retains sufficient integrity to warrant nomination to the National Register of Historic Places as a cultural landscape. Further research is required to positively identify and evaluate all of the contributing and non-contributing features of the landscape.”

Their package of proposals and demolitions would ruin any prospect of proper designation. Hopefully SKMR LLC can agree that the “Town Hill” deserves recognition for its role as one of the first ski areas to be established on USFS lands (and the first in Wyoming), and that there are still physical elements that can assist to educate future generations.

Evaluation of historic significance:

The Snow King ski area appears to be eligible for the National Register of Historic Places as a rural historic landscape under Criterion A, with areas of significance in Community Development and Recreation. The ski area has played a major role in the development of Jackson Hole as a ski destination. Although later eclipsed by the Jackson Hole Ski Area, Snow King was the first ski area to be developed in Wyoming and early on established Jackson Hole’s reputation as a ski town. Snow King has also played a major role in the culture and traditions of Jackson Hole, from fund raisers, carnivals and other community events to ski races and exhibitions.

Thank you for your time and consideration,
Shane Rothman
Jackson WY

From: shane rothman
To: comments-intermtn-bridger-teton-jackson@fs.fed.us; [County Commissioners](#); [Snow King Engagement](#); [Town Council](#)
Subject: Snow King Mountain Resort On-Mountain Improvements: Zipline
Date: Thursday, October 04, 2018 1:18:39 PM

Hello BTNF officials,

I have been very disappointed that SKMR LLC did not remove the illogical zipline proposal from their updated Master Development Plan. Here are some of my questions and comments regarding this concept.

Perhaps millions of people have stood on the Observatory Platform at the top of Snow King to appreciate this "world class view", which is also the approximate site of their proposed zipline. No current zipline in the USA even comes close to the steepness or speed(70mph) of this thing, especially on public land.

Have you ever stood there and instead imagined a zipline going down? It's a crazy concept that does not appeal to the overwhelming majority of their clientele.

Here are just a few questions that should be considered when making a future decision:

1. Is this thrill ride inviting for everyone? Will anyone's entire family be interested in participating? How many people have voiced their support for this on public record? Why didn't anyone voice an interest for this during the first SK Community Engagement forum, when about 100 objectives were derived?
2. Would people still be able to appreciate the view while you're at the top, or be distracted by people hyping themselves up prior to the mandatory scream of their life? Will those zipliners be screaming in the background while people are exchanging their wedding vows at the proposed wedding venue?
3. Would locals and visitors still enjoy hiking and dog walking on Snow King Mountain, or choose to go elsewhere? Would the adjacent and historical "bootpack" route decline greatly in popularity?
4. How much would it cost for less than 30 seconds of action? Has SKMR LLC done any market research to determine the pricing? Will this income even be comparable to their rollercoaster or even mini golf? Do you think they would consider giving you a discount if you hiked up the mountain instead of riding their lift? Would the possible inclusion of this activity on season passes raise the price of winter skiing significantly?
5. Would SKMR LLC ever consider putting this liability on their own private land? Will they respect the community's desire to keep the "West Portal" inviting to the local residents?
6. Would local residents be proud if SKM was recognized in the national media for being a "zipliner destination"?

7. What would the operating hours be? Would SK try to operate this in the dark, like they do with their rollercoaster? (They aren't supposed to operate the coaster in the dark, or past 8pm according to their business application, but it's been open until 9pm, well past sunsets for the previous two summer seasons).

8. Would there be any possible way to mitigate the unknown noise impacts of this unprecedented zipline? Will the steepness, length and speed likely result in the loudest zipline ever built in the USA? How many decibels would it be? (The coaster claims to operate under 65 decibels, which is equivalent to a human conversation at a 3 foot distance. If this is untrue, SKMR LLC would not be in compliance with TOJ protocol) ...How many decibels is a teenage girl screaming? Haven't people already been aggravated by the constant noise from their coaster that is heard throughout East Jackson?

9. Would an injury or death mar Snow King Mountain forever? How many ziplines in the USA have been shut down due to accidents? How many lawsuits have been filed against the operators of much mellower ziplines? What were the results of these lawsuits? Why hasn't Grand Targhee ever re-introduced ziplining after they were involved in an accident and lawsuit?

10. Wouldn't a large zipline be more appropriate on the noisy Rafferty side, where there is already a noisy Alpine Slide and rollercoaster? This area already has many ziplines, as well as a "flying surfboard", Tarzan swing, and many other similar activities.

11. How does this zipline "foster an appreciation for nature", or even meet other standards for USFS protocol? Is it harmonious to its surroundings, such as a cemetery?

12. Will it distract from concerts and farmer's markets at the base? What about funerals and visitors to the cemetery?

13. Is this a suitable addition to Phil Baux Park? Why hasn't SK adhered to Parks and Rec's protocol if they desperately want to place a gondola there? Will this zipline continue to be "packaged" with a gondola?

14. How could this possibly benefit our community character? Will this attract customers who aren't interested in traditional forms of recreation, and might not appreciate our National Parks?

15. Would you feel safe knowing that SKMR LLC is the operator? Would the new jobs pay enough to ensure properly trained employees can address restrictions such as age(ID requirements for young children?) and weight limits? Will they be trained to perform sobriety tests or administer a Breathalyzer test?

16. If this is approved, will negative reactions result in poor publicity and declining local visitation for Snow King Mountain?

17. How could zipline riders safely slow down from 70mph to 0mph in such a short

and steep deceleration area?

18 .How long would this zipline be in operation before it gets shut down due to safety issues or noise complaints?

I strongly believe that a zipline approval would be a grave mistake with many negative consequences, and have strong doubts that this would be a sensible or appropriate investment for SKMR LLC to undertake.

Thank you for your time and consideration,
Shane Rothman
Jackson WY

From: shane rothman
To: comments-intermt-n-bridger-teton-jackson@fs.fed.us; [Snow King Engagement](#); [County Commissioners](#); [Town Council](#)
Subject: Snow King Mountain On-Mountain Improvements: 1936 CCC Road
Date: Thursday, October 04, 2018 1:01:18 PM

Hello BTNF officials,

Please do not allow Snow King to erase the history associated with the Civilian Conservation Corps role in 1936 to facilitate the original access road up the mountain, which was designed to use the best possible route.

Their proposed road will definitely make the ski area more dangerous, contrary to their beliefs. Ski Patrol's responsibilities will be multiplied, and they will be further required to provide avalanche control of the notoriously poor snowpack conditions, which are becoming more challenging due to the increasing frequency of rain events. Inexperienced and intermediate skiers will have easy access to steep forested terrain, where rescues would be lengthy and technical. A beginner trail from the Summit will have many intersections with higher speed runs, increasing the accident potential for everyone. In the event of a Summit lift closure, their stranded beginner skiers at the proposed ski school area would have no choice but to descend a route with very steep exposure.

There are so many other issues, but the worst-case scenario would be if a seemingly inevitable forest fire starts near the base, and quickly races up the King. With a huge cross-section removed, erosion and landslide events would be a likely result for the eternal future. A scorched ski area with this road could likely result in frequent closures of the entire mountain when saturated or thawing soils are present. The entire hillside could feature uninhabitable private properties. Even without a fire event, clearcutting trails above the proposed road and/or adding snowmaking could lead to a disaster because of this road. Otherwise, cutting the toe of a slope or just a simple leaky pipe along this route might be all that it would take, as seen during the Budge/Walgreen's Slide event.

Their current road still provides reasonable access for all of their work trucks, and frequent trips by their ATVs, snowcats, and snowmobiles. Any skier with a little bit of experience can proudly descend it, and it will serve as the highlight of their trip to Snow King. Perhaps even a very experienced cement truck driver could make it up, but any smart driver would prefer to use the existing road on the backside.

In the 1940's, the road up Leeks Canyon on the backside was constructed to facilitate Summit access and construction projects. For decades, diesel tanks were towed up there in mid-winter behind a truck to refuel the old lifts. Fire trucks used it during the Horsethief Fire in 2012. Radio Tower maintenance crews will likely continue to use it forever. This road was constructed at a suitable grade without any major roadcuts or clearcuts, and it also doesn't require any avalanche mitigation to ensure safety.

SKMR LLC has no plans to acknowledge any historical landmarks that are eligible to be recognized. This CCC Road is likely the most eligible way to acknowledge the

history of the collaboration needed to start one of the first ski areas located on public land. Millions of users have used this route since its creation.

Thank you for your time and consideration,
Shane Rothman
Jackson WY

October 4, 2018

Bridger-Teton National Forest – Jackson Ranger District
P.O. Box 1689
Jackson, WY 83001
Attn: Mary Moore

Submitted via email: comments-intermtn-bridger-teton-jackson@fs.fed.us

Attention: SKMR On-mountain Improvement Projects

Dear Ms. Moore,

Thank you for the opportunity to comment on the proposed Snow King Mountain Resort On-mountain Improvement Project. At the Jackson Hole Conservation Alliance (Alliance), we have been following the planning process around future development of our Town Hill and appreciate the opportunity to provide insight as to how this proposal may impact our town's community character, wildlife, and quality of life.

The Alliance represents over 2,000 constituents locally and works to protect the wildlife, wild lands, and community character of Jackson Hole. We believe that this valley can be a national model of a strong community living in balance with nature. We strive to make sure that we recreate in ways that respect wildlife and aim to have honest conversations about our decisions based on facts and data.

Summary and outline of comments

Upon review of the submitted Snow King Mountain Resort On-mountain Improvement Projects, we believe many elements warrant in-depth analysis. In these comments, we:

- Analyze the stated purpose and need for the project proposal
- Outline potential negative impacts to our community
- Outline potential negative impacts to area wildlife and natural resources
- Identify issues with specific project components
- Request additional alternatives for examination during the Environmental Impact Statement (EIS) process
- Express concerns with the community engagement process to date
- Provide additional documents and references for your review.

Purpose and need

We find a significant disconnect between the stated purpose and need and the actual components of the proposed project. Please carefully analyze whether the proposed project elements are necessary – or even beneficial – towards achieving the purpose and need. Then, please analyze other alternatives that meet the stated purpose and need without as many impacts to our community and wildlife. Specifically, we have concerns with the following:

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The stated “purposes” to be achieved through the proposed action are:

Purpose	Concerns
To maintain and improve the winter sport infrastructure on National Forest System lands at Snow King Mountain Resort.	Much of the proposal – specifically, footprint/boundary expansion and summer profit-center development – is unnecessary to achieve this purpose. In the actual proposal there are minimal upgrades to the current footprint and existing ski runs, with most of the proposed development occurring in an unnecessary boundary expansion. As we explain below in our proposed “balanced vision alternative,” there are many on-mountain improvements that can be made to the existing ski runs, resort infrastructure, and terrain that would improve and maintain the winter sport infrastructure on Snow King, without expanding into wildlife habitat.
To provide new and innovative forms of year-round outdoor recreation for residents and visitors to Jackson Hole, using the existing resort infrastructure as the hub.	Much of the proposal – specifically, footprint/boundary expansion – is unnecessary to achieve this purpose. Snow King is proposing increasing their developed footprint by 250%, which suggests most of their development will be taking place outside of existing resort infrastructure. Snow King could clearly provide new recreation opportunities within the existing resort footprint. As stated above, improvements within the existing footprint would achieve this purpose without having to expand into valuable wildlife habitat.
To capitalize on the established relationship between the Bridger-Teton National Forest and Snow King Mountain Resort that connects visitors with the natural environment and supports the quality of life and the economy of the local community.	The proposal actively harms this purpose. Many aspects of this proposal stand to harm our environment and our quality of life. As we will highlight below, the impacts to the community from this development are significant and warrant deeper investigation. It is difficult to imagine that our quality of life will be improved by increased traffic, adding new jobs to an already unbalanced job to workforce ratio, increased ticket prices, and reduced free public access to our public lands. Adding in amusement park style attractions like ziplines does little to connect visitors to the natural world in a manner that respects the character of the community.

The stated “needs” include:

Need	Concerns
Improve and increase beginner and	Again, this proposal is based on a boundary/footprint expansion that is unnecessary for this need, which could be achieved within the existing

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intermediate ski terrain, lifts, and facilities to serve as the primary ski resort in Jackson, WY to introduce and recruit new skiers to the sport.	footprint and boundaries. (Please see our Alternatives below.) Snow King Mountain Resort has terrain within their existing footprint that could be improved to meet this need without having to expand boundaries and develop on the backside of the mountain in winter wildlife habitat. Additionally, the proposed new ski runs to accommodate beginner and intermediate skiers are not well suited for that skill level. Beginner ski runs should be short, easily repeatable runs close to base facilities. Positioning beginner and intermediate ski runs on the backside of the mountain, far away from emergency and base facilities, and calling a road the main beginner ski run should not be considered ahead of developing beginner ski terrain towards the base on the existing footprint.
Expand snowmaking on the mountain to enable an early November opening for ski race training, provide coverage to the upper mountain, and aid in fire prevention.	Expanded snowmaking requires more analysis before being accepted as a valid “need.” Snow King is a relatively low-elevation resort that sees milder temperatures in the early winter season. Expanded snowmaking is unnecessary for ski race training, because racing is on the already-snowmaking-covered Cougar Lift. The locations of new proposed snowmaking seemingly go beyond locations that are suitable for ski race training. Expanding snowmaking on the backside doesn’t help with ski racing. Expanded snowmaking coverage on the upper mountain may be unnecessary, as the upper mountain often receives snow while the lower mountain receives rain. Also, please consult with Jackson Ranger District fire managers to best understand how and if new snowmaking capabilities on the mountain would actually result in more effective fire prevention.
Introduce high-quality guest service facilities to attract and retain local and destination skiers, serve as an event venue, and provide an outdoor education center for Jackson residents and visitors.	This need can be accomplished without footprint / boundary expansion. Also, this must be balanced against the negative impacts to our quality of life – key to the purpose.
Provide access to a wide range of year-round activities catering to a variety of visitors passing through the	This need can also be accomplished without footprint / boundary expansion and should be balanced against negative impacts to our quality of life. In order to substantiate this need, Snow King managers need to

Town of Jackson.	provide <i>updated</i> future projections for the amount of visitors they anticipate attracting, in contrast with the out-of-date projections in the 2017 Master Development Plan (MDP). Our community should not be tasked with supporting a project that will negatively impact our traffic, housing crisis, access to public lands, wildlife habitat, and quality of life without fully understanding the number of visitors that are needed on an annual basis to support Snow King's operations.
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Impacts on our community

The proposed on-mountain development stands to have a significant impact on our community. As we heard throughout the stakeholder group, public meetings, and meetings with our elected representatives, many locals are concerned about continued affordability for the community, visual and noise impacts, loss of our longstanding access to our public land, impacts from increased visitor use, social and economic impacts, and the role that expanded development on Snow King will play in regard to cumulative development throughout our valley.

Continued affordability

Throughout the years, and especially in the past few years, our community has been impacted by steadily increasing prices for activities on Snow King. For example, in the 2017-2018 winter season, after over 80 years of free uphill access to our Town Hill, Snow King management began charging substantial fees for uphill skinning, and faced significant public backlash. We fear that new development will result in continued increases to fees for developed and human-powered recreation, which will make our Town Hill less affordable and accessible for the local community. To fully understand the financial impact the proposed development may have on community members, it is essential for the Draft EIS to include past price changes in lift and season tickets (e.g. ticket and pass price increases over the past 10 years), prices of current summer activities, the rates asked of local non-profits operating programs on the mountain (like how much the Jackson Hole Ski and Snowboard Club and the Doug Coombs Foundation pay for lift tickets, rentals, lessons, etc.), and ticket price projections for all planned future activities. Just because Snow King tickets remain less expensive than other resorts in the area does not mean they will remain affordable to our whole community.

Noise and visual impacts

Snow King sits at the center of our town. As you arrive in Jackson from the north or west, it is nearly impossible to ignore the mountain. As community members, it provides the backdrop for our backyards, the People's Market, summer concert series, gateway to our national forest lands, and children's ball games in the park. To allow a new road, a gondola, a zip-line, mountain bike trails throughout the face, and a massive restaurant development at the top would greatly diminish the scenic resource at the heart of our community.



Artist's rendering of what Snow King would look like with the proposed roadcut and trails

The proposed increase in ridgetop winter nighttime lighting will not only increase light pollution in the town and the currently undeveloped Leeks Canyon but would also hurt our dark skies and the proposed observatory. The infrastructure development proposed does not promote quiet recreation, and instead will likely increase the burden of noise on the residents of the town. Many town residents spoke out last year against increasing the hours of operation for the winter SnoCross event, as they felt the public burden (noise impacts etc) outweighed public benefits. During the Snow King development public meeting process, it was clear that the community does not want a noisy zipline on our Town Hill. Again, to understand the full impact of this development, we need updated user number projections.

Free access to our public lands

In Jackson Hole, we are surrounded by 97% public lands and count ourselves lucky to have relatively easy and cost-free access to the Bridger-Teton National Forest. As mentioned above, in the 2017-2018 winter season, our access was limited due to an imposed fee for uphill travel – a “taking” of traditional public land access. As we heard throughout the community engagement process, residents are concerned about these fees on uphill winter travel – and are afraid that Snow King may charge fees for summer recreation as well. Please require that Snow King stop charging for human-powered travel.

Additionally, please give serious consideration to the types of access that will be facilitated by the proposal. For example, the terrain on the face of the mountain is seemingly only suitable for experienced mountain bike riders, and hikers will be funneled into either a steep staircase or a heavily switchbacked hiking trail. At the base, we may lose part of a town park to become a zipline landing and tour bus drop-off zone. We are concerned about losing historic access to Forest (and town) lands and being forced to “pay to play” – if we can afford it.

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Social and economic impacts

Additional amenities on our Town Hill will likely increase use by out-of-town visitors. The proposal could lead to Snow King becoming a large summer amusement park where our Town Hill is covered in roller coasters, top-to-bottom noisy ziplines, and a massive restaurant complex on the narrow ridgetop, making our summer gridlock even worse. Prior to any approval of on-mountain attractions, Snow King developers should be required to produce a detailed plan to deal with extra traffic and parking issues created by their development, as well as employee housing that is in line with our Town requirements. Please require that Snow King commit in legally-binding documents to fully mitigate all impacts *before* getting approval to build any new projects.

Please analyze these and similar key questions:

- How many skier days does Snow King host today – and how many will it host after boundary, trail, and lift expansion?
- How many people ride the Summit lift now and how many people do they expect to ride the new gondola – in winter and in summer?
- How many people do they expect to ride the zipline, every day, and total?
- How many employees does Snow King have now – vs. after building all these projects? And how will they mitigate housing for existing and new employees?
- How much parking does Snow King use now – vs. after building these projects? How many new parking spots will this development require, and where will they put those spots?
- How much more impact will there be on utilities – water, sewer, garbage, etc.? And who will pay for the necessary upgrades to town infrastructure?

Cumulative impacts of development

The Snow King Mountain Resort development cannot be looked at as a stand-alone proposal. Our town and valley face many growth challenges that should be looked at holistically. Staff conducting the EIS must work in close conjunction with the cooperating agencies of the Town of Jackson and Teton County to fully understand the biological and socioeconomic cumulative impacts that this proposal has when considered with other future potential development across the town and valley.

Impact on our Comprehensive Plan and Land Development Regulations

Our 2012 Comprehensive Plan (Comp Plan)¹ gives clear direction: “Preserve and protect the area’s ecosystem in order to ensure a healthy environment, community and economy for current and future generations.” One relevant policy is that “existing Planned Resorts should be limited to their existing footprint” (Policy 3.1.d). The proposed on-mountain development, in conjunction with development of parcels at the base, clearly contradicts our Comprehensive Plan directive to protect our ecosystem.

¹ Jackson, Teton County Comprehensive Plan. 2012.

<http://www.tetonwyo.org/DocumentCenter/View/1837/JacksonTeton-County-Comprehensive-Plan-April-6-2012-PDF?bidId=>

Our current Land Development Regulations (LDRs) have many relevant points as well. Under Planned Resort Zones (4.3.1) we read that “The intent of this development type is to...”

4.3.1.A.1. Encourage recreational activities that rely on indigenous natural attributes of the area, contribute to the community’s character and economy and have a long-standing, beneficial role in the community

→ *Ziplines can be built anywhere, go against our community character, do not have a long-standing or beneficial role – and are opposed by a large segment of our community.*

4.3.1.A.6. Ensure resort plans are consistent with the Comprehensive Plan, and therefore, are beneficial to the community

→ *Elements of the proposed development go against the direction set by the Comprehensive Plan. Specifically, see Comp Plan 3.1.d: “should be limited to their existing footprint” above. Development into wildlife habitat goes against the Comp Plan’s vision to “protect and preserve the area’s ecosystem.”*

4.3.1.A.7. Enable long-range planning for infrastructure, capital facilities, and community land use patterns by establishing a level of predictability in the maximum potential size and character of each resort area

→ *The current investors want to remove the predictability we have had for decades by drastically changing the size and character of this resort area.*

4.3.1.A.8. Ensure a balance is maintained between tourism and community that promotes social diversity but does not cause undesired shifts away from rural, western community character

→ *This proposal will mark a clear end to “Jackson Hole, Last of the Old West.” Ziplines, downhill bike parks, and massive buildings on top of Josie’s Ridge are widely undesired and clearly not “rural, western community character.”*

4.3.1.A.9. Produce resort plans that make significant contributions toward protecting attributes of the community that are considered critical to the community’s long-term health, welfare, and well being

→ *This new plan will harm our community by destroying wildlife habitat – directly contradicting our core Comprehensive Plan goal to “protect and preserve the area’s ecosystem.”*

Impacts on our wildlife and natural resources

The Snow King area is unique. It is uncommon to have important wildlife habitat so incredibly proximate to a populated area such as the Town of Jackson. From the perspective of town, looking at the Snow King ridgeline, this area is just the edge of town. However, from a larger landscape perspective, this area is the edge of a vast piece of undeveloped forest land stretching the length of Teton County and beyond from the Gros Ventre Range to the Wind River Range. Many wildlife species use this expanse of land to travel through the landscape and to skirt the edge of human development.

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Footprint expansion and wildlife habitat & connectivity

The proposed expansion in land use is an approximately 250% increase from the current use footprint of 191 acres. In size alone, this footprint expansion of the resort use area is significant. A footprint increase such as this must be done in the most thoughtful and careful manner to avoid and minimize potentially significant impacts to wildlife and their habitats. Increased human activity expanding over the ridge to the south-facing slopes of the “backside” as well as onto steep, conifer covered slopes to the east and west represent the insertion of human use at potentially significant numbers and high speeds into areas that currently have no or limited use by humans throughout the year.

Impacts on big game and predator species

Big game species moving from north to south pass through and along this ridge while some will stay to utilize the winter and summer habitats present along this ridgeline area. In the wintertime, reports of bears and mountain lions are common; mule deer and elk have been known to frequent south-facing, undisturbed areas such as the backside expansion area; and in the past few years wintering big horn sheep have been reported in the upper reaches of Leeks Canyon. The backside slopes represent similar habitat to that found on the southern end of East Gros Ventre Butte – an area of ungulate winter range that is negatively impacted by proximate human use.

- What will be the impacts to these big game, non-game and predator species, from habitat fragmentation and habitat alteration – in each expansion area and cumulatively?
- Are there big game and non-game species parturition / calving areas nearby? How will proposed activities be managed to protect these critical areas?
- What Forest and State sensitive species and federally-listed species may be impacted by the proposed activities?
- What are the possible human-wildlife incidents that may occur from increased human use – in each area as well as overall?
- What habitat impacts will result from the expansion of facilities and infrastructure? Will these impacts carry with them mitigation requirements?
- Are the stated needs for the proposed expansion areas based solely on needs related to snow sports? Could these stated needs be achieved within the current footprint?

Impacts on birds

In addition to big game, many bird species from raptors to songbirds are known to nest in the north-facing conifer slopes as well as the south-facing sagebrush and forested habitats of the proposed expansion areas. Raptor and songbird species are both sensitive to human use disturbances during the nesting seasons within their home ranges. As highlighted in the *State of Wildlife Report* (attached), these intact conifer forest areas are part of a larger ecological system as well. For instance, songbird species that nest in the conifers often stage lower down in Karns Meadow in late spring before moving up into the conifer forests to nest. Therefore, a disturbance within the conifer habitat along the hillside will also have implications stretching to other areas in the valley.

- What effects are expected on avian species and their habitats from area expansion, proposed infrastructure, increased human use, habitat fragmentation and/or habitat alteration?

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- How will Northern Goshawk nests (a BTNF Sensitive Species) be protected from human activity disturbances within 100m (Squires and Kennedy, 2006) of their nest site as well as within the territorial foraging area?
- How will raptor species in addition to the Northern Goshawk and their nesting habitats be protected from impacts?

Impacts of habitat alteration

Thinning and clearing both have detrimental effects on wildlife species, and effects are species-specific. We are interested to see species-specific analyses for all habitat alteration methods (e.g. mowing, grading, clearing, thinning, glading, understory removal and alteration). Additionally, the increase in or addition of snowmaking in areas will potentially alter the water regime in those areas. The proposed snowmaking could affect water regimes on both the north-facing slopes as well as the south-facing, both of which are a component of the Flat Creek watershed. Particularly with the south-facing slopes, adding additional water into these ecological systems could have an effect of altering the vegetation type and species composition found there.

- What are the effects of each habitat alteration method (e.g. mowing, grading, clearing, thinning, glading, understory removal and alteration) and resulting use on each species affected within that habitat?
- What are the effects of grading to water resources and how will these be minimized?
- What are the effects of possible changes in water regimes resulting from snowmaking in affected habitats (e.g. sagebrush, juniper, deciduous forest and coniferous forests)? Will these vegetation types and their species composition change?

Finally, we understand from public statements that Snow King may ask future permission to drill a well to supply water for snowmaking – but that it is not currently part of this analysis. Please include potential well sites and their impacts in this Environmental Impact Statement.

Human-wildlife conflicts

An increase in human use – particularly at high speeds – will likely increase human-wildlife interactions and incidents. We are interested to know what the projected carrying capacity on the mountain will be once all infrastructure is in place.

- What levels of human use are expected and how do these numbers compare with current use? (See specific questions above re: community impact.)
- What are the likely impacts to wildlife and the ecological system specifically from this increase in human use?
- Do the proposed uses exceed a threshold between acceptable and harmful use? Where is that threshold?

Cumulative impacts of development

We would like to see full environmental analysis of not only the project components on their own but also of the cumulative effects if some or all of the project components are implemented. For example, what will the cumulative impact be for wildlife if Snow King expands its boundaries and develops into critical habitat on the backside, and at the same time, the important winter moose and deer habitat in Karns Meadow is developed with a lighted ski trail, as is

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currently within the written easement for the meadow. As we detail below, there should be an alternative that specifically prioritizes minimizing impacts to wildlife, habitat, and natural resources.

Concerns regarding specific project components

In addition to our concerns with the impact on our community and wildlife from the proposed projects, we have the following concerns about the coherence of specific components:

Beginner and intermediate skiing and safety

The developers' proposal to put beginners and youth on the ridgetop and backside seems like a significant safety hazard. The ridgetop is high-elevation and often windy and stormy through the winter season. Putting youth halfway down Leeks Canyon is also a bad idea: in the event of the backside lift closing, they would be stuck in a different drainage without facilities. The developers' insistence that they need a top-to-bottom road to serve as a beginner "ski run" to get beginners safely down the mountain shows that they should not be, and do not need to be, putting beginners on top of the mountain in the first place. This road would *also* put beginners in harm's way during the whole traverse down (sliding off the edge; collisions with skiers skiing or sliding out of control down steep intersecting trails). To put safety first, please develop an alternative that keeps new beginner runs and facilities on the frontside, near the base of the existing infrastructure.

It is important to note that the management leading this proposal was responsible for opening the resort on a dangerous day in 2017, which led to beginner skiers being in harm's way during an in-bounds avalanche². Please conduct a thorough investigation with current and former ski patrollers and leaders to determine whether management appropriately listened to ski patrol safety concerns on that day. After investigating, please determine whether the Forest Service should implement additional safety oversight over Snow King management through any new approvals, potentially including elevating the authority of ski patrol over office management.

Boundary and footprint expansions

From the perspective of the purpose and need, the developers are proposing an unnecessary expansion to the east onto terrain similar to the already open steep, north-facing, uncrowded and underutilized resort terrain. Additionally, they are proposing an expansion to the west, far onto Josie's Ridge and very near winter seasonal closures. An expansion would disturb habitat close to critical winter range that is closed to all human use. If we can't walk out there, why allow more disturbance near it with skiing and a road?

A new lift on the backside would greatly increase encroachment and use in a drainage that is currently unused except by wildlife. South-side terrain is sunny and windswept, which results in more available forage for wildlife like mule deer, and causes difficulty maintaining desirable, skiable snow conditions and depths. Opening the backside for skiing would require increased

² "Slide closes Snow King," February 11, 2017, *Jackson Hole News & Guide*.
https://www.jhnewsandguide.com/jackson_hole_daily/local/article_c2e4babd-8885-5cb5-be42-eea081fe4924.html

snowmaking, a potentially significant financial responsibility and a strain on our water supply.

In addition to the objectives stated in the Comprehensive Plan, the Bridger-Teton National Forest Plan outlines relevant goals and objectives to maintain wildlife habitat in balance with recreational development:

Forest Challenge: Avoid Unacceptable Effects from Recreation Use. Overuse by recreationists and the existence of too many trails on the Bridger-Teton National Forest can reduce trail and recreational experience, and soil and water qualities. The challenge is to manage the pattern of use and the available trails and facilities to prevent problems with human health and safety or the loss of basic resource values. If the challenge is not met, the experiences people seek may disappear and the potential for human injury or illness increase.

Goal 2.1: Adequate habitat for wildlife, fish, and edible vegetation to help meet human food needs is preserved.

Objective: Provide suitable and adequate habitat to support the game and fish populations established by the Wyoming Game and Fish Department, as agreed to by the Forest Service

Goal 4.1: a) Road management preserves wildlife security, soil, visual resource, and water quality values. b) minimize new road building and downgrade or close existing roads and motorized access trails to maintain or increase wildlife security. c) Design roads and structures to retain soil, visual resource, and water-quality values.

We believe that the proposed road, boundary, and footprint expansions are in opposition to the Forest goals and our community goals.

New road

The proposed new front-side road is unnecessary and damages our ski hill. We refer to excellent comments by Rod Newcomb in the *Jackson Hole News&Guide*:

As a Snow King patroller in the early 1960s, retired mountain guide and avalanche instructor, my concerns are about the road.

First, what will the proposed road do to the quality of skiing? The road enters the forest boundary east of the Rafferty lift and traverses to the east with a grade of 7 to 8 percent and a width of 16 feet. After a switchback to the west it traverses under the top terminal of the Rafferty lift and continues across the Grizzly Run, then the Elk Run to the Bearcat Run. From there to Scotty's Ridge it crosses slope angles of 35 degrees.

Near the top of Scotty's the proposed run turns back east and ends at the top of the present Summit lift. Total length is approximately 1.4 miles. This 16-foot-wide road crosses Elk Run, 100 feet slope distance above where the Karns Traverse enters Elk. At this point Elk has a slope angle of 30 degrees. For a horizontal road 16 feet wide on a 30-

degree slope, there is a 6-foot road cut that skiers would need to negotiate about halfway from the top of Elk Run to Old Man's Flats.

Intermediate to expert skiers prefer long uninterrupted runs. Elk Run is the mountain's best run and should not be interrupted by a 16-foot-wide road.

The second issue regarding the front-side road is personal for many folks and can be difficult for developers to understand. Many hikers (the King has said up to 500 a day) consider the forest beyond the boundary an extension of Phil Baux Park. They want the front-side roads left as they are and no more disturbance than necessary for the proposed expansion.

Impact on existing local agreements regarding Snow King

The proposed action has a significant impact on existing agreements with the cooperating agency Town of Jackson.

In 2000, the town made a deal with Snow King to allow dramatically more commercial and lodging development at the base – 915,000 square feet (sf), the equivalent of almost 10 of the new Marriott hotel or 20 of the new ballpark condos – in exchange for that development serving as the “financial and operational platform” for the ski area. Essentially, local government created many millions of dollars of commercial property value through an upzone, and gave it to the investors. In total, that development equates to 550 new condos or 1100 new hotel rooms – about half of it still latent. Nearby condos are currently selling for \$1.5-2 million, so 550 condos means \$800 million to a billion dollars of condo revenue.

A small portion of that revenue was supposed to support the winter skiing operations. The investors agreed to use some of the additional revenues from the increased lodging and commercial development to fund “community-oriented activities” like operating the ski area. The Resort Master Plan was clear on how this would work:

“The Snow King ski area provides a venue for the junior ski racing programs, adult ski racing as well as recreational skiing and snowboarding, both day and night. ... It must be noted that many of our community partnership activities mentioned above often come at a high cost to Snow King. Resort operation of lodging and other facilities provides the financial and operational platform and the resources to support these and other community-oriented activities.” (page 172-173)³

The investors want to remove their responsibilities from that deal with the Town, and instead set up a new deal in which high-impact on-mountain developments like a zipline serve as the “financial platform” for the mountain. However, they want to keep the remaining 500,000 sf of commercial development they received from the Town in 2000. We believe that the investors should not get to keep the benefits from that deal *and* build new development with negative impacts on USFS land.

³ Snow King Planned Resort Master Plan, 2000.

<https://www.jacksonwy.gov/DocumentCenter/View/435/Snow-King-Master-Plan-PDF>

We believe the whole community should be allowed to negotiate a new and comprehensive deal, and to hold the investors accountable to existing agreements. Please analyze the connection between Forest approvals and the 2000 Town agreement. *Please see our attached comments to the Town Planning Commission for further detail and evidence on this subject.*

Alternatives

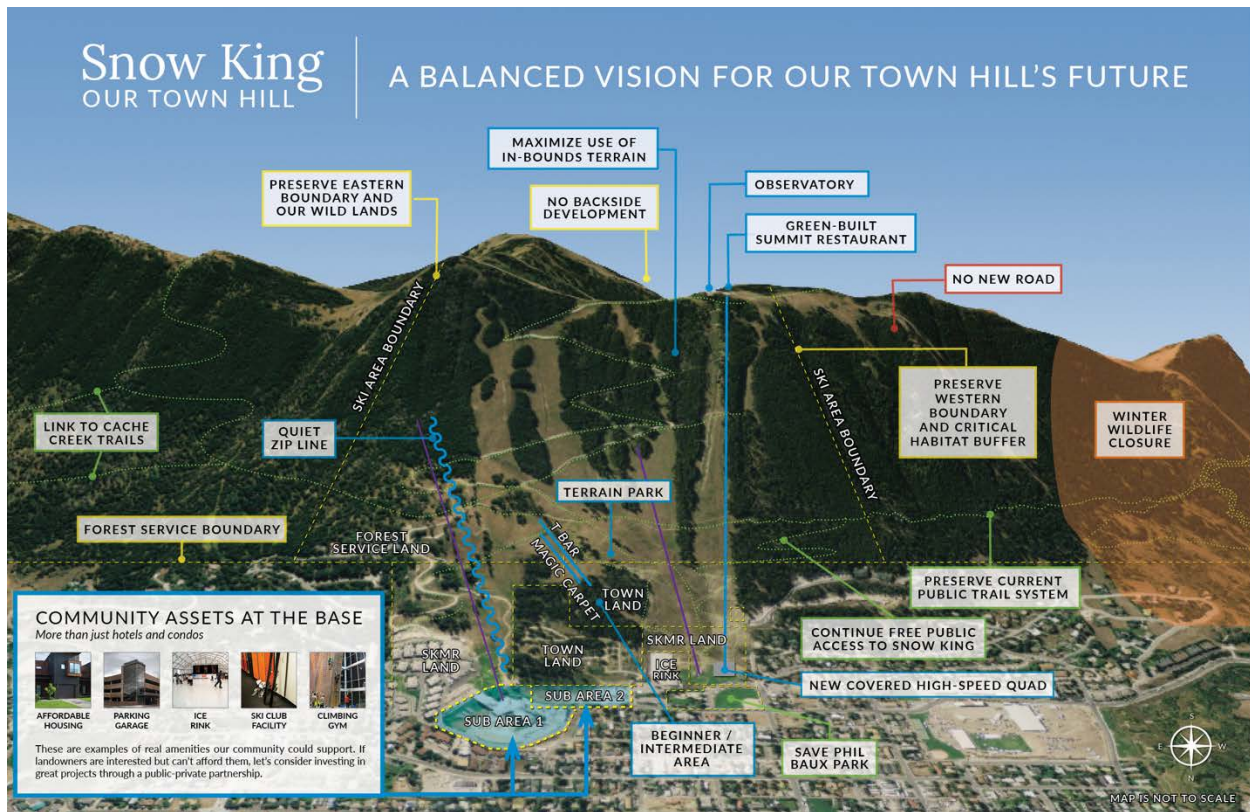
In addition to the project proposal and the no action alternative, we request you analyze the following two alternatives:

1. **Balanced vision alternative:** We worked in coordination with community members to develop alternative improvements and development within the existing footprint that achieve the Purpose and Need without expanding into valuable wildlife habitat and sacrificing important aspects of our community character.
2. **Wildlife alternative:** Snow King Mountain is home to valuable wildlife habitat that should be considered at a high level when analyzing alternatives to the proposed project. A wildlife-friendly alternative would prioritize protecting wildlife and *improving* wildlife habitat and connectivity. It should include no boundary expansion, no development on the backside, no yurt or chairlift on the backside, recreation development that is sensitive to wildlife, and new closures for critical wildlife habitat.

Balanced vision alternative

Below, we detail a balanced alternative proposal for our Town Hill. We worked with a diverse group of community members—developers, elected representatives, planners, former National Forest staff, neighbors, skiers, snowboarders, hikers, naturalists, young and old—to develop a plan that achieves the purpose and need without expanding boundaries into wildlife habitat.

We also attended all stakeholder and public meetings convened by Snow King and the Town of Jackson and incorporated community input into our initial balanced vision. We believe this alternative better encompasses the outcomes of those community conversations, and we believe that Snow King can succeed with responsible development like this.



Snow King Summit and Ridgetop

Observatory

An observatory would be a unique educational opportunity for the community and a great offering to visitors, connecting people with the natural world. Other summit development should not create light pollution preventing dark skies for the observatory. The observatory would provide new, unique educational opportunities for our community while at the same time promoting our community values. The development footprint should be in the existing developed area.

Green-built summit restaurant that maintains affordability for the community

A new summit restaurant could create a quality and welcoming gathering place for locals and visitors. It should be built within or close to the existing Panorama House footprint, with minimal visual and environmental impact, no “skylining” and no light pollution. We do not need a massive 20,000 sf complex with the associated infrastructure and impacts. Any and all increased traffic and parking demand created by the restaurant should be mitigated by Snow King with a community-approved plan. Please research other resorts with sustainably-built buildings and use them to guide building practices. It should be a national model of “green” design and building. Finally, in order for this to be a “community benefit” as advertised by the developers, it must be affordable to our full range of community members – not just visitors and wealthier locals.

On-Mountain

Covered, high-speed quad

We encourage replacing the Summit Lift with a covered high-speed quad chairlift, in the current

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location of the Summit Lift. The current lift is slow, old, and should be replaced by a new and faster high-speed quad. A covered lift will provide more comfortable transportation on rainy, snowy, or frigid days. Replacing the current lift with a gondola could require more development to recoup the investment. By replacing the lift with a less expensive covered quad, development can be limited to the existing footprint.

Quiet zipline

New ziplines, if allowed, should be limited to the Rafferty Lift area where there is already considerable activity such as the Cowboy Coaster; and should incorporate state-of-the-art noise-cancelling technology so that constant screaming doesn't disrupt wildlife and people. Our community has voiced significant concern over the proposed zipline and its impact. With noise-canceling technology, Snow King could potentially build a zipline that will keep the current public trail system in its peaceful state for quiet hikes and bike rides. This will also keep local restaurants and businesses from being impacted from constant noise on the mountain during the daytime.

Maximize use of in-bounds terrain

Enhance and maximize all of Snow King's existing in-bounds permitted terrain with removal of downfall, selective thinning and potentially cut new narrow trails that will not impact the historical view, or require avalanche mitigation and snowmaking. Use natural topography features such as ravines and small ridges to improve fall-line top to bottom ski runs. Snow King has plenty of terrain within their current footprint that is suitable for upgrades and would allow for more runs suitable for beginners and intermediates. Maximizing in-bound terrain should be considered prior to any development outside of the current footprint.

Beginner/intermediate area

The Rafferty area is a great location for beginner and intermediate skiers and doesn't need to expand the footprint onto new terrain. A new magic carpet and T-bar to the west of the Rafferty lift would safely welcome beginners, without the impacts of expanding the footprint into new areas. This new beginner area terrain development would keep Snow King from having unnecessary boundary expansion and snowmaking. It would also provide new opportunities for beginner skiers and snowboarders. Finally, it would avoid the dangerous situation of putting beginners and youth on a high-elevation windswept stormy ridge, or halfway down Leeks Canyon (in the event of lifts closing, they're stuck) – as the developer has proposed doing.

Terrain park

Expand terrain park on suitable grades including Rafferty and the current Old Man's Flats location. Create more features for beginners and intermediates, and provide the opportunity to link terrain parks and isolated features with berms/wiggles. Build a halfpipe for all abilities. Construct wooden terrain features on appropriate areas of the mountain. Our community is lucky to have access to world-class resort and backcountry skiing. However, there are limited opportunities for riders that want to test their abilities in a terrain park. Improving the existing footprint with an updated terrain park would give Snow King a feature separate from other local resorts and would increase access for the terrain park demographic.

Public access

Preserve current, free and unfettered public trail system, in perpetuity

An important and fundamental part of the Town Hill is the public trail system we all use. The current trail system is an integral part of the larger Cache Creek trail system and is used extensively in summer and winter, night and day. The public should have the unfettered legal right to use Snow King land as we always have. Almost 90% of the Snow King ski area sits on public land, owned by the Town of Jackson or the Forest Service. We should not have to pay to do human-powered recreation on our own public lands, and these historic recreation uses should never be prohibited.

Part of new development should be an agreement that ensures human-powered public access rights forever. We should all be free to walk dogs, trail run, hike, mountain bike, skin or hike uphill, and enjoy the mountain with our families and friends regardless of income. This public right should be written into Snow King's future permit and lease agreements.

Link to Cache Creek trail system

The eastern boundary is a quick transition from the developed Snow King Mountain Resort to the untouched beauty and wild area of the Cache Creek trail system. We support maintaining free public access across Snow King to the trails in Cache Creek.

Boundaries and Footprint

No backside development

Snow King should improve existing terrain (see above) instead of increasing the resort operating footprint on the back (south) side of the mountain.

Preserve Western boundary and critical habitat buffer

Snow King should improve existing terrain within the current boundaries instead of increasing the resort operating boundaries to the west – far onto Josie's Ridge and very near winter seasonal closures.

Use backside road

Snow King or the Town of Jackson should arrange for an easement providing perpetual access via the Leeks Canyon Road. The Leeks Canyon Road is safe to use and all options should be exhausted before a new road is built on the front side of the mountain, necessitating boundary expansion. Again, from Rod Newcomb's letter to the *Jackson Hole News&Guide*:

There is an alternative. That is the back-side road, in use since sometime after 1945, that was used to install the top terminal of the first Summit lift and supply fuel to the lift's diesel engine. The road is currently used by the folks who operate the cell towers at the top of the mountain.

It has a grade of 11 to 12 percent, is wide enough for trucks and has no switchbacks. It begins from the highway south of High School Road, crosses 1,000 feet of Lockhart land and continues up Leeks Canyon 2.4 miles to the summit. It is listed on the 1996 quad as a 4-wheel-drive road. There is a short stretch of 14 percent grade. It needs work, such as

culverts and gravel, to be used for heavy construction vehicles. The Lockhart family has indicated a willingness to negotiate access with Snow King.

Snow King is against the back-side road because it would require improvements, negotiation with the Lockharts and driving from Snow King's base to the entrance of Leeks Canyon. But this compromise would save the best ski run on the mountain.

Preserve eastern boundary and our wildlands

The eastern boundary of Snow King has an incredible and diverse concentration of wildlife right next to town. Jackson has the rare privilege of an intact ecosystem and as stated in our Comprehensive Plan, we are responsible for "preserving and protecting our area's ecosystem" from unnecessary development.

Wildlife alternative

In addition to the above "Balanced Vision" alternative, please include an alternative that prioritizes and protects the wildlife and wildlife habitat on Snow King. As mentioned, Snow King mountain contains vital habitat and movement areas for both mammal and avian species and their food sources. Please develop a wildlife-specific alternative, utilizing all available data sources. This proposal should include no boundary expansion, no development on the backside, recreation development that is sensitive to wildlife, and new closures for critical wildlife habitat.

Please consider whether the existing winter closure on Josie's Ridge should be expanded closer to the resort, whether there should be a winter closure on the south side, and whether additional closures are warranted in the Skyline area. Also, please remove the existing permit boundary from the backside to prevent future development, and only allow development within the current footprint. This alternative could outline a way to actually *improve* wildlife habitat and connectivity – in addition to various alternatives showing different levels of degradation.

Several excellent local data sources exist that may help inform wildlife use of the project area. Please consult datasets generated through Nature Mapping Jackson Hole, Wyoming Game and Fish Department, USFS, Western Migration Initiative and the National Elk Refuge for observational and movement wildlife data.

Mitigation

All alternatives should also include measures for mitigation, using other resorts for guidance of best practices. Multiple mitigation strategies should be considered and analyzed. Examples include securing off-site land easements, funding restoration and conservation efforts across the valley, or, every acre of new development could be mitigated by taking away two acres from another part of the permit area. With this letter, we have included examples of other ski resort mitigation efforts as well as a peer-reviewed article detailing mitigation standards for ski resort development. Please review these and other research as you consider necessary mitigation for development.

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Thank you for the opportunity to comment on this proposal. We look forward to working with the Forest Service, Snow King Mountain Resort, and the entire community to ensure that we continue to live and recreate in balance with nature and our community values.

If you have any questions, please do not hesitate to contact us.

Skye Schell

Executive Director
Jackson Hole Conservation Alliance

Leah Zamesnik

Conservation Policy Manager

Appendix A: The community engagement process and proposal development

Since January, the Alliance and our members were actively involved in the Town's public engagement process. We looked forward to developing a comprehensive proposal that truly reflected the community's desires. Unfortunately, after two public meetings and months of hard work by a stakeholder group, the developers submitted a proposal that is in contrast with ideas put forth by the community and stakeholders.

At the Town's public meeting in January, when the facilitator asked for community members' real opinions, our staff watched as a Snow King employee at our table read aloud from a 3-page "supporter talking points" sheet, apparently prepared by their PR firm. This is not authentic community engagement.

Next, the developers tried to push their proposal through the Town's stakeholder group, which was supposed to come up with a series of balanced compromises. Instead, Snow King's manager argued for each aspect of their existing proposal, and at the end tried to get their entire original proposal included as a scenario. The stakeholders did not allow that.

The stakeholders did include some projects that were totally rejected by the majority of people at the public meetings – like landing the gondola in the town ballpark. (*Please see our summary and tally of community input from the second community meeting, below.*) But the stakeholders didn't go as far as the developers proposed. The stakeholders didn't support ziplines, or a massive boundary expansion. They limited boundary expansions, when allowed at all, to the new road itself. As the stakeholder facilitator wrote:

Among the more challenging issues [sic] that the group addressed were boundary expansion, road development, and zipline... The group explored several ideas and options related to gains for Snow King and for the community but did not agree on or converge on a particular outcome.⁴

The applicant ignored the stakeholders and essentially submitted their original massive proposals: a massive boundary expansion and roadcut east and west; a huge footprint expansion onto the backside; a tour bus and zipline landing zone in our town ballpark; a top-to-bottom zipline; and (to the Town) additional condos at the base.

⁴ Town Council workshop agenda packet, May 21, 2018. Page 122.
<https://www.jacksonwy.gov/AgendaCenter/ViewFile/Agenda/05212018-339>

Tally & Summary of Community Input at Second Public Meeting, March 2018

Gondola: the majority said don't land it in the ballpark – leave it where the current summit lift is

- A - Ballpark - 124
- B - Current location - 135
- Other - 5, N/A - 24

Ice Rink: the majority are happy with an ice rink expansion

- A - Move somewhere else - 87
- B - expand to east - 132
- C - expand to west - 22
- Other - 14, N/A - 33

Mountain Sports Center: the majority are happy with a mountain sports center. There wasn't a real range of options.

- A - take over ice rink (if moved) - 93
- B - include in ice rink expansion - 145
- Other - 3, N/A - 47

West Portal: this was controversial. A slight majority of this group was OK with charging for public uphill access in winter

- A - unlimited summer / managed winter - 143
- B - unlimited summer and winter - 125
- Other - 2, N/A - 18

Zipline: the vast majority (at least 180) rejected the proposal to put a zipline next to the summit lift / gondola. This is Snow King's least popular / most disliked proposal.

- A - by gondola - 82
- B - by Rafferty - 70
- C - no zipline - 110
- Other - 11, N/A - 15

Boundary expansion / road: this question was posed in a very complex and confusing way. About half of people were OK with Snow King's proposal, and half wanted to scale it back.

- A - boundary & road as SK wants - 129
- B - just new frontside road - 24
- C - just new frontside road to the west (none to the east) - 10
- D - no expansion - 74
- E - just new frontside road to the east (none to the west) - 12
- Other - 11, N/A - 28

Summit: the majority of people were OK with beginner skiing on summit, but that doesn't mean they're OK with everything that might have to come with it

- A - west summit beginner expansion - 166
- B - no change - 88

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- Other - 4, N/A - 30

Back side: this was a very divisive issue. Slight majority OK with a new lift; slight minority prefer either only human-power on the back or actually removing the back side from the permit area entirely. Snow King ignored all those people and proposed everything they wanted from the start.

- A - human-powered & yurts - 67
- B - new lift etc. - 147
- C - pull back boundary to footprint - 51
- Other - 4, N/A - 19

Uphill access: slight majority of people who came to the meeting were OK with charging for uphill access (though hundreds of people who didn't make it to the meeting have signed a petition rejecting uphill fees)

- A - free - 123
- B - charge - 140
- Other - 3, N/A - 22

Housing: agreement that Snow King should do its part to house their employees, vs their previous tactics of putting 12 seasonal workers in one single-family home.

- A - new agreement - 146
- B - status quo - 34
- C - Town LDRs - 64
- Other - 3, N/A - 40

Appendix B: Documents accompanying comment letter for review

Along with our comment letter, you will find the following documents at this online shared folder, as they are too large to send over email:

https://jhca.sharepoint.com/:f:/g/ErasNfqo3jdIoWsnjB_Ay4sBO4xbkN8TSK8OmNTkNuQ2rQ?e=b1lUb6

1. Relevant academic articles
 - a. Does artificial snow production affect soil and vegetation of ski pistes? A review (Rixen, Stoeckli & Ammann, 2003)
 - b. Watershed analysis of forest fragmentation by clearcuts and roads in a Wyoming forest (Tinker et al, 1997)
 - c. The impact of forest ski-pistes on diversity of ground-dwelling arthropods and small mammals in the Alps (Negro et al, 2009)
 - d. Ski tourism affects habitat use and evokes a physiological stress response in capercaillie *Tetrao urogallus*: a new methodological approach (Thiel et al, 2008)
 - e. Northern Goshawk ecology: an assessment of current knowledge and information needs for conservation and management (Squires & Kennedy, 2006)
 - f. Forest bird diversity and ski-runs: a case of negative edge effect (Laiolo and Roldando, 2004)
 - g. Impact of outdoor winter sports on the abundance of a key indicator species of alpine ecosystems (Patthey et al, 2008)
 - h. Effects of ski piste preparation on alpine vegetation (Wipf et al, 2005)
 - i. Not all ski slopes are created equal: Disturbance intensity affects ecosystem properties (Burt & Rice, 2009)
 - j. State of Wildlife in Jackson Hole (Clark & Riginos, 2018)
2. Examples of mitigation and resort development best practices
 - a. Ecological uncertainty, adaptation, and mitigation in the U.S. ski resort industry: managing resource dependence and institutional pressure (Tashman & Rivera, 2015)
 - b. Snowbird Record of Decision with mitigation standards (1999)
 - c. Heavenly Mountain Resort Mitigation and Monitoring Plan Annual Report (2009-2010)
 - d. Best practices guide: for resort development in British Columbia (2005)
3. Relevant letters from community members published in the Jackson Hole News and Guide
 - a. Noah Osnos Letter to the Editor (LTE) “What’s the impact?”
 - b. Glen Esnard LTE “The King is king”
 - c. Geneva Chong LTE “Dismissive language”
 - d. Kirk Davenport LTE “Irresistible urges”
 - e. Kyle Kissock LTE “Don’t budge ballfield”
 - f. Rod Newcomb LTE “Snow King wrong road”
 - g. Skye Schell Guest Shot “Let’s expand our vision of Snow King’s success”

- h. Sam Petri Guest Shot “Soaring Eagle hasn’t landed-yet”
 - i. Geneva Chong Guest Shot “Making Snow King a community gem”
 - j. Paul Hansen Common Ground column “Judging what’s right for us and Snow King”
4. Alliance letter submitted to Jackson Town Planning Commission, September 18, 2018

September 18, 2018



Dear Town Planning Commissioners:

Thank you for the opportunity to comment on the Snow King base area master plan amendment. We believe Jackson Hole can be a national model of a strong community living in balance with nature, and Snow King can be the greatest example of this balance: a ski hill built on our community values of protecting wildlife and providing access to nature on our public lands. We want Snow King to succeed as our Town Hill, not an amusement park covered in new condos at the base.

We appreciate that the Town, County, and Forest Service are all working together to make holistic decisions about the future of Snow King. Within that context, please understand that **the base area master plan amendment you are currently reviewing is entirely about future private real estate development – and the developers are proposing a radical shift from the deal our town made in 2000.**

In 2000, our town made a deal with Snow King to allow dramatically more commercial and lodging development at the base – 915,000 square feet, the equivalent of almost 10 Marriotts or two Four Seasons – in exchange for that development serving as the “financial and operational platform” for the ski area¹. Essentially, local government created many millions of dollars of commercial property value through an upzone, and gave it to the investors. In total, that development equates to 550 new condos or 1100 new hotel rooms – about half of it still latent. Nearby condos are currently selling for \$1.5-2 million, so 550 condos means \$800 million to a billion dollars of condo revenue. A small portion of that revenue was supposed to – and easily could – support the winter skiing operations.

The investors agreed to use some of the additional revenues from the increased lodging and commercial development to fund “community-oriented activities” like operating the ski area. The Resort Master Plan was crystal clear on how this would work:

“The Snow King ski area provides a venue for the junior ski racing programs, adult ski racing as well as recreational skiing and snowboarding, both day and night. ... It must be noted that many of our community partnership activities mentioned above often come at a high cost to Snow King. Resort operation of lodging and other facilities provides the financial and operational platform and the resources to support these and other community-oriented activities.” [172-173]

This is normal for ski resorts – most don’t make their money on lift tickets, they make money on lodging, real estate, and commercial development at the base.

So, Snow King’s investors agreed to create the Snow King Resort Master Association (SKRMA). The simplest way to understand SKRMA is that it’s like a Homeowners’ Association (HOA) for everyone who owns land or does business at Snow King. SKRMA was empowered to charge dues on all the property owners. According to the Resort Master Plan:

“SKRMA will act as a pseudo improvement district and be entitled to assess and collect dues and assessments from all property owners, renters, resort guests and from any

¹ *Snow King Planned Resort District Master Plan [2000]*, page 172-173.

entities performing management functions, owning property or obtaining revenues within this Planned Resort District. These dues are intended to cover all of SKRMA's costs including various mitigation plans, constructing and maintaining any improvements that are its responsibility including landscaping, roads, utilities, employee housing, parking, pathways, recreation, district promotion, common signage, transportation, marketing and any other aspects associated with the proper and successful implementation of this Master Plan and its goals and objectives." [171]

The deal was clear: the community gave Snow King's investors additional commercial value and revenue; in return, the investors agreed to use part of that revenue to pay for community benefits. Unfortunately, Snow King's investors never carried out their end of the deal. They never levied dues through SKRMA to fund the "community-oriented activities" with those dues. According to the Wyoming Secretary of State's website, SKRMA stopped even filing its paperwork, so the State dissolved it in 2014.² (Snow King has since re-filed SKRMA's paperwork.)

It gets more complicated. When our community made the deal with Snow King in 2000, the same investors owned everything: the ski area, the hotel, and the vacant land at the base, so it would have been easy for them to set up SKRMA. But over time, the investors made short-term business decisions to sell off key parcels like the hotel and the new condos, sacrificing part of their "financial and operational platform" for fast cash. As a result, there are now more owners at the SKRMA table, making it more complicated to get agreement on how to levy and spend dues – but that doesn't change their responsibilities.

We hoped the investors would try to fix this situation through the amendment in front of you. Unfortunately, they're doing just the opposite. **The new investor group wants to delete their responsibilities from that deal with the Town, and instead set up a new deal in which intrusive on-mountain amusements like a zipline serve as the "financial platform" for the mountain.** They want to do this by changing the base master plan text as follows (see the "track changes" version, PDF page 366 in the P18-208 transmittal memo):

Current text	Proposed text
Resort operation of lodging and other facilities provides the financial and operational platform and the resources to support these and other community-oriented activities.	"operation of lodging, conference, and on mountain activities provide the financial and operational platform and the resources to support these and other community-oriented activities."

However, they want to keep the remaining 500,000 sf of commercial development they received from the Town in 2000. We believe that the investors need to decide whether to have their cake or eat it, but not both. Either they follow through with the 2000 master plan deal and use the development and commercial revenue to support the ski hill, as promised, or we should undo the deal entirely (and remove the massive future commercial development potential) and they can use new zipline revenues to support the ski hill.

²WY Secretary of State website:

<https://wyobiz.wy.gov/business/FilingDetails.aspx?eFNum=142033254045148183251016013178103047250038006104>

Here are two simple options:

	Town: Base master plan	USFS: On-mountain
Option 1: stick with deal	Follow through with 2000 deal: use revenues from the base to support ski area, keep 500,000 sf of latent development	Don't need to build new amusements to generate revenue, since revenue comes from base
Option 2: new deal	Undo 2000 deal: don't use base revenues to support ski area – and remove 500,000 sf of latent hotel/condo/commercial development	Build new amusements to generate on-mountain revenue to support ski area, since no revenue from base

Before our community gives Snow King's investors even more economic benefits on our Town Hill, we and our Town Council need to hold them accountable to the deal they already agreed to. *Before* we approve anything new, Snow King's investors should get together with the other resort property owners and agree on a legally-binding SKRMA funding structure, dues, and what those dues will go to. They should commit (in binding documents, with bonding) to keep the lifts spinning, maintain free uphill public access to our public lands, build workforce housing, and invest in transit and parking for their new summer traffic – with the dues from their commercial and lodging revenues.

How this relates to decisions on Town land

The investors also want to take over more Town land in Phil Baux Park, to land a private gondola and zipline. The Parks & Rec director and board both rejected a zipline on Town land, and the board also rejected the proposed gondola location. Whatever Parks & Rec *does* approve should be part of a comprehensive negotiation about the entire future of Snow King – public and private land. Please work with your Parks & Rec colleagues to come up with a joint recommendation for:

1. Re-negotiating the base area masterplan [you recommend, Town decides]
2. Re-negotiating Town lease agreements for Phil Baux Park, the almost 30 acres of ski area the Town owns, half the ice rink building, etc [Parks & Rec recommends, Town decides]
3. Allowing new amusements like ziplines [Town recommends, Forest Service decides]

Please look at all these processes holistically and comprehensively, so that our community can best negotiate a great outcome for our Town Hill.

Please let me know if we can be of assistance.

Sincerely,



Skye Schell

Executive Director

Jackson Hole Conservation Alliance

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JACKSON HOLE CONSERVATION ALLIANCE

STATE OF WILDLIFE IN JACKSON HOLE

— 2018 —

State of Wildlife in the Jackson Hole Area

Authors: Frances H. Clark & Corinna Riginos

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List of Abbreviations

BTNF — Bridger-Teton National Forest
GTNP — Grand Teton National Park
GYA — Greater Yellowstone Area
GYE — Greater Yellowstone Ecosystem
JH — Jackson Hole
NER — National Elk Refuge
NRTAB — Natural Resources Technical Advisory Board
SGCN — Species of Greatest Conservation Need
SWAP — State Wildlife Action Plan
WGFD — Wyoming Game and Fish Department
YNP — Yellowstone National Park

Acknowledgements

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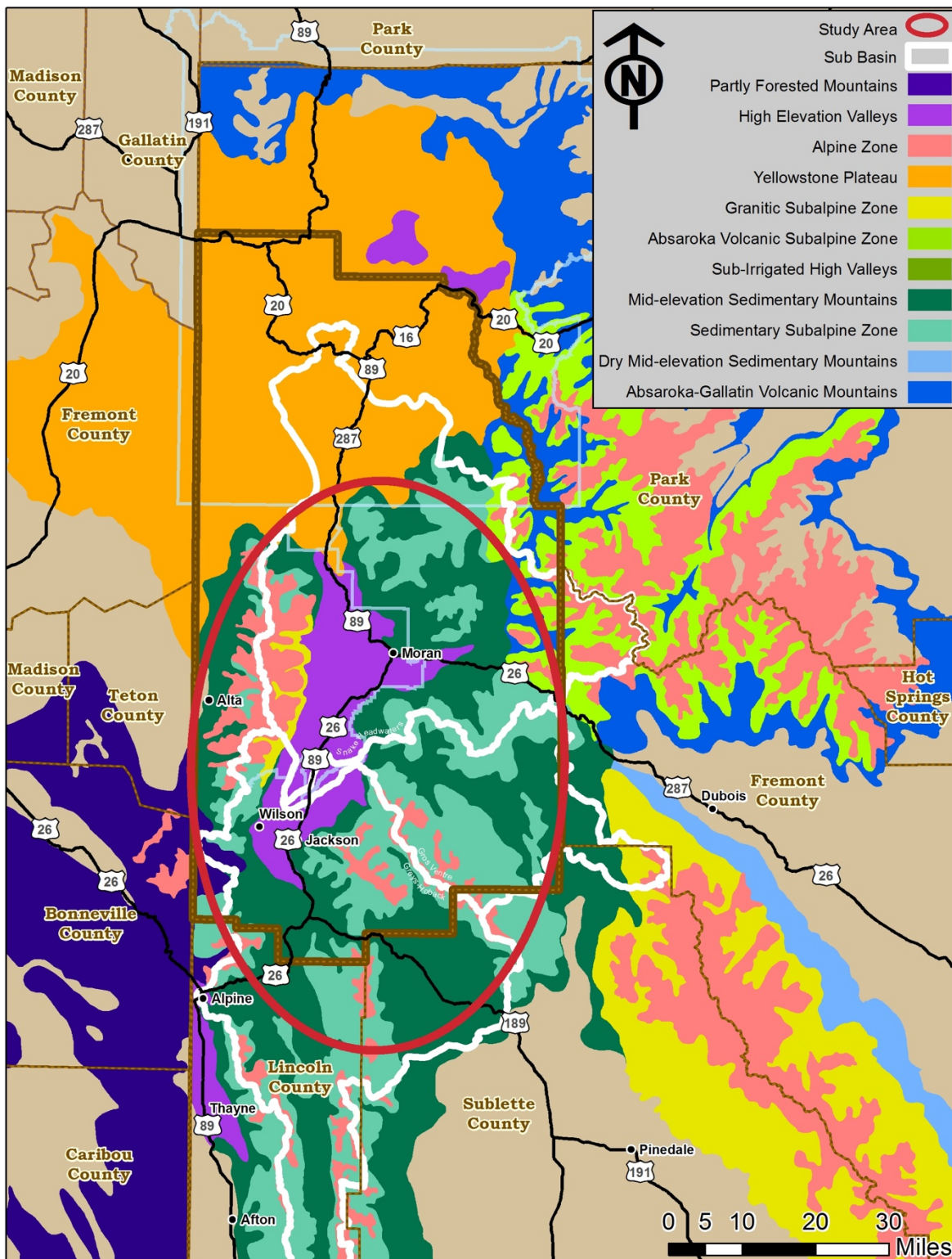
This report draws on the expertise of numerous biologists. The following people contributed in important ways, from meetings and conversations to reviewing drafts of sections of this report:

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Images courtesy of Frances H. Clarke

Maps courtesy of Corinna Riginos and Chauncey Smith

The report was commissioned by the Jackson Hole Conservation Alliance, a local grassroots conservation organization dedicated to protecting the wildlife, wild places, and community character of Jackson Hole by advocating for conservation policy based on the best available facts and data.



Jackson Hole area (study area) in relation to sub-basins of the Upper Snake River and sub-regions of the Middle Rockies ecoregion

Introduction and Summary

The Purpose of this Report

The purpose of this report is to identify and highlight key conservation “targets” and the threats to those targets in the Jackson Hole area. In doing so, we aim to promote efficient and effective conservation efforts backed by sound science. The report was commissioned by the Jackson Hole Conservation Alliance in support of these ends.

We have defined a geographic area that is a distinct and important part of the Greater Yellowstone Ecosystem — one of the most ecologically intact and beloved regions of the world. We have chosen ten targets that together encompass the biological diversity of the Jackson Hole area most in need of conservation attention. For each of these targets, we have researched the current status and trends relative to historic benchmarks and identified the major threats to them over the next 50 years. Through this process, and with the input of numerous biologists and managers, we have gathered the best and most up-to-date scientific knowledge about each of our conservation targets in the Jackson Hole area.

Our intent is to motivate and focus conservation efforts. We compile this report for the Jackson Hole community at large to encourage people to work together on the difficult task of conserving these targets. This document is an assessment of the status and threats to wildlife, not a prescription for how to manage or how to solve the complex conservation challenges that lie ahead. It is meant to highlight and complement the many exemplary efforts already underway by various land and resource management agencies, NGOs and local government leaders. Our purpose is to provide a reference that cuts across jurisdictional lines and synthesizes a large amount of existing knowledge in one place.

Selection of Geographic Extent — The Jackson Hole Area

Jackson Hole lies within the Greater Yellowstone Ecosystem (GYE) — a large, complex, and iconic part of the United States. The GYE is considered by many to be the most ecologically intact temperate ecosystem in the world. It is home to the headwaters of three major river systems, abundant wildlife, and diverse and unique geology. It is defined by two National Parks, five National Forests, two national wildlife refuges, and other surrounding private, state, and federal lands.

Within this context, our goal was to define an ecologically and socio-politically meaningful piece of the GYE that could broadly be considered the “Jackson Hole area.” Our intent was that this extent should capture the defining features of the area, while acknowledging that it is connected to the much larger ecosystem. We defined our geographic extent by identifying key ecological and social-political factors and seeking input from diverse experts and stakeholders. Although we gave more weight to ecological factors than political boundaries, in some cases political boundaries did define edges to our geographic extent. For example, we decided to limit the scope to Wyoming, although we acknowledge many important ecological connections that cross borders into neighboring states.



The ecological factors we used as a basis for defining the Jackson Hole area were (a) the main watershed or drainage sub-basins of the Upper Snake River basin, and (b) the main ecoregions around Jackson Hole. Watersheds are defined by topography and represent natural barriers to many animals' movements, especially aquatic species. Ecoregions are defined using a combination of information on underlying rocks and soils, climate, topography, and plant cover; they represent broad groupings of ecologically similar units at a coarse scale [1]. The sub-basins and sub-ecoregions together suggested a core area, mostly in Teton County. While we determined a core area for this study, we recognize that this core area is ecologically connected to other, nearby areas such as the Yellowstone Plateau, the Salt River basin, and the Upper Green River basin.

The area we have defined through this process is ecologically distinct within the Greater Yellowstone Ecosystem — particularly because it includes significant areas of high elevation sagebrush valleys, sedimentary mountains, and alpine areas. At the same time, this area lies more or less at the heart of the GYE and is a crucial piece of the ecosystem in terms of habitat connectivity for many wildlife species.

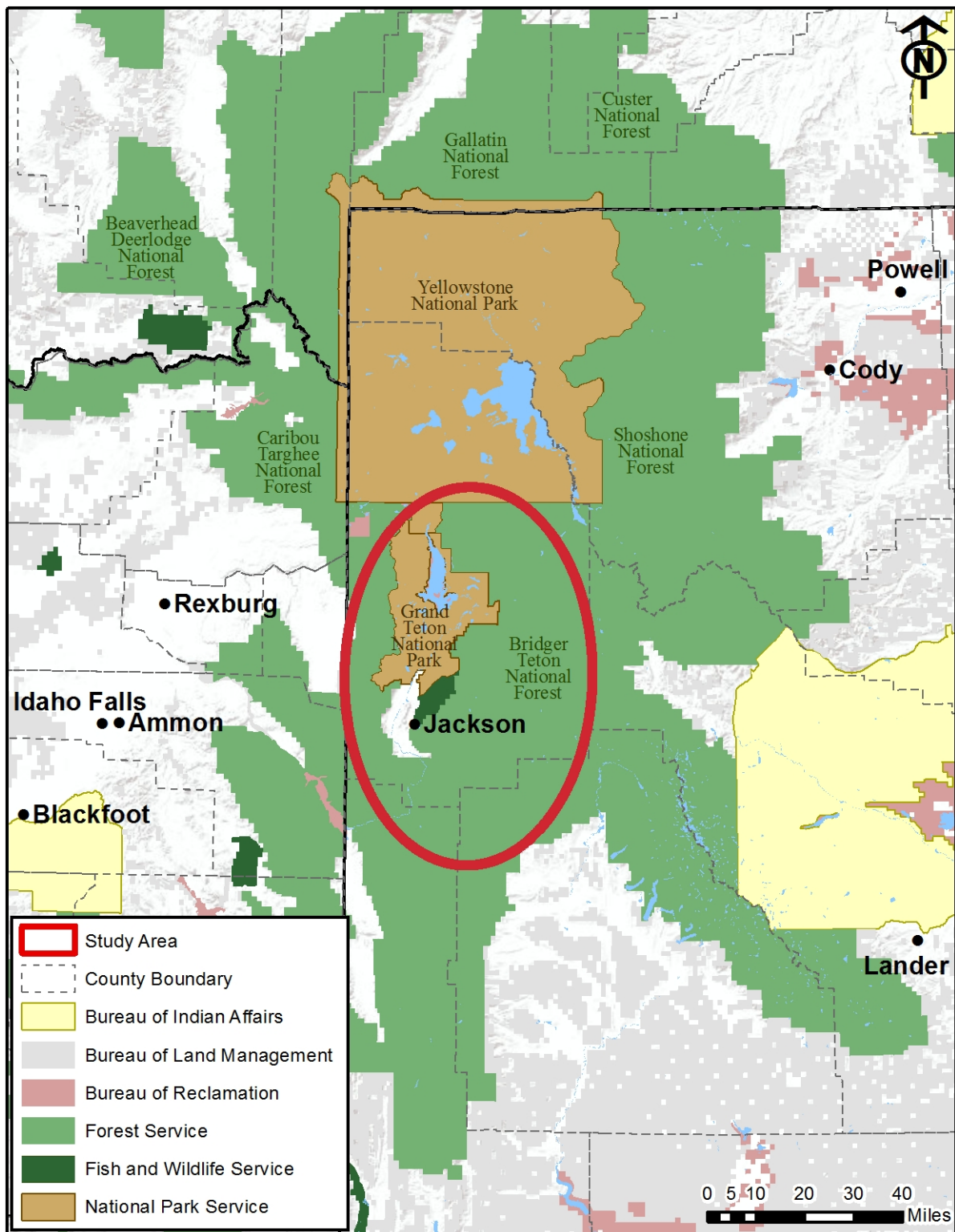
Selection of Conservation Targets

We selected a set of conservation targets based on a methodology developed by the Conservation Measures Partnership, a consortium of national and international conservation organizations and foundations. A target can be a species, a habitat, or a process. This approach emphasizes concentrating on a few targets to focus conservation actions in a way that conserves much of the ecological integrity of the area effectively and efficiently [2, 3]. The process of selection involves local stakeholders and is informed by experts and research. It allows for some flexibility in criteria.

We reviewed lists of rare, endangered, or vulnerable species on a federal, state, and county level. We looked at the type and distribution of habitats throughout the state and region, and considered significant natural processes such as fire, hydrological dynamics, disease, and migration. We reviewed agency and county management plans and discussed potential targets with numerous scientists and managers. We deliberately sifted through, selected, and connected together what we propose here as a practical set of conservation targets that encompass the majority of the natural diversity of the Jackson Hole area.

Key questions we asked:

1. Is the target vulnerable e.g. declining or under significant threat?
2. How feasible is it to track the target's status over time to determine whether management actions are effectively conserving it?
3. Can sound local management and policies have an impact on sustaining or recovering the target?
4. Is the target a regionally important population or habitat of a more widespread species or habitat type that we do not want to lose?
5. How will conserving this target influence other elements in the ecosystem? Does this target serve as a useful umbrella for other potential targets?
6. How do all the targets fit together as a set to capture most of the natural diversity of the Jackson Hole area?
7. Are we leaving anything out?



Jackson Hole area within the Greater Yellowstone Ecosystem.

Assessment of Status, Trends and Threats

For each target, we evaluated its status and trend relative to the best available data from the past. Historic data were variable; in some cases we compared current status of the target population, habitat, or process relative to 40-50 years ago, but in several cases these targets have only been given significant attention in the last couple of decades. We also evaluated the main threats facing each target over the next 50 years. We gave each threat an overall rating of “low,” “medium,” or “high” based on its severity, extent, irreversibility, and probability of occurring. Severity is defined as the level of damage to the conservation target; extent is the geographic area expected to be affected within the study area; irreversibility describes the degree to which the effects of a threat can be undone or restored; and probability is defined as the likelihood of the threat occurring if it is not present yet [2].

We emphasize that all threat ratings could change over time as conditions change or as more information becomes available. We also emphasize that a “low” threat rating does not mean the threat is less important to address than a “medium” or “high” rating. Some threats are more easily addressed than others, and every threat that can be alleviated will help to ensure the persistence of the target species, habitats, and vital processes in the Jackson Hole area.

Overview of Targets, Status, and Threats

Through the selection process, we settled on ten main targets, four of which group together. The main body of this report details each target’s ecological importance, its current status and trends relative to the past several decades, and the threats facing that target, as well as any information gaps around that target. Here, we provide a short overview for each target.

Snake River and Wetlands Complex

The headwaters of the Snake River and its associated lakes, streams, wetlands, and tributaries flow through the heart of the Jackson Hole area and create a rich habitat mosaic that supports much of the area’s biological diversity. Within this broad target, we highlight four more specific targets; however, we urge that the whole river and wetlands complex should be considered critical and deserving of conservation attention.

Hydrologic Processes

- *Importance:* Hydrological processes are fundamental to riverine and wetland systems. The depth and flow rate of water, the deposition and stability of sediments, and magnitude and frequency of flooding events define the diverse habitat mosaic that is essential for supporting plants and animals.
- *Status and Trend:* For decades, the Jackson Lake Dam and levees between Moose and Hog Island have altered river flows, reducing flooding and channel meanders along the Snake River and affecting spring creek flows, with significant impacts for fish and wildlife habitat.
- *Greatest Threats:*
 - *Residential development and agriculture cause water withdrawals and nutrient additions:* Water withdrawals alter water tables and stream flows. Runoff brings added nutrient to water bodies, compromising water quality and promoting algae blooms and aquatic plants that can clog channels.
 - *Invasive and problematic species:* Invasive plants such as spotted knapweed and perennial pepperweed are readily spread by equipment and flowing waters,

displacing native species. If the few New Zealand mud snails occurrences expand and if Zebra mussels are transported here by watercraft, these prolific invertebrates can disrupt the first and essential links in the aquatic food chain, changing food availability and water quality for many other species.

- *Dams and levees:* Jackson Lake Dam and the levees continue to alter hydrological dynamics.

Beaver

- *Importance:* Beaver are ecosystem engineers that create willow habitat and stable ponds that provide habitat for numerous other species of amphibians, plants, insects, fish, and birds.
- *Status and Trend:* Beaver abundance in GTNP declined by 80% over the past 40 years. Beaver are trapped outside of the park, and the impact of trapping on their population is not known. Several agencies are considering restoring beaver to watersheds to enhance these habitats and ecological services. Beaver are considered a conservation opportunity.
- *Greatest Threats:*
 - *Residential development:* The expansion of development leads to more trapping as “nuisance” animals are removed.
 - *Unknown:* The cause of beaver declines in GTNP is unknown but may relate to hydrological changes. Levees, water diversions, and other hydrological changes are all likely threats.

Cottonwood Galleries

- *Importance:* Narrowleaf cottonwood galleries provide vital and unique habitat for a variety of birds and bats. They are essential habitat corridors for many larger terrestrial species and are an excellent indicator of riverine ecosystem integrity.
- *Status and Trend:* Jackson Lake Dam and levees limit flooding, which is essential for new cottonwoods to germinate and establish. Trees are long-lived but an estimated 30% of this forest type has been degraded since the 1950s between the dam and Moose; this figure is likely greater for the leveed areas south of the Park.
- *Greatest Threats:*
 - *Dams and levees:* Jackson Lake Dam and the levees continue to limit flooding and cottonwood establishment.
 - *Climate change:* Changes in precipitation and hydrologic processes may lower the water table, favoring spruce over cottonwoods.
 - *Invasive and problematic species:* Invasive plants can crowd out native plants in the cottonwood galleries, reducing habitat quality for wildlife.
 - *Residential and recreational development:* Remaining cottonwood galleries are being degraded by the construction of homes, golf courses, and boat launches.

Snake River Cutthroat Trout

- *Importance:* This subspecies of cutthroat trout is a popular sport fish and an indicator of a healthy riverine and wetland ecosystem that supports many other species.
- *Status and Trend:* Currently considered common throughout the watershed.
- *Greatest Threats:*

- *Disease*: Cutthroat trout are vulnerable to whirling disease, an introduced parasite that is spreading.
- *Changes in temperature due to climate change*: Warming waters are expected to reduce trout reproduction, resistance to disease, and ability to compete with non-native trout.
- *Changes in hydrological processes due to climate change*: Changes in hydrological processes and water diversions compound the effects of warming waters.

Sagebrush and Sage-Dependent Species

- *Importance*: The sagebrush plains and grassy buttes of the Jackson Hole valley support a diversity of species not found in other habitats, including the vulnerable Greater Sage-Grouse. The high elevation and precipitation make the sagebrush steppe in this area different from other parts of the West.
- *Status and Trends*: Many areas of sagebrush are protected within Grand Teton National Park, but many other areas have been converted to other land-uses. It is estimated that 45% of historic sage-grouse habitat has been lost. Sage-grouse numbers have declined by 50-75% since the 1950s.
- *Greatest threats*:
 - *More frequent fire*: Sagebrush is adapted to infrequent fires (>100 years between fires) and it takes many years for the shrub to recover. Fires are expected to become much more frequent as the climate warms. Human activity in sagebrush areas also increases the risk of accidental fire.
 - *Invasive and problematic species*: Invasive species, especially cheatgrass, promote fire and outcompete native plants. A warming climate is expected to hasten the spread of cheatgrass, which has devastated sagebrush systems elsewhere.
 - *Air and vehicle traffic, roads and airports*: Cars, trucks, airplanes, and airport management to push birds away from the runway disturb the highly sensitive sage-grouse, threatening their ability to reproduce.

Ungulate Migration as a process

- *Importance*: Ungulate migration routes, such as the designated Path of the Pronghorn, crisscross the Jackson Hole area. The number, length, and relative intactness of migrations found in the Jackson Hole area are rare on a global scale. Migration is an essential process for maintaining the large herds of ungulates that are a vital part of the GYE.
- *Status and Trends*: Most migration routes have been altered to some extent by human presence. The historic bighorn sheep migration from the top of the Tetons to the valleys has been completely severed. Elk migrations are much shorter than they were pre-settlement. Deer and pronghorn have to navigate many obstacles as they migrate.
- *Greatest threats*:
 - *Roads*: Vehicle traffic makes it hard for ungulates to cross roads that cut through their migration routes and winter ranges.
 - *Fences*: Fences can be difficult or even impossible for animals to cross.
 - *Residential and energy development*: Development in the private lands of Jackson Hole makes it difficult for ungulates to move freely through the landscape. Energy development in deer and pronghorn winter ranges in Sublette County threaten some of the herds that migrate into the Jackson Hole area for the summer.

- *Disease*: Chronic wasting disease is expected to arrive in the Jackson Hole area in the coming years; this disease is expected to significantly reduce the populations of migratory elk and deer.

Moose

- *Importance*: Moose are one of the most beloved species of wildlife in Jackson Hole. Moose roam among local wetland and stream habitats and up drainages throughout the valley — relying on habitat connectivity across the valley. This sub-species of moose, the Shiras moose, is found only in the northern Rockies and many of its populations are undergoing precipitous declines.
- *Status and Trends*: Moose numbers have plummeted from around 3,000 or more in the early 1990s to about 500 today. Their reproductive success continues to be low and there is no sign of a population rebound occurring.

Greatest threats:

- *Climate change*: Climate change is the greatest overall threat to moose, as it threatens to increase direct thermal stress to these temperature-sensitive animals and contributes to several indirect threats.
- *Disease*: Carotid artery worm can severely alter moose cognition and vision, directly or indirectly contributing to mortalities. A warming climate is hastening the spread of this fly-borne pathogen.
- *Roads*: Rising traffic volumes are making roads more and more difficult for moose to cross and access different parts of their habitat.
- *Residential development*: Some of the most in-demand and valuable real estate in the private lands of Jackson Hole sits in moose habitat. Development reduces habitat available to moose and introduces new stresses to animals that must live in increasing proximity with humans.

Goshawk and the Mature Forest Mosaic

- *Importance*: The Northern Goshawk is a good indicator of large blocks of unfragmented, older-aged conifer forest. This connected forest mosaic is vital habitat for many other species including a variety of owls, songbirds, and small mammals.
- *Status and Trends*: Methods for counting goshawk are evolving and time consuming, making it difficult to determine trends; however, surveys suggest declines in nesting presence or success in disturbed habitats.
- *Greatest threats*:
 - *Fire*: The frequency and severity of forest fires are expected to increase as the climate warms over the next several decades, threatening the mosaic of mature conifers.



- *Recreation*: Hikers, mountain bikers, backcountry skiers and other recreationalists use mid-elevation (6,300-7,800 foot) conifer forests extensively. Trails can fragment the forest, and increased human and dog presence disturbs raptors and their prey, reducing the quality and connectivity of their habitat.
- *Invasive and problematic species*: Invasive plants displace native species, reduce the food available for herbivores that may be prey for goshawk and other raptors, and can contribute to more frequent fires.

Whitebark Pine

- *Importance*: Whitebark pine trees grow where most other trees cannot and play a unique ecological role by supplying an abundance of nutritious pine “nuts” for red squirrels, grizzly bears, and Clark’s Nutcrackers. Clark’s Nutcrackers and whitebark pine have a rare mutualism where a plant depends upon a bird. Whitebark pine stands protect the snowpack in the subalpine zone that feeds streams throughout the growing season.
- *Status and Trends*: Whitebark pine populations have declined between 40%-90% in the GYE and across its range in the last two decades, mostly due to blister rust and mountain pine beetle infestations. Although these trees are highly threatened, the Jackson Hole area includes some trees and remnant stands that may contain the genetic keys to the future survival of these populations.
- *Greatest threats*:
 - *Invasive and problematic species*: *White pine blister rust* is an introduced fungal disease that kills whitebark pine trees of all ages. Outbreaks of another problem species mountain pine beetle have become more frequent and severe due to warming temperatures. These two pests combined give little opportunity for old or young trees to survive.
 - *Climate change*: Warming temperatures will enable Subalpine fir and Engelmann spruce to grow at higher elevations, crowding out whitebark pine.
 - *Fire*: Climate change is expected to cause more frequent and extensive forest fires, leaving insufficient time for trees to reach reproductive age between fires.

Watch List

In addition to the above targets, we identified a number of species and habitats to keep an eye on as possible future targets. These include some vital players in the Jackson Hole area’s ecology, such as grizzly bears, wolves, aspen stands, and amphibians. These and others did not make our top-tier target list because we determined that (1) They were already receiving ongoing and sufficient attention, funding and expertise, often on a regional or national scale; (2) They did not currently meet our criteria; and/or (3) We did not have sufficient information about them. We applaud the work being accomplished on these species and habitats and recommend that we watch how they are doing over time to see if they merit target status in the future.

Cross-Cutting Threats

The threats summary table provides a quick, visual overview of the major threats to each target. A more detailed version of this table, with explanations of each threat, is included in the full report. From these tables, it is clear that there are many threats that are shared across targets. In fact, most of the

threats to wildlife in the Jackson Hole area are inter-related, synergistic, and cumulative. Some of the common threats shared by multiple targets are:

- Altered hydrologic dynamics of our rivers, streams, wetlands, and lakes
- Development of rural areas in the private lands of the JH area
- Roads and traffic
- Increases in the amount and number of types of recreation
- Invasive and problematic species and diseases, often exacerbated by climate change
- Expected changes in the frequency and severity of fires, primarily due to climate change
- Rising temperatures and changes in precipitation and hydrological processes due to climate change

Contributing Factors

A number of other factors contribute indirectly to the direct threats we have outlined for each target. It is important to recognize these indirect threats, because in many cases they are the ultimate drivers of direct threats. Key indirect threats include:

- *Climate change*: Climate change is itself a direct threat (e.g. warming temperatures physically stress many species) as well as an indirect threat that aggravates many other direct threats. It threatens to facilitate invasions of exotic species and pathogens, change fire regimes, and reduce species' abilities to cope with diseases or competitors. Conserving landscape connectivity and viable populations enable species to adapt to climate change. Continuing to understand the impacts of climate change as they unfold will also be vital in enabling managers to respond in a timely manner.
- *Human population growth*: The GYE lies within one of the fastest growing rural areas in the country. Currently there are 400,000 residents in the GYE region. Human population growth is the ultimate cause of expanding residential and commercial development, increased recreational activity, and increased number of vehicles on our roads.
- *Laws, policies, and funding*: Different agencies and elected officials — federal, state, and county — are responsible for determining the legal parameters, management plans, budgets, and day-to-day operations that affect both public and private lands and the wildlife that live on these lands. Policies and laws can shape the extent to which a direct threat manifests itself or not. For example, land-use regulations determine what forms of development can happen and where. Funding for cooperative efforts across agencies and jurisdictions is essential for controlling certain threats such as the spread of invasive species and enabling multi-partner strategies to conserve whitebark pine. Some current and upcoming plans and policies that could play a considerable role in contributing to or mitigating direct threats to our targets include: the Bridger-Teton National Forest management plan, Teton County natural resource land development regulations, and forest fuels reductions plans.

Additional Thoughts

As we have compiled this status and threats assessment and sifted through numerous reports, management plans, and research papers, several additional lessons have become apparent. These include:

1. Of all ecosystems in the lower 48 states, the GYE has the *greatest possibility of maintaining its essential functions and species diversity despite climate change*. The varied elevations, north-south trending mountains, large area, and intact landscape with viable populations of species are key to resilience to climate change.

2. A wide variety of biologists and managers have contributed significantly to our collective scientific understanding of the local region. Their research is thorough and often cutting-edge. It is also clear that *local study of species and habitats is essential* for future decision-making. Animals and habitats respond differently to the conditions found in northwest Wyoming compared to other regions. Especially as the climate changes, we need to continue improving our understanding of local wildlife ecology.
3. *The residents of Jackson Hole have a strategic role in assuring the future of the GYE.* The Jackson Hole area includes habitats, species, and connections that are vital to the GYE as a whole. Even though the Jackson Hole area is only a piece of the GYE, the central location and unique features of this area (for example, high altitude sagebrush valleys) make this area regionally important to conservation in the entire GYE.

We have written this report to be scientifically rigorous and thorough, yet accessible to the general public. Although we do not make management recommendations here, we wish to note that the keys to conservation of the targets we have identified are (1) cooperation across multiple management entities, from town and county government to the federal level, and (2) an engaged and concerned citizenship to support these efforts. There is a long legacy of conservation leadership in the GYE and in Jackson Hole; we hope that by focusing attention on a few, key conservation targets and their individual and cross-cutting threats, we can help rally the community as a whole to tackle the conservation challenges that lie ahead.

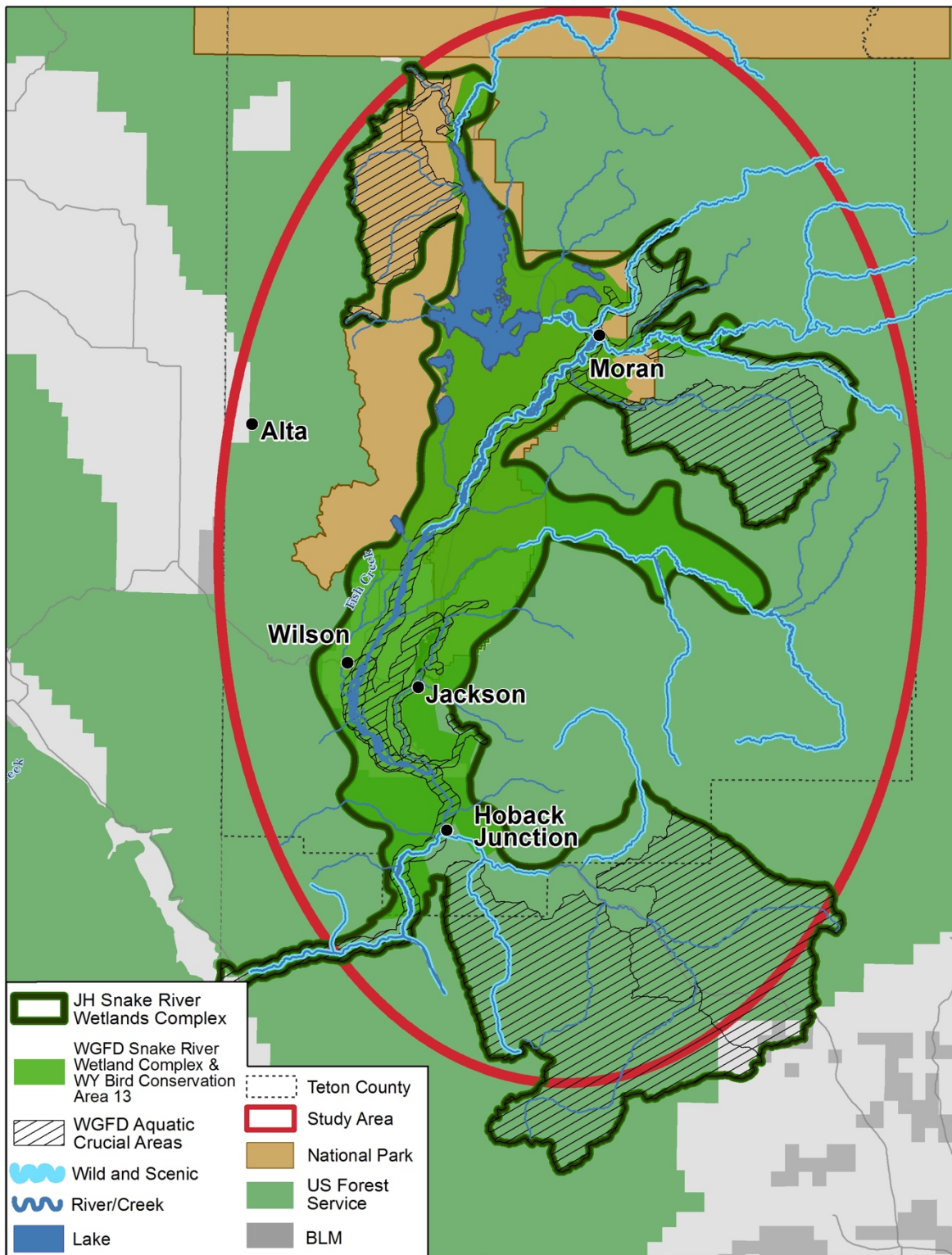
[Summary by Corinna Riginos and Frances H. Clark]

Threats and Threat Rating

This table provides a synthesis and brief explanation of the threats for each of our chosen targets. The threats are explained in greater detail in the separate chapters on each target. The purpose of this table is to provide an easy and centralized reference for each threat and its overall rating. We have followed the Conservation Measures Partnership's threats classification scheme [4] for grouping threats into overarching themes.

Category	Sub-Category	Hydrology	Beaver	Cottonwood Galleries	Cutthroat Trout	Sagebrush & Sage-grouse	Ungulate Migration	Moose	Goshawk & Mature Forest Mosaic	Whitebark Pine
Residential and Commercial Development	Residential Development	Moderate Threat	Minor Threat	Minor Threat		Moderate Threat	Major Threat	Moderate Threat	Minor Threat	
Residential and Commercial Development	Tourism and recreation areas	Minor Threat					Minor Threat	Minor Threat	Moderate Threat	
Agriculture	Livestock farming and ranching: grazing and haying	Minor Threat		Minor Threat	Moderate Threat		Major Threat			
Agriculture	Livestock farming and ranching: fences						Major Threat	Minor Threat		
Energy Production and Mining	Oil and gas drilling						Minor Threat			
Transportation and Service Corridors	Roads and paved pathways	Minor Threat			Minor Threat	Moderate Threat	Major Threat	Moderate Threat		
Transportation and Service Corridors	Flight paths and airports	Minor Threat				Moderate Threat				
Human Intrusions and Disturbance	Recreation: mountain biking							Minor Threat	Moderate Threat	
Human Intrusions and Disturbance	Recreation: hiking						Minor Threat	Minor Threat	Minor Threat	
Human Intrusions and Disturbance	Recreation: backcountry skiing						Moderate Threat			
Human Intrusions and Disturbance	Recreation: water craft			Minor Threat						
Natural Systems Modification	Dams, levees, and water management	Moderate Threat	Unknown	Major Threat	Moderate Threat		Moderate Threat			
Natural Systems Modification	Fire: increase in frequency, extent, severity					Major Threat		Moderate Threat	Moderate Threat	Moderate Threat
Natural Systems Modification	Fire: fuels management								Minor Threat	
Natural Systems Modification	Supplemental food for ungulates						Moderate Threat	Minor Threat	Minor Threat	
Invasive and Problematic Species and Pathogens	Invasive species: animals	Major Threat			Moderate Threat					
Invasive and Problematic Species and Pathogens	Invasive species: plants	Moderate Threat		Moderate Threat		Major Threat	Moderate Threat		Minor Threat	
Invasive and Problematic Species and Pathogens	Pathogens and microbes				Major Threat		Moderate Threat	Moderate Threat		Major Threat
Pollution	Household and commercial sewage and waste water	Major Threat								
Climate Change	Changes in temperature regimes				Major Threat		Minor Threat	Major Threat		Major Threat
Climate Change	Changes in precipitation and hydrological regimes		Unknown	Major Threat	Major Threat		Minor Threat	Minor Threat		

KEY Minor Threat Moderate Threat Major Threat Unknown



Snake River wetland complex area within the Jackson Hole area.

Snake River Wetlands Complex

Critical water for life in Jackson Hole

Overview

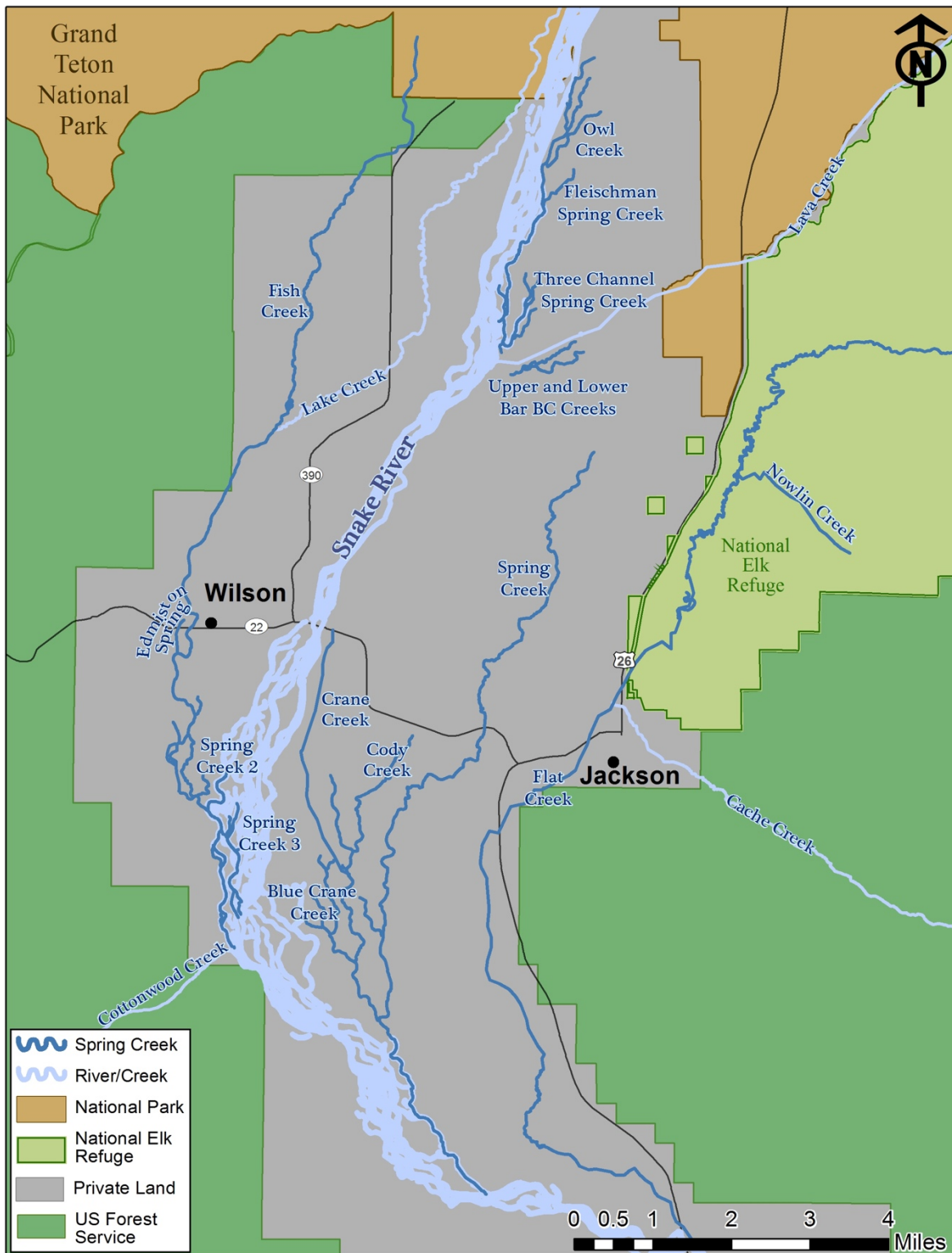
Below the towering Tetons, the signature landmark of Jackson Hole, lies an equally impressive and perhaps more significant scene: the Snake River. Spied from almost all points of the valley, the glistening river wends its way south through forested moraines, sage-clad river benches, and past dikes and housing developments, then spreads wide between ancient sedimentary hills before bending west and channeling through the Snake River Canyon. At the Idaho border, it pools behind the Palisades Dam. The beginnings of the Snake River and its many sources of water are central to the ecological and social well being of Jackson Hole. We chose it as a “conservation target” because of its ecological necessity and the many threats that require cooperative attention.

Description

Riverine habitats and associated wetlands form a life-sustaining mosaic throughout the Jackson Hole area (JH area). Creeks and streams arise in the mountains, flow down through the glacially sculpted valley to feed lakes, and foster willow-alder shrub-swamps, cattail marshes, and grassy wet meadows. These waters meet to form the main stem of the Snake River, which is joined by the Gros Ventre and Hoback Rivers. Augmented by snowmelt or heavy rains, these larger streams and rivers flood extensive lowlands, altering streambeds, braiding together channels, and supporting galleries of cottonwoods. Both streams and wetlands contribute to the vital aquifer that lies beneath the valley floor. Spring creeks, also fed by snowmelt and connected to channels above and the water table below, form their own wetland mosaics. Each of these types of water features and wetlands independently and collectively supports a unique array of plants and animals that interact in biological communities.

Ecological Importance

Wetlands are one of the most important ecosystems on Earth [5]. In Wyoming, wetlands and riparian areas combined support 18 species of greatest conservation need (SGCN) yet cover only 2% of the land, indicating the disproportionate importance of wetlands [6, 7]. Within Teton County, wetland and riparian areas provide crucial habitat for 80% of migratory birds, including 76 species in nesting season, with 23 species relatively abundant in the southern GYE [8]. The upper Snake River is said to serve as the ecological nexus for biodiversity at all levels from invertebrates to large mammals [9] and is ranked the largest, best preserved, least vulnerable wetland systems in the state, except for private lands within its center which are deemed at high risk [10]. This system's integrity, size, and location within the GYE signify that the upper Snake River is integral to the largest preserved ecosystem in the contiguous United States.



Spring creeks within the core private lands of the Jackson Hole area.

Target: Hydrological Processes

We have chosen the upper Snake River and associated wetlands as an overall conservation target for its high ecological value and significant threats, and also because there is strong potential for cooperation among many agencies and groups to address these threats. Within this target we also emphasize four associated targets: hydrological processes, cottonwood galleries, beaver, and Snake River Cutthroat Trout. WGFD calls this system the Upper Snake River Basin Wetland Complex and has developed an exemplary plan [11] along with an Aquatic Habitat Priority Areas Plan [12]. We merge much of these two areas, along with two state designated bird conservation areas, and call the target Snake River Wetlands Complex. By choosing this combination of habitats, our intention is to support and focus the work already in process.

Hydrological processes determine the formation and dynamic of riverine and wetland ecosystems. These processes include the amount and timing of precipitation; flow amount, velocity, and duration; water penetration below ground as well as flows above ground; evaporation and transpiration rates, and the like. These processes are fundamentally affected by climate, geology, topography, and soils. The upper Snake River is categorized in part as a gravel-bed river system, which is found in glacially sculpted valleys in the Rocky Mountains from the GYE to Yukon (C. Girard, personal communication, [9]). Surrounded by mountains and shaped by glaciers, these deep, broad valleys concentrate nutrients, flows, and wildlife, creating a unique opportunity for biodiversity.

In all watersheds, water drains downslope and through soils to collect in streams and wetlands. Abiotic forces of hydrology (amount, timing, quality of water), hydraulics (energetic movement and forces), and geomorphology (sorting and arrangement of various sediments) ultimately support and, in turn, are affected by the overlying biological network. Biological players include both small and large organisms, from algae and invertebrates to trees and ungulates. The integrated dynamic of abiotic and biological elements occurs both above and below ground. While these essential elements are similar across watersheds, each system is unique due to the variety and complexity of influences [13, 14].

The JH area lies within the wettest region of the state (range from 14-40 inches of precipitation) with the vast majority of precipitation falling as snow [6]. Moisture from the Pacific Ocean is carried inland across the western United States during the winter months by a variety of means, including storms that form in the Gulf of Alaska which are then directed towards western Wyoming by the jet stream. When that moisture is forced against the Teton Range, it is lifted upward, and that lifting over the mountains produces additional snowfall at the higher elevations. Approximately five times more snow falls annually at the upper elevations in the Tetons than at valley floor (J. Woodmency, personal communication). Consequently, a deep snowpack builds up in the mountains and a lesser amount in the valley below.

Come spring, the valley floor begins to thaw and the overlying snow melts. Melt water percolates through the deep gravel layers of glacial outwash and more recent alluvial deposits and seeps into stream and river channels. As temperatures increase in the mountain summits, melting snow begins to rush downslope, feeding rising creeks. Pacific, Buffalo Fork, Spread, and Fish Creeks and Gros Ventre and Hoback Rivers swell the Snake River. Peak flood season typically starts in May and runs into June [15].

Melt waters flow underground as well as through established stream and river channels. The water table is the area below the soil surface that is fully saturated with water. The amount and depth of water stored and the flow rate within this underground reservoir depends in large part on the type and distribution of deposits, as well as the tilt of the land. Combined valley and mountain runoff can raise water tables 8-15 feet (2.4-4.5 m) in Jackson Hole during flood months [16]. Hydraulic pressure can push cool water (as well as micro-organisms) underground through the “hyporheic” zones into adjoining streams, such as between Fish Creek and the Snake River. These buried, moving waters can give rise to spring creeks that form at the base of the mountains or along former river channels (C. Girard, personal communication). As they are fed by underground water, spring creeks feature cool temperatures, consistent flow, and hyporheic nutrient regimes and create their own wetland mosaics important to

wildlife, including vital fish spawning areas. Examples of spring creeks include Flat, Fish, and Bar BC Creeks, as well as the aptly named Spring Creek. In sum, in this glacial-valley ecosystem, streams are fed by ongoing snowmelt and water table reserves.

Spring floods are essential to the dynamic of the riverine and wetland systems. Snow melt provides the energy and substance to carry sediments — from clays and sands to gravels and cobbles — downstream, scouring islands, accreting sand bars, undercutting banks, and realigning channels in the valley floor. This dynamic is easily seen in Ditch, Spread, and Pacific Creeks as well as the Gros Ventre and Snake Rivers.



Floods also determine the primary vegetative structure along floodplains. Windblown seeds of willows and cottonwoods, along with other pioneer plants, take root in the moist, exposed soils after floods. Depending on the amount of disturbance and available seed sources, over time herbs, shrubs, and trees provide both vertical and horizontal vegetative complexity. Roots draw up nutrients, and leaves convert these elements into new compounds, which ultimately change the chemistry of soil and water. Plant debris — fallen trees, clumps of branches and leaves — also alter channel flows and nutrient regimes. Boatmen and fishermen are tuned to these changes. Severe floods restart the successional process all over again. Flooding is the primary natural disturbance event in these systems.

Even minor changes in topography, soils, and the depth and duration of water can alter plant growth, causing the difference between wet meadows, shrub-swamps, and marshes. Temporary flooding in spring that dries up by mid summer supports sedges and specially adapted grasses. Areas with water at or just below the surface much of the spring and summer may be dominated by willows, while marshes have 1-2 feet (0.3-0.6 m) of water flowing throughout the growing season and are filled with emergent cattails, sedges and rushes as well as floating pondweeds.

The complex interactions among many species, nutrient cycles, and physical structures within floodplains and wetland communities provides for a disproportionate amount of diversity for the area covered.

Wildlife: Fish, Birds, Mammals, Amphibians and Reptiles, Invertebrates

An exceptional variety of species depend on this wetland complex, including state species of greatest conservation need (SGCN) and species that the Teton County Natural Resources Technical Advisory Board (NRTAB) has chosen as “focal” species. The summary below is elaborated upon later in this section.

At the smallest scale, tiny organisms may be flushed by water through different layers of deposits (hyporheic zones) to where springs upwell into spring creeks. These microorganisms, such as bacteria, fungi, and protozoa feed macroinvertebrates, such as insects, segmented worms, and nematodes, that in turn feed fish [17]. Many bird, amphibian, and reptile species rely on a combination of wetland types as well as adjacent uplands to complete their breeding cycles. Beaver enhance this diversity by building dams that expand ponded areas, support willow groves, and maintain stream flows. Several large mammals use the network of riparian corridors for key transportation routes seasonally or daily, including elk, deer, moose, bison, black and grizzly bears, and mountain lions. Bats roost, travel, and feed disproportionately in or near rivers, lakes, and wetlands. Fish move extensively to different parts of the stream system, including the Bluehead Sucker and Snake River Cutthroat Trout. River otters, which are very rare in Wyoming, need extensive territories of riparian habitat with fish and invertebrates. Streams and rivers together with the mosaic of wetlands accommodate a network of seasonal and daily movements throughout the region.

Status and Trends of Snake River Wetlands Complex

Both dams and levees have altered the geomorphological dynamic of the Snake River as well as the biological dynamic of the river systems. Formerly, the river was a complex of braided channels and wooded islands that provided a highly diverse and productive habitat of both aquatic and terrestrial species. Floods typically occurred every few years [18] and floodwaters reached well over and beyond the first banks, adding or depleting sediments and nutrients. Elevated water tables helped to nourish and flush spring creeks. In extreme flood years, roiling waters swept away towering cottonwoods and encroaching spruce trees, preparing the ground for a new generation of seeds.

Since the construction of the Jackson Lake Dam in 1906, natural hydrological cycles have been changed. Peak flows of the Snake River have been reduced in both frequency and magnitude and naturally very low flows are artificially augmented. One researcher determined that between 1945 and 1989, on the river stretch from the Jackson Lake Dam to Moose, 30% of cottonwood communities had changed to a mixed forest of cottonwood and blue spruce, with an increased dominance of blue spruce over time [18]. Willow and alder shrub-swamp, which contains more biodiversity than the evergreen spruce forest, declined significantly (27%).

The Jackson Lake Dam will remain and the hydrological processes will continue to be manipulated. By law, the Jackson Lake Dam will continue to store water belonging to the state of Idaho. Over the years, flows have been adjusted to accommodate recreational activities such as rafting to fishing by moderating the low and peak flows throughout the tourist season. Dam outflows are also carefully managed to prevent flooding downstream in high snow melt years, as occurred in 2017.

An even greater alteration to the river dynamic began with the construction of levees for 22 miles (35 km) from below Moose to Hog Island. The levee system was constructed in the 1950s to provide flood protection for ranch lands in the floodplain, and it continues to be maintained to protect new homes. The increased water velocity, instability of river islands and banks, and loss of overland flooding and channel

meanders have reduced natural habitat by an estimated 80-90% since 1956 or from 25,000 acres to just 2,500 acres beyond the reach of the dikes [19].

The levees have profoundly impacted fish and wildlife habitats along the river. Adult Bluehead Suckers are significantly fewer in this constrained stretch of river. [20]. The cottonwood forest no longer receives regular peak floods or even normal spring waters, reducing opportunities for seedlings to establish and threatening older tree survival. Where intensive grazing exists in the cottonwood riparian zone, both elk and cattle reduce vegetative structure and diversity. Furthermore, houses and other forms of development in the floodplain eliminate, degrade, and alter the more extensive wetland mosaic beyond. Maintenance of the dikes — including elimination of woody vegetation — disrupts nesting birds in summer (F. Clark, personal observation). In some areas, spring creeks are responsible for 40% of spawning Snake River Cutthroat Trout [21], and yet many spring creeks are no longer receiving regular flushing (A. Senecal, personal communication).

It is hard to imagine that these levees will ever be removed as they are essential to protecting private homes and ranch lands. However, opportunities exist for improvements [10]. The Teton Conservation District along with the Army Corps of Engineers (ACOE) are investigating mitigation opportunities. Overall, human alteration of the flooding dynamic by the dam and levees has significant, often permanent, impacts on the natural river system. Remarkably, despite the dam and levees, the upper Snake River remains a very rich and relatively undisturbed natural resource.

Threats to Snake River Wetlands Complex

The ongoing and future threats to the Snake River Wetlands Complex, including the hydrological processes, are several, inter-related, and synergistic. Pressures include increased development of private lands and increased recreation on lakes, ponds, streams, and rivers on public lands. The dam and levees continue to compromise natural river flows. Climate change adds a wildcard into the type, amount, and timing of precipitation and, therefore, the natural hydrological dynamics of even unaltered riverine and wetland systems. Combined, these threats pervade the Snake River Wetlands Complex.

Development — Moderate to high, locally

- **Dam and levees — Moderate** — These structural constraints and flow manipulations will continue to affect spring creek flows, river morphology, and vegetation, particularly cottonwood galleries. Lower peak flows and lack of flooding reduce the water table throughout the valley and affect water flows throughout the season, including spring creeks that spawn fish and nurture amphibians. Furthermore, these property protections continue to encourage development within the floodplain, including cottonwood galleries — adding to reduction and fragmentation of key wildlife corridors and habitat.
- **Development within the core of the JH area on private lands — High, local** — Several state plans target private lands in the core of the valley as the most vulnerable area in the region [10, 22]. Outright loss and degradation of habitat along with fragmentation and human disturbance irreplaceably alters plant communities and the wildlife that depend on them. Creation of pastures and hay fields with their associated grazing, irrigation ditches, and diversions have all degraded natural wetlands, but not irreparably. However, many of these properties are now being sold and developed for new homes, which will cause irreplaceable wetland loss and leave fewer options for mitigating the effects of the levees.
- **Water use, diversion, obstruction — Unknown, local** — Public water demand will grow with increased development within the JH area. Already, diversions for new development including golf courses and lawns, as well as traditional agriculture, have caused stretches of the Gros

Ventre to dry up in late summer. Interruption of water flows fragments the river with implications both down and up stream, particularly for fish.

- **Nutrient additions (from lawn fertilizers, livestock waste, and septic systems) — High, local** — Natural systems utilize certain levels of nitrogen and phosphorus to function; however, when human inputs become excessive, they can cause an increase in algae blooms and aquatic plants, which in turn reduce oxygen in the water and clog the natural flushing of channels. Many of these inputs filter through soils or are injected below ground into the groundwater. Spring creeks are particularly affected. Fish Creek is experiencing these phenomena [23]. Water quality in Flat Creek has also been compromised. And as new areas south of Jackson are developed, a further network of spring creeks and tributaries could be compromised.
- **Transportation routes — Low, local** — Widening of Rt. 22 and other highways has the potential to reduce wetlands and obstruct both overland and groundwater flows. If not designed adequately, road construction and drainage systems can impede wildlife movements and aquatic species passage along wetland corridors. Runoff from winter road treatments can affect water quality. Finally, the Jackson Hole Airport lies over the Jackson Hole aquifer that supplies 95% of the water for Jackson Hole residents. Chemical contaminants are being closely monitored [16].

Invasive and Problematic Species — Moderate, potentially extensive

Non-native species are degrading aquatic ecosystems, plant communities, and wildlife populations, with new intruders likely to come. Each species can have different impacts depending on its reproductive cycle and response to its novel environment. It is hard to predict how an alien will respond to the specific conditions of the JH area; however, those listed below are of most concern to wildlife managers of aquatic, riparian, and wetland environments.

Fish: Introduced fish species are affecting the genetic strains and viability of native populations.

- Fall spawning trout and char species, such as Brown, Brook and Lake Trout, reach maturation earlier in the season as compared to cutthroat trout, which spawn in the spring. Superior body size and weight give these introduced species an advantage when competing for limited resources and also make cutthroat trout vulnerable to piscivory. When large, the main food of these introduced trout is small fish, including native cutthroat trout (Anna Senecal, personal communication).
- The prospect of invasion by Silver Carp (*Hypophthalmichthys molitrix*), which is currently found in the Mississippi watershed but not yet in our region, is a concern among fisheries managers. Originally from Asia, this exotic was introduced into the U.S. for plankton control and as fish food. It can grow to 3 feet (1 m) and weigh 60 pounds (27 kg). While they mature between 4 and 8 years old in their native waters, in North America they can mature in as few as 2 years [24]. If present in large numbers, Silver Carp has the potential to cause enormous damage to native species because it feeds on plankton required by native mussels and larval native fish.

Invertebrates:

- New Zealand mudsnails (*Potamopyrgus antipodarum*) were discovered in the Snake River in Idaho in 1987 and are now present above Jackson Lake Dam in Polecat Creek and the Snake River at the Flagg Ranch boat ramp [25]. In Yellowstone National Park, researchers have counted over 750,000 mudsnails per square meter. Originally from New Zealand, this one-eighth inch (3 cm) snail can adapt to a wide variety of temperatures, turbidity, velocity, stream productivity, substrates, and other variations of aquatic habitats. A single female mudsnail can result in a colony of 40 million snails in one year. Grazing at night, the snails consume plant and animal detritus, algae, sediments and diatoms. In some areas they outcompete other

macroinvertebrates and can outcompete or displace native snails, mussels, and aquatic insects that native fish species and other animals depend on for food. Although abundant, New Zealand mudsnails do not provide any food value for fish, ducks, or other waterfowl. They can also alter nutrient (nitrogen and carbon) cycles.

These snails are easily and invisibly introduced to new waters. Snails are transported on boats, fishing gear, and other equipment as well as muddy bodies of birds and mammals, and even travel through the guts of fish. They can seal themselves into their shells, enabling them to withstand several weeks in cool, damp conditions. It is easy to see how they have spread so readily from the Great Lakes into the watersheds of the West and Pacific Coast. [26–28].

- Quagga and zebra mussels (*Dreissena polymorpha*, *D. bugensis*) are closely related to each other, are both about a half inch (4 cm) long, and may even hybridize. They filter prodigious amounts of water, clearing the water column of phytoplankton, which includes single-celled algae, diatoms, and cyanobacteria that zooplankton depend upon. These microscopic organisms are the first links in the food chain that nourishes fish and waterfowl. Also, as the mussels remove phytoplankton, the water becomes more clear and light penetrates more deeply; this stimulates aquatic plant growth, altering the dominance and mix of species. The mussels' pseudofeces, or by-products of phytoplankton consumption, can reduce oxygen, increase acidity, and concentrate pollutants in the water. The pathways of change are still being researched, but it is apparent that these non-native mussels alter the natural ecology of aquatic systems.

The highly adaptable mussels have spread by bilge water and fishing and boating equipment, leapfrogging across the country over the last couple of decades. While not in the GYE at this time, their spread is mostly invisible and unpredictable, and managers predict that they will eventually arrive in this area [22, 29, 30]. Once detected, they would be very difficult to remove. Infestation sites would be most likely Jackson Lake and Palisades Reservoir. Not only would they alter water quality, they could have significant impacts by encrusting pipes and other apparatus of the dams (M. Daluge, personal communication).

Plants: Invasive plant species typically produce an abundance of seeds that germinate readily on a variety of soils and light conditions. Seedlings grow and flower quickly and/or plants spread vegetatively by stem or root. Few indigenous insects or diseases are able to deter their spread. Consequently, these invasive exotics crowd out native plants, altering food and cover characteristics valuable to wildlife of all sizes and kinds. They can also infest nearby agricultural and other disturbed sites. In the JH area, weed control experts are concerned about spotted knapweed (*Centaurea maculosa*) and perennial pepperweed (*Lepidium latifolium*) which are already invading shores and islands of our rivers, along with tamarisk trees (*Tamarix* sp.) which are just beginning to show up from the south (M. Daluge, personal communication).

- Spotted knapweed (*Centaurea maculata*) is found throughout the region, primarily on upper terraces of major river courses, gravel bars, and relatively dry, disturbed sites. Early and deep root development, as well as colonization of roots by arbuscular mycorrhizal fungi, may contribute to its invasiveness by facilitating greater acquisition of nitrogen and phosphorus. Chemicals released from decaying plant leaves, stems, and roots may chemically interfere with the growth of other herbaceous species (allelopathy). The physical dominance of this exotic species can reduce the number and diversity of native plants that animal species depend upon. The county is also on the alert for other species of knapweed (*C. diffusa*, *C. repens*). [31–33].
- Perennial pepperweed (*Lepidium latifolium*), a “Priority 1” noxious weed of Teton County — meaning it is highly invasive, poses the highest threat to native plant communities, and is known

to render land unfit for wildlife — is also colonizing the Snake River watershed. This Eurasian species belonging to the mustard family (Brassicaceae) can produce hundreds of small white flowers which together produce thousands of tiny seeds per plant. In sunny, moist sites in the JH area, plants can grow to 4-5 feet tall (1.2-1.5 m) and the roots from a single plant can extend 10 feet (3 m) in a year from which new plants can sprout. Pieces of roots spread by scouring waters also enable colonization. The density of plants degrades wildlife habitat as well as agricultural lands and lowers diversity of native flora and fauna. The weed can act as a salt pump, i.e. it draws salt ions from deep within the soil profile and increases salinity near the surface, which can be disadvantageous for plants intolerant to salt. It is known to interfere with colonization by cottonwoods. [34, 35]

- Several different species of tamarisk or saltcedar trees and shrubs have spread throughout the U.S. Tamarisk (*Tamarix* spp.), with its colorful pink flowers and semi-evergreen foliage, was planted as an ornamental and to prevent soil erosion. However, it escapes cultivation and has spread throughout much of the U.S. It can form monocultures that severely reduce biodiversity; its tiny seeds and foliage are not eaten by native animals, the leaves leave a salt residue on the top of soil, and it reduces nesting habitat for birds. Furthermore, it can change the moisture and chemistry of riparian soils; plants have the ability to transpire up to 200 gallons of water each day and negatively modify soil alkalinity by releasing salt. Thus, tamarisk is another invasive plant species that land managers are concerned about in wetland and riparian habitats. [33, 36]

Pathogens — Moderate

Introduced pathogens such as chytrid fungus and ranavirus, transferred by fishermen's and researchers' boots and gear, as well as waterfowl feet, can infect amphibian populations (see Amphibians section, below). Whirling disease can kill sensitive populations of cutthroat trout, especially as waters warm and drought occurs more frequently due to climate change (see Cutthroat Trout section, below).

Recreation — Moderate, potentially extensive

While we often consider wildlife safe in our national parks and forests and wild and scenic rivers, increasing numbers of people recreating in the front country and now backcountry has an impact on wildlife. While individual actions may seem to have little consequence, each adds up. Increasingly popular travel routes up canyons and to lakes affect habitats that many birds, mammals, and amphibians depend on absolutely, with no other alternatives. People and their dogs make noise and movement, pushing wildlife away, often without people ever seeing them. This occurs in places such as the dikes in Wilson and trails up Cache and Game Creeks. Boating along the mainstem of the river has intensified, particularly below the Wilson Bridge where a permit system was incorporated in May 2015. Expanded boat launches and parking areas intrude into cottonwood galleries and wildlife corridors. Proposed in-river structures to enhance whitewater experiences could reduce fisheries and impede fish passage especially for the Snake River's migratory fish populations, such as Snake River Cutthroat Trout and Bluehead Suckers (C. Girard, personal communication). Increased activity on the Snake River, particularly at dusk, dawn, and night could add a major source of interruption to mammals (S. Cain, personal communication).

Climate Change — Unknown, likely high and extensive

Changes in precipitation patterns, snowpack, runoff amount and timing, warming and drying up of streams and ponds, and flooding regimes all affect essential hydrological processes, invasive species success, and, therefore, habitat and species. For instance, across its range, Yellowstone Cutthroat Trout populations are projected to decline by 28% by the 2040s and 58% by the 2080s under high emissions

scenarios [37]. This is due in part to the direct negative effects of warming stream temperatures, but also because of competitive interactions with non-native Brook and Rainbow Trout, which are predicted to fare relatively better under warming conditions [37–39]. These same influences are also noted for the Snake River Cutthroat Trout [22]. Warming waters and eutrophication can encourage proliferation of zebra mussels and mudsnails. The greater the resilience — size, health, and connectivity of populations of both plants and animals — the greater the opportunity for survival in the years to come.

Also, catch and release fly-fishing is a very large recreational industry in the Snake River that is expected to have an increasingly negative effect on fish with rising water temperatures. Trout have been shown to have increased mortality following catch and release as water temperatures rise (C. Girard, personal communication).

Indirect Threats or Contributing Factors

- **Land-use regulations** — Teton County land-use regulations are currently being revised. These will have significant impact on the future of private properties in the core of the JH area as regulations determine the location, type, and density of development and, consequently, the proximity to and connectivity of sensitive habitat. Regulations affect the amount of water withdrawn and number of roads built. Each allowed use has cumulative impacts on the whole area.
- **Unintended introductions** — Boating and fishing activities accidentally transport invertebrates such as New Zealand mudsnails and Zebra mussels into new waterways, lakes, and wetlands. Education programs and inspections reduce the chance of introductions.
- **Reduction in funds and personnel** — Local, county, state, and federal funds and personnel affect monitoring of water quantity and quality, management of levees and dams, control of invasive exotics, and restoration of stream channels for fish. Reduction of funds and cooperative programs can have significant negative effects on these projects.
- **Permits** — Trapping permits determine how many beaver are trapped out of an area which can affect the presence and density of beaver.

Opportunities and Collaboration

In the JH area, federal, state, and county agencies have jurisdiction over the different types of critical wetlands, both public and private. Independently, these public servants have acknowledged the critical nature of the Snake River wetlands complex and developed plans, policies, and regulations to conserve and restore plentiful clean water, flood control, and wildlife diversity. They cite ongoing threats of water withdrawals, diversions, and obstructions on private lands — within the core of the JH area — which alter the essential hydrological processes of the region. Parties are concerned also with pollutants and invasive non-native species of fish, diseases, and plants. With coordination and prioritization, as well as delegation of tasks and allocation of funding, over the long term there is ample opportunity to maintain the resiliency of the habitat for wildlife. (See list at the end of this chapter for agency jurisdictions and priorities).

Information Gaps

- Ongoing effect of levees and dam on plant communities — The last comparison was done in 2005. What are the trends on type of and extent of wetland habitat?

- Impacts of levee construction on hydrological dynamics — How does the aggrading (building up) and degrading (downcutting) of the Snake River bed affect the valley's water table, flood risk areas, and management of industries like gravel mining?
- What are the cumulative losses due to development?
- Future Land Development Regulations (LDRs) — How will the regulations affect the development of private lands and, therefore, the hydrological dynamics and habitats within and around them?
- Cumulative impacts of small diversions — What is the amount of water being withdrawn and diverted from natural channels by the many small irrigation ditches and other diversions, and what is the quality and quantity of the water being returned? The 12 USGS water gauges in the JH area monitor only the large-scale impacts.
- What is the specific extent and impact of recreation on wetland species? This subject is understudied.
- What will be the impacts of climate change on hydrological processes, invasive species, and wildlife populations in the future?

Highlighted Habitats and Associated Species

Below, we detail the variety of habitats and species found in the Snake River Wetlands Complex, their associated Trends/Status, and Threats specific to each. We emphasize the notable and interesting characteristics of each habitat or species to accentuate its importance and fascination. These descriptions are not intended to be comprehensive — we list sources for additional information on each.

We have chosen **cottonwood galleries**, **beaver**, and **Snake River Cutthroat Trout** as associated targets to help focus attention on a few ecological elements that, if conserved, will benefit the biodiversity overall. We also provide additional information on several “watch list” species: edge-of-range populations of Harlequin Ducks, Common Loons, and Trumpeter Swans and amphibians as a group. Of key importance is sustaining the underlying hydrological dynamics with broad floodplains.

The following watershed components are organized more or less as the water flows:

- headwater streams, ponds, and lakes
- willow shrub-swamps
- marshes
- large streams and mainstem rivers

Habitat: Mountain streams, ponds, and lakes

The upper reaches of the Snake River watershed features federally designated Wild and Scenic Rivers and other high quality waters. Many of these streams are protected within designated Wilderness Areas under U.S. Forest Service management. Some flow into several large glacial lakes, such as Jackson, Emma Matilda, Two Ocean, String, Leigh, Jenny, and Phelps.

Isolated or small populations of three SGCN birds — Harlequin Duck, Common Loon, and Trumpeter Swan — utilize these streams, lakes, and wetlands and illustrate the precarious nature of edge-of-range populations. Edge-of-range populations are notable because they offer opportunity for genetic adaptations, range expansions, and safety from stochastic (chance) events over the long term. We highlight them here because the JH area protects a significant portion of these populations and, therefore, has a heightened responsibility for preserving them to benefit the species overall and to retain the species in Wyoming and on our national public lands. We designate them as watch-list species: if the current inventories and management actions continue, the populations will likely remain relatively stable.

Edge-of-range bird populations — Watch List

Harlequin Ducks

The Wyoming Harlequin Duck population is found only in northwest Wyoming and is currently considered stable; however, recently pairs have not been documented on some historic nesting streams in the Teton Range [22]. The population is the southeastern-most breeding population in western North America with an estimated 70 pairs in Wyoming [40].

A small group of colorful, even clownish looking, ducks migrate to northwest Wyoming to breed, and then leave again to spend the rest of the year along the Pacific coast. Harlequins are found breeding only in Grand Teton and Yellowstone National Parks and in the Bridger-Teton and Shoshone National Forests. Pairs bond in the late fall on the coast and arrive in mountain streams by mid-May. Typically the species nests on islands or in dense shrubs adjacent to low-gradient, clear-water creeks in subalpine habitats. Pairs return to the same location over the years. Males depart in June to July, a strategy to prevent competition with their growing family for sparse resources. Females remain with the chicks until they fledge (are able to fly). Females and surviving juveniles migrate to the west coast in late fall. Females do not fully mature until 5 years old and their broods often do not survive, so long-term productivity in harlequins is relatively low [22].

Fitted with remote sensing tags, two male harlequins were tracked in 2016 flying 930 miles (1500 km) from GTNP to Vancouver Island within 12 and 20 days respectively. So far, Wyoming's Harlequin Ducks appear to concentrate in the Strait of Juan de Fuca (Puget Sound) in Washington state and British Columbia [41].

Trends/Status: WGFD conducts helicopter surveys every five years and additional surveys by air or land as funding is available. Based on results over the last 30 years — most recently in 2007, 2008, and 2012 — WGFD estimates a minimum of 70 breeding pairs and a stable population. A mid-May 2017 aerial survey spotted 53 harlequins, similar to the number counted in 2012 [42]. Biodiversity Research Institute is working with WGFD to improve survey techniques to find, track, and understand our local birds [40].

Threats: Breeding habitat along isolated, clear water streams is very limited. The main threat in our area is expanded recreational use by pack rafters, fishermen, and other recreationists in these vital and sensitive areas. Birds can easily be disturbed to abandon their nests or young. Forest fires or recreational use can cause erosion and siltation of streams. As harlequins exhibit strong site fidelity, if they are pushed off breeding streams, it is unknown whether they would continue to return to the Snake River drainage to attempt breeding. They are unlikely to try again or even return the following year. Too much disturbance along these critical streams could extirpate the population in Wyoming, following Colorado and California with the loss of these remarkable birds [22].

Common Loons

Common Loons (*Gavia immer*) are known for their haunting calls echoing across tranquil lakes on summer nights and fluffy chicks straddling glistening black-and-white backs of statuesque adults. While widespread across Canada and northern New England, only a few nesting loons are seen or heard in Wyoming. This isolated population of 40-60 birds resides 200 miles (322 km) south of the next nearest population in Montana and is distinctive in appearance and behavior. The JH area supports the most southern population of Common Loons in North America.

Loons are intriguing birds. With legs near the back of their streamlined bodies, they can dive up to 250 feet (76 m) for over 5 minutes in pursuit of their primary prey: fish. In addition to being extremely agile and quick under water, they can fly up to 60-70 mph (96-112 kph), making them a challenging sport bird. Yet, they are very awkward walking on land. As top predators, these piscivores are subject to

bioaccumulation of toxins including lead fishing tackle (V. Spagnuolo, personal communication 2017). Due to their longevity, food source, and site fidelity, they are well known to represent the integrity of aquatic habitats.

Loons live for up to 30 years, yet the likelihood of replacing themselves in their lifetime can be low. Undisturbed loon nesting habitat is becoming more limited. Common Loons breed on lakes usually greater than 25 acres (10 ha) with clear waters to 10-15 feet (3-4 m) to facilitate catching small-to mid-sized fish, their primary food. Fish need lakes greater than 6 feet (2 m) deep to overwinter under the ice. Other habitat parameters include particular structure and vegetation for nesting sites and four months of ice-free surface to provide chicks time to fledge. As their shallow nests are built within 4 feet of shoreline, changes in water levels of 6-12 inches (15-30 cm) are destructive. Also, adults return to a given territory year after year, dispersing at best only 8 miles (13 km). If their vital habitats are disturbed or are destroyed, they may not venture far enough to find a new location. Loss of habitat is one reason for the retraction of their range throughout North America. [43, 44]

Even provided habitat, loons do not breed until they are 4-6 years old and with limited success. A pair incubates only two eggs and typically only one chick survives to fledge after 12-13 weeks. This lone juvenile must migrate to and mature at sea for 2-3 years on its own before it returns to its natal area. One bird from a lake in Yellowstone migrated over 1500 miles (2415 km) to Baja California for the winter, indicating the perilous nature of their life cycle. [43, 44]

Researchers are discovering differences in the Wyoming population compared to others. The birds are smaller in size and utilize smaller and often fishless lakes. Atypical for the species, the two most productive pairs in the GYE have been on fishless lakes with a covering of lily pads. Perhaps these ponds without fish but with added plants contain more invertebrates that are the perfect size for chick food [44].

The Wyoming population of Common Loons is barely stable [6, 45]. Survey counts since the 1980s show a population decline starting in 2007 to only 17 territorial pairs and 15 nesting pairs of loons in 2015, with a recent rebound to 21 territorial pairs in 2016. Most nesting pairs are within YNP (13) with a few scattered elsewhere on U.S. Forest Service lands (5), and in Grand Teton National Park (1). There is potential for additional territorial pairs in historical and potential sites throughout the GYE including the Wind River Mountains. Currently, nesting productivity is 0.53 chicks per territorial pair per year just over the 0.48 threshold needed for population stability, that is they must produce one successful chick every two years. [44, 45]

One of the key threats to nesting loons in the JH area is human disturbance by adventurous boaters, paddle boarders, and hikers, as well as fishermen. Recreationists can cause adults to abandon nests and chicks. With so few isolated nesting habitats for these birds, Common Loons have a risky existence even within our national parks and wilderness areas. They are cited as Extremely Vulnerable by WGFD [22]. As many of their current and potential sites are within our JH area, we place them on our watch list.

Trumpeter Swans

With a wingspan of 7-8 feet (2.1-2.4 m) and a body that extends up to 6 feet (2 m) from beak to tail in flight, Trumpeter Swans are the largest water birds in North America. Pure white all over except for their sloping black beaks and wide webbed feet, these graceful birds are a popular subject of wildlife paintings and photographs. They excite visitors and residents alike who see these glistening birds gliding on lakes or flying overhead, making a racket like an orchestra of out-of-tune trumpets.

Trumpeter Swans seen in the upper Snake River basin are direct descendants of the remnant U.S. population that survived through the species' population collapse of the early 1900s. After an era of extensive exploitation, particularly for powder puffs and fashionable women's hats, only a tiny population of 60-70 resident adult birds and an additional number of Canadian migrants that wintered in the Greater

Yellowstone was thought to remain in the world, safely isolated in the remote areas of the Greater Yellowstone area. Red Rocks Lake National Wildlife Refuge was created in 1932 for its protection, and these few birds increased to over 500 swans by the 1950s, protected from hunting and provided with supplemental food in the winter. Many offspring were the source for attempting to re-establish nesting Trumpeter Swans to Oregon, Nevada, and Wyoming. Several thousand swans were “discovered” in Alaska which winter along the west coast and are considered a separate breeding population. Thanks to conservation efforts, over 63,000 Trumpeter Swans now reside in North America. (S. Patla, personal communication). [46–48]



Ironically, the successful re-establishment of Trumpeter Swans throughout the U.S. and Canada may be imperiling our local population. In winter, Jackson Hole residents see hundreds of swans feeding in open waters of Flat and Fish Creeks and flying overhead between Jackson and the Snake River, and consequently think swans are common and secure. However, most of these birds are winter migrants from Canada. In 2015, the WGFD winter survey recorded 568 swans. The summer count of resident Teton County swans that year was 68. Winter migrants compete for scarce resources — ice-free waters and food sources—with our relatively few resident birds here in JH area. Indeed, overall, the JH area core population, which averaged 62 birds between 1999 and 2016 [49], is losing nesting sites and is of low productivity. Ongoing conservation efforts are essential to maintaining this isolated, historic flock [47].

As with Common Loons, Trumpeter Swans have specific behaviors and habitats that limit nesting success in the GYE. Typically, swans do not reproduce until 6-7 years old and pairs prefer to return to traditional sites. Their offspring also return to the same vicinity. Swans need both security and forage for nesting and survival [49]. For breeding, swans prefer stable, quiet, and shallow waters greater than 8-15 acres (3.2-6 ha) in size with at least 5 acres (2 ha) of shallow areas less than 4 feet (1.2 m) deep with

supporting vegetation. Fluctuating water levels can flood nests. These large birds also need nutrient-rich waters that provide aquatic vegetation and invertebrates to nurture their young, such as can be seen along Flat Creek. Nesting pairs will stay on territory to raise their chicks for 5-6 months. In winter, swans require 45 foot-wide (13 m) unfrozen stretches of river or lakes to feed and rest. Also, swans require long take-off and landing zones 300 feet (91 m) long that are not obstructed by fences or powerlines, a particular hazard in developed areas. [6, 22, 49]

Status/Trends: The JH area protects one of a very few breeding concentrations of Trumpeter Swans outside of Alaska, and these often isolated groups are small and vulnerable [50]. Numbers in the JH area have fluctuated over the last 30 years and continue to do so. Although the number of nesting pairs has increased since 2004 in the Green River basin, challenges remain for swans nesting in the GYE as a whole [22, 47]. WGFD has worked over the years with ranchers and other private property owners to increase nesting habitat with some success and continues to monitor birds annually. To maintain this population, continued conservation management is necessary.

Threats to Swans: Trumpeter Swans are easily disturbed off their nests by human activity from developments, tourism, and recreation. Isolated breeding territories are becoming more scarce as increasing number of recreationists and visitors access more remote sites. Other hazards include electrical wires, unmarked wire fences, mistaken identity by hunters, and Bald Eagles preying on their young. Larger numbers provide for greater resilience. [22]

Habitat: Willow shrub-swamps

A mass of billowing green, willow shrub-swamps appear monotonous. Indeed, different willow species with their simple oblong leaves are hard even for botanists to distinguish. Yet within these dense thickets, bugs buzz, birds chirp, and large beasts munch away. There is much more diversity than first meets the eye.

Hydrological processes and soil types drive the establishment of shrub-swamps. Typically shrub-swamp habitats flood in spring, and as summer arrives, the water table drops below the surface. Unlike upland plants, wetland plant species can survive anaerobic, saturated soils for a few weeks during the growing season and, therefore, can dominate. Each of the nine different willow (*Salix* spp.) species in the JH area is specialized to slightly different conditions. Mountain alder (*Alnus incana* var. *tenuifolia*) is also able to live in nutrient poor soils and in anaerobic conditions and is frequently found with willows. Bacteria (actinomycetes) growing within root nodules of alder fix nitrogen and thereby enrich soils and affect successional processes [51]. Willow-alder shrub-swamps can intersperse with cottonwood riparian habitats or dominate on their own.

This shrub community provides various functions. Willows and alders help to stabilize flooded areas with their extensive root systems. Their multiple stems slow flows and cause fine sediments to settle out, building and enriching soils. Willows provide important browse for moose and elk, especially in winter. Richer soils and varied structure provide for invertebrates, thereby enhancing food for birds, amphibians, and fish. Willows have a large number of phytophagous (plant eating) insects, which add biodiversity in their own right, but also attract a variety of insect eaters including birds and bats. Both willows and alders re-sprout readily and offer dense cover for wildlife, including moose (which rely heavily on willows for the majority of their winter diet), elk, and deer. Taller willows support greater bird diversity [52]. Other wetland types can mix with shrub-swamps. For instance, lower elevations of just a foot or so can support primarily herbaceous vs. woody plants, forming pockets of cattails, sedges, and grasses. When interspersed with open water, these wetland mosaics are particularly productive for waterfowl.

As mentioned above, willows can support great bird diversity – mostly small to medium songbirds. Red-wing Blackbirds, Lincoln's and Song Sparrows, Yellow Warblers, and Common Yellowthroats are common to these shrubby, insect-rich wetlands. MacGillivray's Warbler, a fairly

common but often elusive, bright yellow bird with a black cap, has been selected as one of the Teton County NRTAB's focal species. It is considered an obligate riparian bird that serves as a good indicator for species richness in this habitat. It requires dense shrub cover for nesting, including willow thickets intermixed with wetland herbaceous species. [53-55]

Surprisingly, several other seemingly common bird species are in decline throughout the country. Brewer's Blackbird, Wilson's Warbler, and Least Flycatcher are listed as "common birds in steep decline" throughout the U.S. according to Partners in Flight, a coalition of federal and non-profit groups [55]. Willow Flycatcher (*Empidonax traillii*), a nondescript bird with an easy to distinguish "fitz-bew" call, is also listed as vulnerable by several agencies and partnerships including Partners in Flight. Alder Flycatcher is found across Wyoming in appropriate habitat, but the highest breeding concentrations occur in portions of Grand Teton National Park around Jenny and Jackson Lakes [52]. They require willow stands of about 5 acres (2 ha) with dense shrubs, openings, and water nearby for nesting success.

Willow shrub-swamps with their dense thickets, insects, and variable micro-topography are important for a diversity of large ungulates and small birds. When adjacent to streams and rivers, they also sculpt stream morphology and create important habitat diversity for fish and other aquatic life (C. Girard, Personal communication).

Location: Extensive shrub-swamps are found around Flagg Ranch in the Rockefeller Parkway; Willow Flats near Jackson Lake; and along Pacific Creek, Buffalo Fork, and sections of the main stem of the Snake and upper Gros Ventre Rivers. Willow stands along the north end of Moose-Wilson Road are a prime place for viewing wildlife — particularly moose — associated with this habitat. Willow was common in the National Elk Refuge before the abundance of elk suppressed the community. Stands are also common along sections of Fall and Fish Creeks in and around Wilson.

Trends in willow habitat: Since the change in flood control at the Jackson Lake Dam in 1947, willow habitat along the Snake River from Jackson Lake dam to Moose has been reduced by 240 acres (97 ha) or 27% between 1945-1987, with an anticipated reduction of 40% by 2033 [18]. This calculation does not take into account any changes due to the dikes below Moose. Ninety-five percent of willow habitat in the National Elk Refuge has been heavily browsed by elk along the lower portion of Flat Creek [8]. Areas around the Gros Ventre and South Park Feed Grounds have also been over browsed. It is unknown what reductions of willow habitat have occurred elsewhere over the past decade or so, including the effect of historic grazing, irrigation regimes on agricultural fields, or development of houses such as along the West Bank and Wilson. On the other hand, with fewer elk and moose, some areas such as around Fish Creek in Wilson and in the Buffalo Valley may support more willow habitat now than in decades past.

Threats: Development of private lands along floodplains, streams, and spring creeks can destroy and fragment willow habitat. Furthermore, development can affect the underlying hydrological dynamics of water quantity and quality. Changes in irrigation methods from flooding ditches to overhead pivot systems could also affect these dynamics and, therefore, willow stands. An abundance of elk is a threat near feed grounds. Trapping of beaver also likely affects the extent of some willow communities. All these impacts on the willows themselves affect habitat for moose, beaver, elk, birds, amphibians, and fish.

Information gap: Whether there have been increases or decreases in willow habitat, including location, size, and nutritional quality.

Target Species: Beaver

This keystone species has declined significantly since 1977, including a 25% decline between 2006 and 2011 along the Snake River within Grand Teton National Park, and possibly other areas as well. With careful inventory and study, beaver may provide opportunities to alter hydrological processes and improve sites within the Snake River Wetland Complex for Trumpeter Swans, amphibians, waterfowl, songbirds, otter, and other species.

Beaver are strongly associated with willows along flowing water. These giant rodents with flat paddle-like tails and two big front teeth rely on willow for food and building materials for their dams and lodges. By building dams, beaver raise the water table and trap sediments; willow seeds land upon exposed, moist edges and germinate in spring, and the seedlings have sufficient moisture in late summer to survive, forming new colonies. Heavy browsing of established plants also stimulates vegetative reproduction. These additional willows enable beaver colonies to thrive. With this positive correlation of beaver and willow, beaver can live in a given stream system for years, slowing floods, maintaining water tables, and adding wildlife habitat. Beaver and willows are often considered mutualists. [56]

Beaver feed on aspen and willow bark and use these soft, woody materials to construct dams, which provide protective moats for their mounded, hollow lodges. Monogamous, beaver raise their kits in lodges and spend winters feeding on stores of willow branches stashed under the ice. If undisturbed and with sufficient habitat, beavers can quickly increase in number, which can become a “nuisance” in developed areas where they often chew on planted aspen trees. Trapping typically eliminates two-year old beavers that are looking for a new territory, thereby restricting their distribution. Trapping of adults can disrupt the colony’s social order and make the family more vulnerable. (Drew Reed, personal communication).

Note, not all beavers build dams and moated lodges. Instead, some create bank lodges along wider, faster rivers like the Snake where their dams are futile, or they form lodges on calm lakeshores. Individual beavers can switch their behavior from building dams to bank lodges.



Ecological Significance

Beaver are considered ecological engineers and a keystone species that disproportionately affects the surrounding ecosystem [57]. Beaver impacts depend on the position of their colonies in the watershed and on the structure of their dams [57]. In certain situations, beaver dams impound water, flooding out and often killing larger trees that then become roosts and breeding habitat for birds. By creating stable ponded waters, beaver create new habitat for aquatic plants and insects that, in turn, provide for various birds, including waterfowl [58, 59]. Fish utilize different depths and temperatures around these ponds, including overwintering in unfrozen recesses. Otters also frequent beaver ponds. The overall vegetative, structural, and hydrologic diversity provided by beaver ponds makes them particularly significant to ecology of aquatic environments.

Amphibians are attracted to beaver areas [60]; these areas can create unusual hotspots where four amphibian species reside [61]. Recent research indicates that amphibians colonized beaver-influenced wetlands at a 35% higher rate than wetlands without beaver [60]. Beaver wetlands often benefit these amphibians by increasing the diversity and connectivity of wetland habitat and buffering against drought [62]. The SGCN species of western (boreal) toads and Columbia spotted frogs were more than twice as abundant in beaver influenced wetlands. Other studies in North America and Europe support this positive association between beaver wetlands and amphibians. (See amphibian section below).

Not only do beaver often add wildlife value, beaver ponds are recognized for providing ecosystem services that benefit both wildlife and people. They control flooding and sediment runoff, elevate and/or restore groundwater, maintain stream flows in summer, and filter water, thereby improving water quality. Federal and state agencies promote beaver restoration into watersheds where they do not interfere with human developments.

Status and Trends

Beaver abundance in Grand Teton National Park declined by almost 50% between 1977 and 2004 [63, 64] and another 25% by 2011 [65], together totaling an 80% drop over the past 40 years. These surveys indicate that a large portion of beaver used to live along this section of the Snake River. It is unclear why beaver have declined to such a degree [65]. However, it may be that the side channels that often support beaver have been altered by changes in hydrological dynamics due to the Jackson Lake Dam.

Outside of the park, trapping likely keeps beaver populations lower than they would be otherwise. Harvest records within WFGD hunt management area 1, which includes the JH area, lists 426 beaver trapped in 2013-14, or 13% of the total hunted in the state. Hot spots include private lands from the south entrance of Grand Teton National Park through Wilson along the Snake River, and east of the Snake River to Kings Highway and the airport area. Beaver also occur south of Melody Ranch (D. Reed, personal communication). Private property owners often have beaver removed, as they chew expensive landscape trees — often aspen — around ornamental ponds. Such trapping for “nuisance” animals is common and legal. Under state regulations, beaver “causing damage or flooding can be removed at anytime by the landowner” [66]. Trapping in the national parks, National Elk Refuge, and some creeks, such as portions of Cache, Cliff, and Granite Creeks, is prohibited. Some other creeks have quotas (often 5 per trapper) and seasons. Elsewhere, trapping is unlimited. Reporting is voluntary, not required. It is unclear what the magnitude of the impact of trapping is on beaver populations.



Threats to Beaver - Mostly Unknown

- The reasons for the steep decline of beaver in the Grand Teton National Park portion of the Snake River are unknown. It could be due to changes in backwater channels and ponds, but the causes have not been studied in detail [65].
- Trapping on private lands and certain drainages could be limiting population expansion. However, lack of trapping records or reports is one factor that makes it impossible to know the extent or impacts.

Beaver as a Conservation Opportunity

WGFD has included beaver reintroduction and management in their priority habitat and restoration and enhancement strategies [6, 12]. Yellowstone National Park is actively researching methods to restore willow-alder shrub-swamps, beaver, and associated bird species. The U.S. Forest Service looks upon beaver as a benefit to habitat. Beaver are being used to enhance stream systems in Teton County, ID. The Trumpeter Swan Association is researching areas where beaver may enhance swan nesting habitat. Beaver restoration in the National Elk Refuge could enhance amphibian populations [67].

In summary, we consider beaver a target species for its ecological value and opportunity. This keystone species has declined significantly since 1977, including a 25% decline between 2006 and 2011 within Grand Teton National Park and possibly other areas as well. With careful inventory and study,

beaver may provide opportunities to alter hydrological dynamics and improve sites within the Snake River Wetland Complex for trumpeter swans, amphibians, waterfowl, songbirds, otter, and other species.

Information Gaps

- Extent of beaver decline.
- Cause of beaver declines.
- The feasibility and benefits of enhancing the Wetland Complex by conserving and restoring beaver populations throughout the watershed.

Watch List: Amphibians

Amphibians are declining worldwide [68, 69], and there are indications that several of the seven species in the JH area may be in decline as well. Threats of development on private lands, as well as disease and climate change, could have serious impacts on populations in the future. Fortunately, there is a significant body of ongoing research on national lands to monitor their status, although significantly less research is available on private lands in the private core of the JH area. We want to make sure these small creatures, representative of intact wetlands and uplands, persist in our region.

All amphibian species in the JH area depend on wetlands for reproduction. Breeding adults deposit their eggs in stagnant, shallow water warmed by the sun in spring after snowmelt. These areas include various types of still water: seasonal and permanent ponds, lake margins, marshes, non-flowing ditches and channels, and oxbows or other backwaters of streams. Within about two weeks, larvae hatch out, sporting torpedo-shaped bodies with gills, long tails, and tiny eyes (also called tadpoles for frogs and toads). They metamorphose into tail-less creatures with four legs, lungs, and prominent eyes (except salamanders) between July and September of the same year. However, development rates are dependent on water temperature and other site characteristics. The persistence of water over this time is key to their initial survival.

Adults, which can live for 12 years or more, and juveniles, which take several years to reach reproductive age, spend most of their lives on land or underground rather than in the wetlands where they breed. Upland areas and stream corridors that connect breeding sites to summer and winter habitat are thus crucial for amphibians to complete their life cycle.

Amphibian Species in the JH Area

Three species are very rare or perhaps already extirpated. American bullfrog (*Lithobates catesbeianus*), found only in Kelly Warm Springs, is targeted for elimination by Grand Teton National Park as it is an introduced population. The northern leopard frog (*Lithobates pipiens*) has not been seen or recorded since 1995 and may well be extirpated from the county. The Great Basin spadefoot toad (*Spea Montana*) possibly occurs in a very limited area in the JH area. Spadefoot toads are eruptive — emerging after heavy rains to congregate in temporary puddles and pools within dry habitats of sagebrush and scrublands. The harsh nasal-sounding snores of males makes identification of breeding sites highly feasible if searches are conducted at the appropriate times and places. More information on Great Basin spadefoot toads would be helpful as the Wyoming State Habitat Priority report mentions it in several drainages for Jackson [12].

Four Relatively Common Amphibian Species that Deserve Monitoring

Western Tiger Salamander (*Abystroma mavortium*) often surprises people. The 6-8 inch-long (15-20 cm) crawling creatures with mottled skin and long tails can be found occasionally in basements, manure piles, water tanks, burrows and other moist places that prevent desiccation. In spring and summer, salamanders migrate to or away from breeding ponds, sometimes crossing roads, particularly on rainy nights. If lucky, one can see dozens basking on rocks around a mountain lake in summer (F. Clark, personal observation). Hatching from tiny eye-ball like eggs attached to underwater stems (singly or in rows), the larvae have greenish bodies with distinctive feathery gills. Legs appear while the larvae are still small. This species has amazing plasticity — while most larvae metamorphose in the same season, some may remain in the breeding ponds for multiple years before they eventually transform. Yet others become reproductively mature while still retaining their gills and dependence on water. A shape-shifting species! After breeding in water, adults spend most of the time underground in rodent burrows, natural cavities, or burrows they dig.

Breeding populations of western tiger salamanders have been found to persist best in relatively larger, deeper, more permanent water bodies [60, 70]. Stocking fish, which eat the larvae, into mountain lakes and ponds can contribute to their declines along with various viruses. Fragmentation of habitat in developed areas can prevent safe movement and alter water quality. Due to the lack of knowledge of populations and their threats, this species has become a SGCN since 2010 [6, 22].

Boreal chorus frog (*Pseudacris maculata*) is relatively common in the JH area and Wyoming. The species is considered a good “flagship species” to promote awareness of wetland habitats [71] and thus it was chosen by the Teton County NRTAB as a focal species. These thumbnail-sized to 1.5 inch-long (4 cm) frogs are often heard trilling in artificial ponds and irrigation ditches throughout the valley from very early spring into early summer. They attach their eggs — up to 200 tiny black dots within an elongate gelatinous mass — onto stems of sedges and rushes in shallow ponds with plenty of emergent vegetation. The larvae gain legs within 6-10 weeks and at only ½ inch (1.2 cm) long, the new froglets leap to terrestrial habitats. While it is impossible to gauge the numbers of frogs from their strident mating calls (D. Patla, personal communication), they are estimated to be numerous and wide ranging throughout the JH area and the state [22]. Reduction in their distinctive calls in neighborhoods could indicate a decline in the local population. The Nature Mapping Jackson Hole program encourages citizen scientists who hear these frogs to record their presence.

Columbia Spotted Frog (*Rana luteiventris*) inhabits mountains and valleys in northwest Wyoming. A disjunct and genetically distinct population is found in the Bighorn Mountains. Up to 3.5 inches (8 cm) long with warts and blotches rather than distinct spots, Columbia spotted frogs can be found in the JH area from the valley floor to the subalpine zone, breeding in a variety of ponded water bodies. After breeding, adults disperse and spend the summer in moist areas or along streams and lakes [72]. They overwinter aquatically or underground in springs, beaver dams, and spring-fed ponds where they can avoid freezing temperatures. While tadpoles metamorphose the first summer, juveniles require 2-5 years to mature (4-6 years at higher elevations), a precariously long time before they have an opportunity to replace themselves.

Western Toad (*Anaxyrus boreas*) is widespread but with substantially fewer known breeding sites than Columbia spotted frogs, boreal chorus frogs, and western tiger salamanders. Noticeably warty with a white stripe down their backs, western toads lay long, thin strings of eggs, averaging 5,200 eggs per fertile toad, and tadpoles typically metamorphose in 4 to 8 weeks. They breed in wetlands from the valley floor to the lower subalpine zones, 6,000-9,000 feet (1,830-2,745 m) in elevation in the JH area. There are two main populations: in mountains in northwestern-western Wyoming and a Southern Rockies population that includes southeastern Wyoming. The Southern Rockies population has declined severely and has probably been decimated by the disease chytridiomycosis (chytrid fungus disease). The U.S. Fish & Wildlife Service is currently deciding if western toads should be listed as a threatened or

endangered species. This process will include a review of genetic information that may determine whether the western toad population in the JH area is included in the listing.

Status and Trends of Amphibians

Five amphibian species in or potentially in the JH area are listed by WGFD as SGCN: Western tiger salamander, Columbia spotted frog, western toad, northern leopard frog, and Great Basin spadefoot toad. Teton County has selected two amphibians as Focal Species: western toad and the more common boreal chorus frog. The U.S. Fish and Wildlife Service is considering listing the southeast population of western toad in 2017 and may include the western toad population in northwestern Wyoming.

Worldwide, as a taxonomic group, amphibians are declining faster than any other vertebrate class [73]. In the GYE, survey results of amphibians vary. Statistical modeling of monitoring data collected from 2002-2011 in Grand Teton and Yellowstone National Parks indicated declines in breeding site occupancy [60]. Boreal chorus frog was the only species among the four widespread amphibian species that did not show declines in this time period. The importance of beaver impoundments for amphibians in our area was indicated by this publication (see beaver section above). Modeling analyses of monitoring results using shorter and more recent time frames (2006-2012) showed slight increases for three species. Western toad data were regarded as too sparse for analysis [61]. Additional analysis of annual monitoring data from Yellowstone and Grand Teton National Parks is in progress, using increasingly complex statistical modeling tools.

Inventory, monitoring, and research have been ongoing in the JH area and adjacent areas since the early 1990s, resulting in a substantial body of information. Most of the formal work has been conducted in Yellowstone and Grand Teton National Parks [74]. In addition, inventory and site-specific monitoring has been conducted on the National Elk Refuge since 1998 [67] and in the Bridger-Teton National Forest. Citizen scientists, as part of the Nature Mapping program, have provided vetted observations of amphibians to the state Wildlife Observation System (WOS) since 2009. WGFD's appointment of a state herpetologist within the aquatic division has also bolstered information. Unfortunately, little to no survey work has been conducted on private lands due to difficulties of access and study design. However, Teton Conservation District has begun amphibian monitoring in conjunction with WGFD on private land sites in 2017 (C. Girard, personal communication).

In sum, at this time, considerable information is available about amphibian populations on public lands in the JH area. Investigation of trends and population persistence is ongoing, leading to increased knowledge of the effects of habitat fragmentation, disease, and climate change on amphibians in the Yellowstone-Teton area and across the Western U.S. While there is scant information on the proportion of occurrences on private lands vs. protected lands, Nature Mapping records suggest that Columbia spotted frogs and western toads are considerably more rare on private lands than public lands. Due to the rapid development of private lands over the past several decades and likely into the future, amphibian populations could be imperiled. Both wetlands used for reproduction and uplands containing summer and winter habitat are necessary for amphibian survival.

Threats to Amphibians

- Loss of habitat by development can wipe out local populations permanently. Fragmentation and degradation of habitat by homes, landscaping, roads, and culverts can prevent amphibians from hopping or swimming to different parts of their year-round range or colonizing new sites. Cleaning up rough, woody debris and underground cavities can eliminate their moist havens. Also, amphibians are vulnerable to chemicals — including herbicides and pesticides — that can penetrate their permeable skin or kill their invertebrate prey. Widely scattered populations of

these small animals that creep and leap to their varied habitats are particularly vulnerable to fragmentation.

- Other threats much harder to mitigate include climate change and disease. Drought and unusual weather patterns can dry up breeding areas and can alter moisture levels in surrounding areas, thus decreasing reproduction and survival [60, 75]. Two diseases — one a virus, the other a fungus — are both widespread in this region. Ranavirus is known to cause sudden mass mortality [61]. Recent research indicates it can be spread between fish and amphibians [60]. Chytrid disease has been shown to slowly reduce population sizes of amphibians and is a global problem [76, 77].

[Deb Patla, herpetologist, contributed extensively to this section]

Target Habitat: Narrowleaf Cottonwood Galleries

We have selected narrowleaf cottonwood galleries as a target. Cottonwood galleries provide essential habitat for a range of species, particularly birds and bats,. They are also essential corridors for many larger species. Cottonwood galleries are particularly dependent on periodic flooding for survival. The impacts of dams, levees, water diversions, and development may not be seen for decades due to the trees' longevity. Over time, the presence of both aged and juvenile stands of narrowleaf cottonwood is a good indicator and flagship species for effective conservation.

Description

Green ribbons of cottonwood border the major rivers of the arid west, accentuating the life-giving source of water both human and animal communities depend upon. In the JH area, phalanxes of 60-foot (18m) tall narrow-leaved cottonwood (*Populus angustifolia*) border the Snake River from Moran Junction south to Hoback. Broad crowns are supported by trunks 2-3 feet (0.6-1 m) in diameter, clad in fissured bark. Silverberry, snowberry, red-stemmed dogwood, and chokecherries — all berry-producing species — may grow in the bright shade along with horsetails and grasses. Willows often crowd into openings nearby. These understory plants are nurtured by the cottonwoods' abundant deciduous leaves that decompose quickly, adding nutrients to the soil and flowing waters. Seedlings of evergreen Colorado spruce establish in shade and can grow up to out-compete the shade intolerant cottonwood seedlings and saplings.

Cottonwoods depend on particular hydrological dynamics to reproduce sexually, a necessity for their populations to endure and adapt over time. Cottonwoods seed abundantly each year; in mid-June, miniature seeds are carried on fine hairs high into the air on warm breezes — looking like snowflakes in a wayward snowstorm. Despite their abundance, the seeds literally have a one-in-a-million chance of germinating. Cottonwood depends on synchrony with seasonal dynamics e.g. peak flooding. A tiny, short-lived (1-2 week viability) seed has to land in a place with a particular set of conditions: moist, mineral soil in full sunlight. These conditions are most likely after severe flooding. Furthermore, flood waters must recede beneath the ground at the same rate as the root grows [78]. A cottonwood seed has a one-in-a-billion chance of reaching maturity from seed; it requires a decade to establish, grow, and become mature [13]. Over many years, pulses of floods create new habitat for seedlings which grow to form stands of different age classes along the river's sinuous path. Disrupting changes in flooding and the associated changes in geomorphology regimes is the single greatest impediment to riparian forest regeneration [13].



Ecological Significance

Cottonwood trees and their associated plants support myriad species of birds and small mammals: their soft wood enables woodpeckers, including rare Lewis' Woodpeckers, to form nesting holes for American Kestrels, Mountain Bluebirds, Tree Swallows, and other cavity nesting birds. Large trees provide roosts for bats, Bald Eagles, hawks, and Osprey. Grassy areas host shrews and mice that serve as prey to raptors, including Great Gray Owls. Continuous stretches of galleries provide habitat, cover, and travel routes for large mammals, such as deer, moose, elk, and black and grizzly bears, which need particularly large ranges. As movement corridors connecting habitat, galleries enable these large animals to mix with individuals from distant areas, sustaining genetic diversity and therefore resilience in wildlife populations [9]. Cottonwood galleries connect much of the JH area from north to south along the Snake River and east out the Buffalo Fork Valley, up Spread and Ditch Creeks, and along the Gros Ventre and Hoback Rivers. Cottonwoods contribute significant shade and large woody debris to the Snake River and its tributaries, adding habitat diversity and playing a role in forming the diverse interconnected patchwork of micro-habitats that so many species' life histories rely upon, including cutthroat trout. Cottonwood galleries form an essential artery for wildlife in the JH area and are an excellent indicator of ecosystem integrity [13].



Status and Trends

The Jackson Lake Dam and levees control essential flooding incidents, potentially decoupling the opportunity for cottonwood to germinate in time with receding floods. Fortunately, narrow-leaf cottonwoods can live for 200-300 years, provided they can reach sufficient moisture, so the existing trees may have time to regenerate sexually. Cottonwoods can also re-sprout from damaged trunks or reproduce vegetatively from fallen limbs, but these are often clones of ancient trees and are perhaps less adapted to climate change [78]. Over time, without flooding and associated scouring, the stands will die out. This can be seen along dried up riparian margins of the Snake River. Already, 30% of this forest type has been degraded since 1957 between Jackson Lake Dam and Moose [18]. There has not been a similar comparison for areas below the park boundary, although the Army Corps of Engineers states that 90% of wetland habitat in general has been affected by the dikes installed in the 1950s [19].

In other regions of the country such as in Arizona along the San Pedro River, changes in hydrological dynamics have killed off cottonwood trees (different species) to such an extent that communities are planting trees, an expensive and complex restoration effort; however, even these efforts are not successful without restoring the underlying hydrological dynamics [13]. Fortunately, our species of cottonwoods are longer-lived and therefore individual trees have time to contribute to new generations if hydrological conditions are sufficiently restored.

Without disturbance of flood or fire, the evergreen forest primarily of Colorado spruce (*Picea pungens*) and occasional hybrids, will likely expand, thereby changing the ecology of cottonwood galleries or even shading them out. These evergreen forests have less nutrition in their branches for browse, lower plant diversity growing in their dense shade, and fewer and different nutrients recycling regularly into the soil and water. On the other hand, the dense evergreen structure provides thermal cover in summer for ungulates and winter habitat for Great Gray Owls. Large trees afford nesting sites and perches for Bald

Eagles and Osprey, as well as roosts for bats. While both kinds of trees are valuable, in the Snake and Gros Ventre riparian corridors, narrow-leaf cottonwoods contribute distinctive diversity in the JH area.

Threats to Cottonwood Galleries

- **Development of homes, parks, golf courses, and boat launches — High, local.** Development continues to degrade remaining habitat on private land. Trees are cut down and artificial ponds and landscaping replace natural habitat and affect local hydrological dynamics. Associated human activities displace wildlife. These pressures are intensifying and causing irreparable harm to the cottonwood galleries connecting wildlife along the full reach of the Snake River.
- **Levees — High.** For decades the Jackson Lake Dam and levees have significantly altered hydrological processes and therefore the regeneration of these long-lived trees. This is a subtle degradation of habitat. There may be some opportunity to restore more natural hydrological regimes in some places (C. Girard, personal communication).
- **Grazing and browsing — Low, local.** In agricultural areas, cattle graze heavily in the understory. Elk in and near feed grounds can have the same effect of eliminating the complexity of the habitat and reducing bird life. This disturbance provides opportunity for invasive species such as spotted knapweed, Canada thistle, Dalmatian toadflax, and perennial pepperweed to further alter the understory vegetation.

Associated Species

Cottonwood riparian forests, along with a mixture of Colorado spruce and balsam poplar (*Populus balsamifera*), provide habitat for a variety of species. Here we emphasize several.

Bald Eagles (Haliaeetus leucocephalus)

The largest nesting population of Bald Eagles in Wyoming resides along the upper Snake River. Bald Eagles prefer a combination of open water and high river sinuosity away from human disturbance. They require trees large and strong enough — such as old cottonwoods — to hold up their giant nests, and birds prefer to be high above the surrounding landscape. They feed primarily on fish but will hunt waterfowl and small mammals as well as scavenge carrion.

Trends/status: Currently the Bald Eagle population along the Snake River drainage in the JH area appears to be stable. WGFD 2016 annual inventory reveals 42 of 50 (84%) surveyed territories were occupied and 28 of 39 (74%) nests surveyed were successful. The productivity data for Greater Yellowstone population collected from 1982-1995 and 2016 indicates the productivity or number of young per occupied site for 2015 is within the historic range. WGFD continues to monitor Bald Eagles annually, and partners are researching effects of development and toxins on their health and reproduction. Genetic studies are also being pursued. [22, 79]

Threats: The loss of large trees over time can affect the eagles' reproductive potential here in the JH area [22]. Nesting eagles are sensitive to disturbance by people, including those recreating in their breeding and foraging habitat, such as boaters along the Snake River. Housing developments in riverine zones, such as south of Grand Teton National Park, also fragment their habitat and disturb the birds.

Osprey (Pandion haliaetus)

Formerly called “fish hawks”, Osprey are a common sight in the JH area where they have sufficient nesting trees or constructed platforms located near their essential food resource: fish. Starting in

October, these birds migrate as far as Cuba and Venezuela for the winter. With luck on their migration and wintering grounds, they return in early May, often to the same partner and nest.

Status and Trends: While not rare and while only a very small portion of the worldwide distribution is here, Osprey are an iconic species here in Jackson Hole. Their population is tracked in part by the Nature Mapping program of JH Wildlife Foundation, Grand Teton National Park, and Teton Raptor Center.

Threats: Low — Loss of nesting sites due to loss of large cottonwood trees as well as competition with Canada Geese affect reproduction. Some action is being taken to provide platforms designed to prevent geese from commandeering nesting sites in early spring. Electrocution from perching on wires is a source of direct death. Otherwise, the main concern is their survival on their wintering grounds in other countries where conservation efforts are rudimentary.

Great Gray Owls (Strix nebulosa)

Great Gray Owls are very rare in Wyoming and are near the southern point of their range in Wyoming. Recent research concludes that these owls concentrate in riparian forests south of Jackson in winter [80]. (For more on Great Gray Owls, see Goshawk chapter of this report).

Bats

Since 1998, the Wyoming Bat Working Group (WYBWG) has been concerned about the status, life histories, and survival of bats. Over the last decade, the WYBWG has been creating conservation plans, conducting surveys, and developing standards for assessment of these nocturnal flying mammals [81] in association with the Western Bat Working Group and federal agencies.

Approximately 10 species of bats — (seven SGCN)—use wetlands and riparian areas within the Upper Snake River and Wetland Complex [22]. Some are considered particularly rare, such as fringed myotis (*Myotis thysanodes*), Yuma myotis (*M. yumanensis*), and Townsend's big-eared bat (*Corynorhinus townsendii*). Our more common species include little brown myotis (*M. lucifugus*), silver-haired bat (*Lasionycteris noctivagans*), hoary bat (*Lasiurus cinereus*), and big brown bat (*Eptesicus fuscus*) [22, 82]. More common species may well contribute a larger benefit to the ecosystem due to their numbers. While often persecuted by people who have misconceptions of their danger to humans, bats provide ecosystem services, including consuming many insects. While bats often feed in insect-rich areas such as wetlands, they often roost some distance (miles) away and, therefore, may play a significant role in nutrient transfer by acting as “pepper shakers,” distributing nutrients throughout their home range [81]. Bats often feed or roost near water, as they require water to excrete toxic nitrogenous waste products accumulated by their high protein diet of insects. People often think of bats roosting in large numbers in caves, but several species roost in smaller number in trees, including cottonwoods, particularly in summer. Others use buildings.

Status and Trends: Unknown — Preliminary survey work was conducted in Grand Teton National Park in 2005 [82]. A combination of observations, mist netting, and acoustic detectors are typically used — but different species use a variety of different territories, have different calls, and fly at different altitudes and times of night. Grand Teton National Park, in cooperation with Boise State University, began research in 2016, coupling acoustic, light, and roost monitoring with radio telemetry to assess factors that influence bat use of historic properties in Grand Teton and how this affects the human-bat interface. Otherwise, extremely little is known about bats in this area (D. Gustine, personal communication).

Threats:

- **White-nose syndrome:** Along with habitat destruction, climate change, and in some locations, wind energy, one of the greatest threats to bats is white-nose syndrome

(WNS). WNS, a fungus disease, is moving west from the northeastern U.S., where it has had devastating impacts (up to 90-100% mortality) on some bat populations, primarily those that roost in colonies. To date, the nearest occurrence of WNS to Wyoming is in eastern Nebraska [83]. WNS has infected at least two of our common resident JH area species: big brown bat (*Eptesicus fuscus*) and little brown myotis (*Myotis lucifagus*). While not yet here, when it does arrive, WNS could have devastating effects on some populations.

- **Public perceptions and health:** In general, bat populations are highly susceptible to loss of any one of their habitat needs, but particularly maternity roosts and hibernation sites, including buildings. While public awareness of the ecological role of bats has improved, bats are often persecuted, particularly around developed areas. Evermore education is needed. In national parks, balancing public health concerns with maintenance of buildings, often historical sites, with bat roosts, is a management concern (D. Reinhart, personal communication). Of note: while bats are associated with rabies, very few reports of rabies from bats are reported nationally each year, with only one confirmed rabid bat in Teton County in at least 17 years [84]. Sixty-three deaths attributed to rabies in bats have been documented in the U.S. between 1951 and 2016 [85].

Information Gap: There is a scarcity of information on our bat populations and the vulnerability of bats in general to loss of habitat and white-nose syndrome in the JH area.

Habitat: Marsh

Marshes support an abundance of water and wildlife, adding significant diversity to the landscape. In Wyoming, the 5th driest state in the nation, marshes are rare. Only a few such lush habitats are found in the JH area; however, one is perhaps the most notable wetland in the valley: Flat Creek marsh on the National Elk Refuge.

Marshes are flooded to a greater depth and for longer periods than any other wetland type [7]. Abundant, slowly moving water flows across the land most of the year. Our Wyoming woody plant species cannot survive in the constant flow and anaerobic conditions. Instead, specially adapted herbaceous “emergent” plants such as cattails, sedges, and bulrushes dominate. Using starches stored in their roots and underground stems during the previous year, the plants grow new leaves through the water afresh each spring. As waters warm, last year’s dried leaves decompose and provide nutrients that make marshes one of the most productive habitats in the JH area. In open water, floating aquatic plants, such as Sago pondweed, duckweed, and pond lilies, thrive on the recycled nutrients and full sun. Nutrients and stands of dense vegetation interspersed with water support a range of micro- and macro- invertebrates.

Marshes provide habitat for amphibians, fish, waterfowl, and Trumpeter Swans. Taller plants provide shelter, nesting material, and food for muskrats and a variety of birds. Red-wing Blackbirds, Yellow-headed Blackbirds, Marsh Wrens, and Song Sparrows are noisy denizens of marshes. Ducks of all sorts utilize these areas during migration. Many ducks nest in the reeds, their young chicks swimming out, diving or dabbling for food, and then rushing back into cover if threatened. Sora and American Bitterns, and more rarely Virginia Rails, skulk through the reeds, rarely seen. Muskrats, related to voles not rats, are the signature mammal of marshes and are adapted to eating all kinds of herbaceous vegetation but particularly cattails and pond lilies. They build “push ups” or high mounds of herbaceous material for dens, which are also used as perches by birds. The workings of muskrats add to the spatial and species diversity of the marsh. Marshes are extremely productive wildlife habitat.

Marshes provide several other important ecological services. Typically located in shallow basins, floodwaters can spread and slow before draining downstream, often recharging aquifers. The dense plant

structure and extensive roots impede water movement, reduce scouring and erosion, and cause sediments to settle out. Cattails have been proven to take up toxins into their roots, also improving water quality. Thus marshes enhance water quality and decrease storm damage, which benefits people as well as wildlife.

Location: The National Elk Refuge features the most visible extensive marsh in the JH area. It is easily seen from Highway 89 heading north out of Jackson. The total acreage is only 630 acres [8]. Surrounding wetlands are classified as wet meadows (see below). No other marsh wetlands are mapped in GTNP or the private lands of Teton County. However, the Grassy Lake Road area in the Rockefeller Parkway features patches of marshes interspersed with willow shrub-swamps and wet meadows. Lakes and ponds with relatively shallow shores can have narrow perimeters of marsh vegetation.

Threats: In general, marshes can be impacted by development with associated changes in hydrological processes and nutrient loads. Fortunately, most of the marshes in the JH area are protected as federal lands. Winter herds of elk in the NER can compact soils and add excessive nutrients, altering the natural vegetation along the Flat Creek marsh. In other locations, boaters can intrude upon marshy edges of lakes and ponds, upsetting wildlife.

Habitat: Wet Meadows and Fields

Wet meadows are one of the most overlooked wetland types of all as high water tables are temporary, and wet meadows are often camouflaged by tall upland grasses in agricultural fields or mountain meadows.

Wet meadows are dominated by native sedges and water-tolerant grasses. Wet meadows form in low-lying, flat terrain that is flooded by melting snow on frozen ground, from overflows from streams and ditches, and seasonally high water tables. They are often interspersed within pastures and hay fields. These very shallow wetlands provide important habitat for many species temporarily and seasonally. The relatively abundant water stimulates rich grass and sedge growth by mid-summer and fall that benefits ungulates in fall and winter.

Diversity within wet meadows shifts throughout the seasons. As soils thaw, invertebrates such as worms wriggle to the warm, soft surface within reach of probing bills of Wilson's Snipe, White-faced Ibis, and egrets. Amphibians may use this moist habitat for movement to deeper waters for breeding. Migrating ducks, sandpipers, dowagers, phalaropes, and avocets may stage here on their way north. Sandhill Cranes form nests out of mud in wetter depressions and feed on nearby vegetation or invertebrates. Long-billed Curlew use their 4-8 inch-long (10-20 cm) bills to probe and pick for invertebrates in May and June, and sage-grouse chicks glean insects in late summer. Elk and deer graze on grasses in fall. Bison prefer sedges for their winter diet. While temporary, these uses of wet, grassy habitats provide essential resources. Sites such as the Walden Ranch conservation easement north of Highway 22, the National Elk Refuge, Elk Ranch Flats and south of Willow Flats in Grand Teton National Park, as well as the less apparent meadows in the Rockefeller Memorial Parkway including Grassy Lake, provide viewing opportunities of this transitory wildlife.

Threats: Depending on the land development regulations, private unprotected agricultural lands are subject to intense development and therefore outright loss of habitat and fragmentation. Grazing by domestic stock as well as concentrated numbers of elk and bison can also impact these habitats. Changes in irrigation systems can also alter local water tables and therefore presence of wet meadows.

Target Species: Snake River Cutthroat Trout

Snake River Cutthroat Trout (*Oncorhynchus clarkia* spp.), a popular native sport fish, is an indicator of an intact riverine and wetland ecosystem throughout the JH area. It is considered a state SGCN and the Teton County NRTAB selected it as a Focal Species [86]. The Snake River Cutthroat

Trout thrives in the cool, clear waters of the upper Snake River and is not yet contaminated by hybridization with non-native Rainbow Trout. Focusing on its need for connectivity, water quality and quantity, and natural flow regimes will benefit many other species highlighted in this report, including the much more rare Bluehead Sucker. The Bluehead Sucker (*Catostomus discobolus*), a native non-game species and also SGCN, is documented in relatively few drainages. Recent research determined that Bluehead Sucker ranges from the north to south end of the Snake River annually [20]. We chose the relatively common Snake River Cutthroat Trout as a Target Species for its value as a flagship and umbrella species.

Ecological Significance

Snake River Cutthroat Trout is an unnamed subspecies [87] that is sometimes referred to as the fine-spotted cutthroat trout, as opposed to the large-spotted Yellowstone Cutthroat Trout (*Oncorhynchus clarkii bouvieri*). Cutthroat trout are the only native trout in Wyoming and includes several subspecies. The Snake River Cutthroat Trout is the native subspecies specifically in the Snake River and its tributaries between Jackson Lake and Palisades Reservoir. Historical and genetic evidence suggests that cutthroat trout have been inhabiting Wyoming's waters for over one-million years. Their distribution was the result of the recession of glaciers and the formation of ice dams creating huge lakes over vast areas of the landscape. When ice dams broke and waters receded, isolated populations of cutthroat trout were left in the different drainages of Wyoming. In this case, the watershed divide of Two Ocean Lake may have isolated the populations of our two local subspecies of Yellowstone Cutthroat and Snake River Cutthroat Trout [87, 88]. This more or less distinct subspecies is prized by anglers who are concerned about hybridization with the closely related Rainbow Trout (*Oncorhynchus mykiss*) that has been introduced throughout Wyoming.

Healthy, sustainable cutthroat trout populations require life-history variations related directly to diversity in the physical nature of the Snake River system [21, 86]. Recent research concludes that where there is a greater mix of habitat types, cutthroat trout have a greater expression of life histories. These include spawning strategies that make their populations more resilient to disturbances and other changes that inevitably occur over time [21]. Factors such as watershed connectivity, stream network topology and complexity, temperature and gradient, as well as physical structure of woody debris, all provide heterogeneity between and within tributaries and lakes. In large, intact river systems, as opposed to small streams, cutthroat trout utilize a much wider range of habitat variations and spatial patterns that enable them to diversify their life histories accordingly. Due to the extensive, relatively intact upper Snake River system, Snake River cutthroat trout have a greater resiliency over the longer term.

Status and Trends

WGFD conducts annual population estimates on the Snake, Gros Ventre, Hoback, and Salt Rivers. Currently it is considered common in the watershed [22]. Even so, WGFD has documented several declines in creeks. A 2008 survey of Flat Creek in the National Elk Refuge upstream from the fish hatchery revealed a decline in the Snake River Cutthroat Trout population and an increasing Brook Trout population. The survey showed Snake River Cutthroat Trout greater than five inches in length in this section had declined from 191 per mile in 2002 to 58 per mile. The number of non-native Brook Trout greater than five inches increased from 18 per mile in 2002 to 122 per mile in this trophy class fishery. Cutthroat populations downstream of the hatchery did not show the same decline [88]. Another survey documented a decline in native cutthroat biomass with a 27% reduction in estimated pounds per mile between 2004 and 2010 along 15 miles of Fish Creek. Estimates of numbers of cutthroat trout spawning also suggest the population is declining in this reach [22, 25].

Threats

- **Non-native species** — Medium. Potential hybridization by non-native Rainbow Trout travelling upstream from Idaho (currently blocked by the Palisades Dam) or from past or future introductions into the upper Snake River and lakes is a concern for preserving the purity of the subspecies. Also, Rainbow Trout are direct predators of and competitors to our native species [22]. Brook Trout is another non-native competitor. Brown Trout are abundant in Jackson Lake and in the Snake River above the lake and are a known predator and competitor to cutthroat trout. Also, Lake Trout are present in Jackson, Phelps, and Jenny Lakes and are known to predate heavily on cutthroat trout. These non-native species can have negative effects on our native trout no matter what the health of the ecosystem.
- **Disease** — High, potentially extensive. Cutthroat trout are sensitive to whirling disease (*Myxobolus cerebralis*), a microscopic parasite introduced from Europe in the early 1900s. The parasite was first detected in Wyoming in 1988, including at the Fish Creek Fish Hatchery in Jackson. It was found in Yellowstone Lake in 1998, where it has infected 20% of Yellowstone Cutthroat Trout. The disease is spreading through the Yellowstone Lake watershed. It is spread by fish-eating birds, such as Great Blue Herons; by anglers, boats, and equipment that is not thoroughly cleaned; and by transport of diseased fish. Relatively warm waters and drought associated with climate change increase incidence of whirling disease. There is no control of the disease in the wild. [89, 90]
- **Degradation, fragmentation, and destruction of habitat by development and agriculture** — Moderate, local. Private lands in Teton County are concentrated in the heart of the watershed. Agricultural irrigation systems — water diversions, channels, and dams — can block or alter fish movements and cause direct mortality by capturing fish in areas that are later dewatered. Cattle grazing can break down banks, affecting shorelines where fish can harbor. Residential and resort development can affect water quality and hydrological dynamics, as well as connectivity. Spring creeks, important spawning areas, are particularly vulnerable in areas that already suffer degradation, such as Fish and Flat Creeks. Artificial ponds, landscaping, lawns and associated nutrient and pesticide run-off can alter temperatures, oxygen levels, and chemistry in waters flowing into larger creeks and the river itself from above and below ground. Road culverts, irrigation dams, and other impediments like the proposed Snake River Wave Park can prevent fish from migrating to overwinter, spawn, and feed.
- **Decline of cottonwood galleries** — Low, local. Over the longer term, loss of cottonwood galleries could also affect cutthroat trout populations. Trees and shrubs provide shade that maintains cool water temperatures and habitat for terrestrial insects that serve as food for juveniles. Galleries add wood and organic matter to the stream. The wider and more structurally diverse the riparian area or buffer, the more value trees will have for cutthroat trout. [91]
- **Climate Change** — High, extensive. Warming of waters and alteration of hydrological cycles and flows are predicted effects of climate change that will severely affect cold-water fishes, including distribution, reproduction, and resistance to disease [38]. Also, it will increase competitive ability of non-native trout species such as Lake and Brown Trout.

Opportunities

Cutthroat trout and several other species are the subject of cooperative efforts. WGFD, Trout Unlimited, federal landowners, Teton Conservation District, and other partners are focused on improving impaired stream systems, with significant accomplishments in the last five years [22]. Local partnering agencies are spearheading strategies for preventing invasive non-native fish, invertebrates — such as New Zealand mudsnails and zebra mussels — diseases, and exotic plants, which will also conserve the

ecological values of the Snake River Wetlands Complex. While WGFD and other biologists are doing their share, it is important that planners, county leaders, and landowners support development regulations and projects to complement these efforts. Recreationists, such as boaters and anglers, have an important role in preventing spread by cleaning their crafts and gear.

Concerned Agencies: Opportunities for Cooperation

The following federal, state, and county agencies have jurisdiction over different parts of the Snake River Wetlands Complex. Many have developed plans, policies, and regulations that affect the future of the JH area.

- National Park Service — Yellowstone and Grand Teton National Parks, along with J.D. Rockefeller Jr. Memorial Parkway, protect the headwaters and main stem of the Snake River and its associated cottonwood gallery forests, willow shrub-swamps and the majority of lakes. Jackson Lake dam is within GTNP.
- Bridger-Teton National Forest — First- and second-order streams, many of them designated as Wild and Scenic Rivers, feed into larger streams and into the Gros Ventre, Snake, and Hoback Rivers. Caribou-Targhee and Bridger-Teton also protect rivers draining into Idaho to the west of the watershed divide. The Bridger-Teton National Forest Management Plan [92] states that the forest includes the “Best cold water fisheries anywhere in the world.”
- National Elk Refuge — NER has 2,676 acres (1,083 ha) of wetlands. These include several creeks, a marsh, and Gros Ventre riparian zones which cover 1,400 acres (566 ha) of riparian and willow habitat. Flat Creek marsh is one of the most extensive marshes in the JH area. NER wetlands are “some of the most diverse and important in Jackson Hole” [8].
- Wyoming Game and Fish Department — In the JH area, the state oversees two Wildlife Management Areas (WMA) which include portions of the Snake and Hoback Rivers, including created wetlands in South Park which benefit waterfowl and Trumpeter Swans. They also oversee fishing and trapping permits.
- Teton Conservation District — This partnering agency is statutorily obligated to conserve soil and water and monitor EPA impaired streams.
- Private landowners and managers — Private lands in Teton County lie within the core of the wetland system described. Ranchers control irrigation systems and grazing rotations. Homeowners along Fish, Flat, Cache Creeks and other spring creeks affect nutrient inputs and water withdrawals. Resort owners also manage pesticides, fertilizers, and water use. The Jackson Hole Airport lies above the aquifer that supplies 98% of water used for domestic and public supply in Teton County [16, 93]. All have a stake in the water quantity and quality that flows through or under their land.

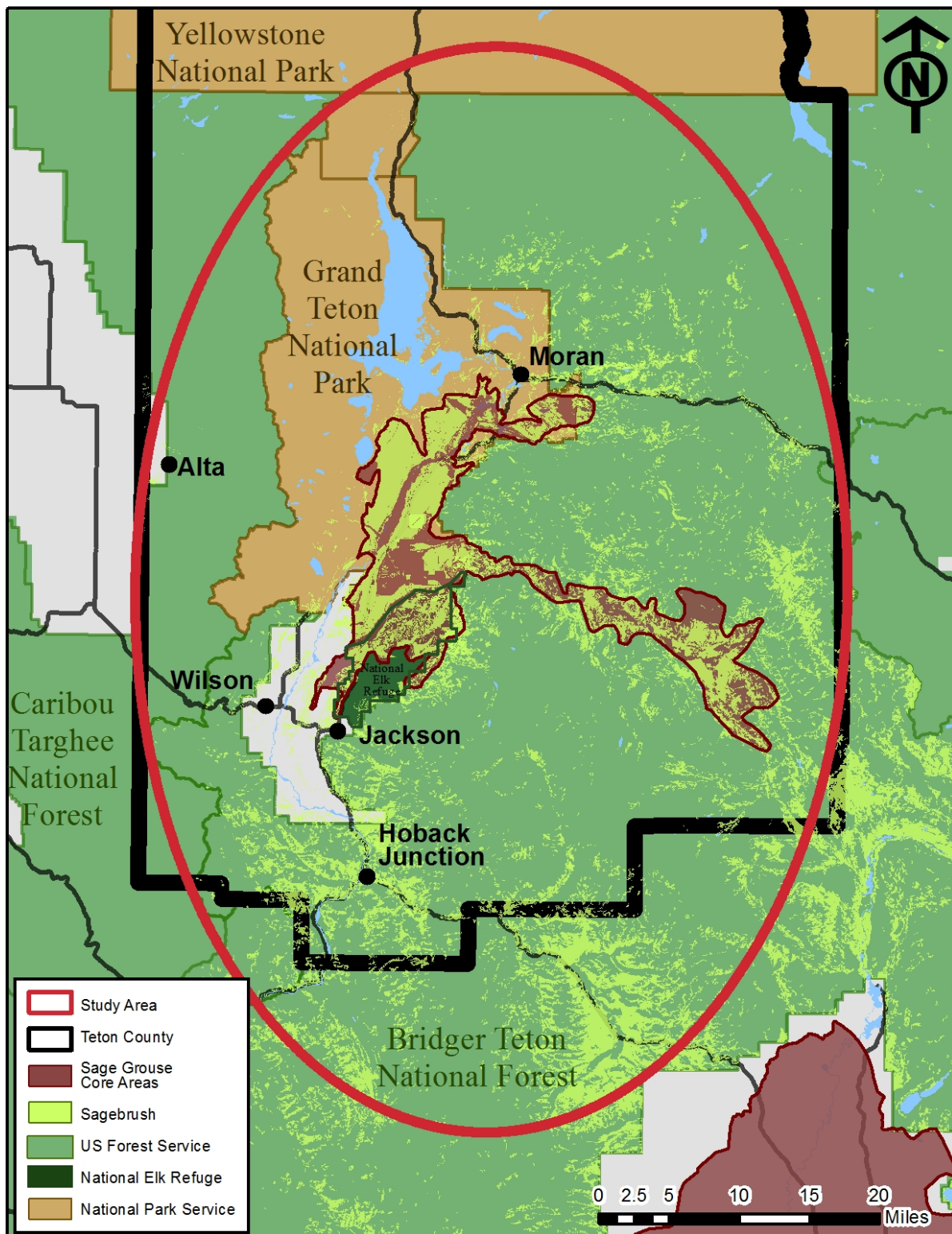
Federal, state and county agencies and associated conservation partnerships have highlighted the importance of wetlands over the years:

- WGFD — Snake River wetland conservation plan [11] highlights the importance of this system. In addition, the agency has designated several connected Aquatic Wildlife Conservation Areas [6, 12] in the JH area; one of only six Priority Wetland Habitats for the state, and two Bird Habitat Conservation Areas [11]. Furthermore, managers have outlined Crucial and Enhancement habitat, with accompanying plans for and investments in stream and fish restoration projects. Many other initiatives support wetland conservation and improvements.
- National Wild and Scenic River designation for over 407 miles (655 km) of stream mostly within BTNF but also within GTNP and YNP boundaries.

- National Wilderness Act protects extensive montane habitat in its most natural state, preventing exploitation of designated areas as well as providing restrictions on mechanical use and fire management options.
- Department of Environmental Quality (DEQ) assigns the top ranking of Class I waters to most of the streams in the region with the exception of Flat and Fish Creeks.
- Army Corps of Engineers (ACOE) built and now maintains the dam and the levees.
- Teton County Commissioners determine land use regulations, including type and density of development.
- Several NGOs also participate in water and wetland issues, including: Jackson Hole Conservation Alliance, Jackson Hole Wildlife Foundation, Snake River Fund, Trout Unlimited, Friends of Fish Creek, Wyoming Wetlands Association, Trumpeter Swan Association.

In sum, many agencies and partnerships have focused on different aspects of this complex system, indicating its high value ecologically and socially to the region, state, and nation.

[This chapter by Frances H. Clark]



Sagebrush cover and sage-grouse core areas within the Jackson Hole area.

Sagebrush and Sage-Dependent Species

Overview

The high-altitude sagebrush and grassland areas are one of the critical habitats in the Jackson Hole area. These shrublands define the Jackson Hole valley both in terms of its appearance — the open sea of sagebrush leading up to the surrounding mountains, the riot of wildflowers dotting hillsides and the valley floor in early summer — and its high abundance of wildlife. The sagebrush steppe habitat is dominated by mountain big sagebrush (*Artemisia tridentata* subsp. *vaseyana*) but includes many other species of shrubs, grasses, and forbs (non-grass herbs). It is valuable habitat for many species of birds and ungulates, including the vulnerable Greater Sage-Grouse (*Centrocercus urophasianus*; hereafter “sage-grouse”), and is a critical connector between other habitats. Because of its high altitude and relatively high precipitation, the sagebrush steppe ecosystem in our study area is ecologically distinct from sagebrush ecosystems in other parts of Wyoming, making it important both locally and regionally. We have chosen this habitat as a conservation target due to the combination of its ecological value and uniqueness and the various threats facing it and the species it supports.

Sagebrush and Sage-Grouse Across the West

Sagebrush ecosystems are widespread across the Western United States. There are several species of sagebrush, the most common being big sagebrush (*Artemisia tridentata*). Individual localities can be dominated by one of three different sub-species and can be quite different ecologically. This broad ecosystem that was once thought of as a vast wasteland is now recognized to be complex and biologically important.

Sagebrush ecosystems are critical habitat for a variety of wildlife species. Perhaps the most famous is the sage-grouse, which depends entirely on sagebrush ecosystems and is very sensitive to human disturbances. Sage-grouse are chicken-like birds that live primarily on the ground and are most known for their elaborate spring courtship displays on shared leks (display sites). In addition to sage-grouse, sagebrush ecosystems support many other bird species as well as iconic large mammals such as pronghorn and mule deer. These are but a few representative examples; all in all, more than 350 species rely on sagebrush ecosystems [94].

Although the “sagebrush sea” once covered some 204,000 mi² (529,000 km²) across the West, sagebrush now exists in about 55% of its previous extent [95]. Various anthropogenic activities have greatly reduced the quantity and quality of sagebrush habitat. These include energy development, conversion to cropland, urban and exurban development, wildfires, invasion of exotic annual grasses, and conifer encroachment [96]. Dramatic increases in wildfire and the invasive cheatgrass (*Bromus tectorum*) are two processes that go hand-in-hand and together severely compromise the quality of sagebrush ecosystems as wildlife habitat. Cheatgrass aggressively out-competes native grasses and forbs early in the growing season, then dries out, becoming highly flammable and increasing the chance of wildfire [97]. Wildfires then burn sagebrush shrubs and native grasses, opening up more opportunity for cheatgrass to colonize [97]. Because these shrubs do not resprout, they can take anywhere from 20 to over 100 years to recover to pre-fire abundance [98]. Meantime the ongoing spread of cheatgrass means that the area is likely to burn again before the shrubs recover [99]. This process has converted millions of hectares of land from a sagebrush sea to a cheatgrass sea [100]. Eradicating cheatgrass once it has taken over is virtually impossible. Because few animals eat cheatgrass, the ability of the land to support wildlife and livestock is severely compromised once cheatgrass becomes abundant.

Multiple anthropogenic changes to sagebrush ecosystems over the last several decades have put sage-grouse under increasing threat [101]. Sage-grouse require large areas of land and a specific

combination of habitat features at specific spatial scales in order to successfully reproduce [102, 103], making them sensitive to any changes in their habitat. Sage-grouse have been considered for listing under the Endangered Species Act but are not currently listed; keeping them off the Endangered Species List is a high priority for many land managers around the West and has motivated widespread efforts to arrest the bird's population declines.

Sagebrush and Sage-grouse in the Jackson Hole Area

Geography

Most of the sagebrush in Jackson Hole is located in the valley bottoms of Grand Teton National Park, such as the extensive Antelope Flats. However, mixed shrub- and grassland areas can be found on the exposed (mostly south-facing) slopes of many of the hills and buttes around the valleys. On the valley floor, there are some pockets of intact native grassland — largely on the National Elk Refuge — and many areas that were converted to agricultural grasslands by settlers in the valley. Pasture grasses are mostly non-native smooth brome (*Bromus inermis*) and crested wheatgrass (*Agropyron cristatum*). Some of these pastures are used by livestock today, while others are within the National Elk Refuge and Grand Teton National Park and are not used by livestock. Other areas in the valley that were once sagebrush have been developed for residential and commercial use.



Ecological importance

The high-altitude, cold-weather mountain big sagebrush (a subspecies of sagebrush) habitat in Jackson Hole is one of only a few areas of its kind in the Western US [104]. Other sagebrush steppe systems in Wyoming and most of the West are found at lower elevations with a much more arid climate. The Jackson Hole area sagebrush includes both “foothill shrublands” and “sagebrush shrublands” habitat types, as designated by the State Wildlife Action Plan [6], which are two of the eight priority habitats in the state.

Because of its high elevation and precipitation, the sagebrush steppe in Jackson Hole can include patches of more montane shrub species such as antelope bitterbrush (*Purshia tridentata*) and snowberry (*Symphoricarpos oreophilus*). Areas to the west of the Snake River, such as Lupine Meadows in GTNP, can be dominated by low sagebrush (*Artemisia arbuscula*). In the spring and summer, many distinct flowers can be found blooming in the sagebrush ecosystem. These include popular species such as shooting stars, larkspur, fritillary, phlox, and buttercups, as well as the more visible arrowleaf balsamroot and lupine. These spring and summer blooms attract diverse pollinators including hummingbirds and bumblebees.

The sagebrush is important habitat for many birds, small mammals, ungulates, and carnivores in the Jackson Hole area. Relatively common bird species that rely on sagebrush and grasslands include Brewer’s, Vesper and Savannah Sparrows; Western Meadowlark, Mountain Bluebird, and Green-tailed Towhee, as well as raptors such as Northern Harriers, Short-eared owls, and Prairie Falcons. Uinta ground squirrels and least chipmunks provide abundant food for coyotes, Red-tailed Hawks, and other raptors. Several Species of Greatest Conservation Need use this area, including sage-grouse (see below), Brewer’s Sparrow and more rarely, Sage Thrasher. Long-billed Curlews also breed in the grassland areas, particularly on the National Elk Refuge and Kelly Hayfields in GTNP. Although this species is widespread in the western US, it has declined considerably, and maintaining existing populations of curlews has become a priority.

Ungulates that use this habitat include pronghorn, moose, bison, elk, and mule deer. Bison and elk make heavy use of the grassier areas, including old fields. Pronghorn summer in the sagebrush flats of GTNP and move more than 100 miles (161 km) south for winter in the famous Path of the Pronghorn migration. Moose rely heavily on antelope bitterbrush and other shrubs in the fall as they put on fat reserves for the winter. Mule deer depend on the mixed grass and shrub hillslopes ringing the valley for their winter habitat. Because these ungulates use the sagebrush and grassland areas heavily, predators such as wolves also use these areas.



The Jackson Hole area is home to a small but important population of sage-grouse. This population is genetically distinct from other sage-grouse populations in the region, probably because of its relative isolation and high-altitude habitat [105]. The majority of the population is found in GTNP, with some presence on the National Elk Refuge and two leks in the Gros Ventre River Valley [106]. Unlike grouse elsewhere in Wyoming, these grouse do not make long-distance migrations [107].

Current Status of Sagebrush and Sage-grouse in Jackson Hole

The human footprint in the Jackson Hole area has had a substantial impact on the sagebrush habitat. Most notably, many areas that were once sagebrush have been converted to residential, commercial, and agricultural land-uses. Historically, the majority of the valley, as far south as Melody Ranch and the Squaw Creek flats, as well as the Jackson Hole airport and neighborhoods west of the airport, were covered in sagebrush and used by sage-grouse (B. Bedrosian, personal communication). It is estimated that greater than 45% of historic sage-grouse habitat has been lost (B. Bedrosian, personal communication).

While development is effectively irreversible, old agricultural fields can be restored to sagebrush habitat, albeit with a large amount of effort. For example, in the Kelly Hayfields area east of Blacktail Butte, GTNP is working extensively to restore a sagebrush community in former pastures. Restoration is a long and complex process since introduced pasture grasses and invasive plant species compete aggressively with slower-growing native grasses, forbs and shrubs; however, park ecologists anticipate that they will successfully bring a functioning sagebrush community back to the restored areas within the next 30 years (K. McCloskey, personal communication). In the summer of 2016, sage-grouse were seen using a site where restoration was initiated in 2008, lending significant optimism that restoration is on track to provide functional habitat for sagebrush-dependent species in the coming years. There are plans to extend sagebrush restoration efforts to several other areas within GTNP, and the same restoration methods could be applied to other areas in the valley in the future.

Fire is another factor that has effectively removed sagebrush habitat for sage-obligate species such as sage-grouse, at least temporarily. A fire in 2003 burned a significant portion of sage-grouse winter habitat around Blacktail Butte, and in total an estimated 13.5% of available sagebrush in the Upper Snake River Sage-Grouse Conservation Area has burned within the last 30 years [106]. Full recovery from fire can take anywhere from 20 to 100 years for sagebrush communities in general [98], but recovery may be on the faster end of the spectrum (15-30 years) in the Jackson Hole area (K. McCloskey, personal communication), which is more resilient to disturbances than many other sagebrush systems. Nevertheless, if significant areas are burned or fires occur frequently, they can effectively reduce sagebrush habitat for years to come.

Where sagebrush has not been impacted by development, agriculture, or fire, it is generally thought to be in fair to good condition, although formal habitat quality assessments have not been conducted. The relatively cool and wet climate of Jackson Hole has helped to limit many invasive plant species that thrive in warmer conditions, including cheatgrass [108]. However, invasive species do have some significant presence; the National Elk Refuge, for example, estimates that invasive plants cover 1,100 acres (445 ha) of the refuge (out of a total of 24,565 acres, or 9.941 ha)[8]. At present some of the most common designated noxious weeds are musk thistle (*Carduus nutans*) and spotted knapweed (*Centaurea maculosa*), but the pasture grass crested wheatgrass is also acting as an invasive species in some areas. Cheatgrass, once rare, expanded significantly on the NER during recent drought years and is now estimated to occupy 250 acres (101 ha) of the Refuge [8].

Conifer encroachment into sagebrush — a problem in many other high-elevation areas of the West — is only a problem in the area between the Upper Gros Ventre and Upper Green River (K. Murphy, personal communication). Conifer encroachment can dramatically reduce habitat quality for

sage-grouse and other sagebrush-dependent wildlife. However, it can be effectively dealt with by mechanically removing conifers, something the BTNF is considering doing in the affected area.

Various historic data sources indicate that sage-grouse used to be much more common in the Jackson Hole area than they are today; one source reports about 500 grouse in total, with 200 males on leks (courtship display sites where they can most easily be counted) every year between 1948-1951 [109]. This number is lower today, with total males on leks in the past two decades ranging from 47 to 165 [106]. There are some challenges to accurately estimating sage-grouse populations, and the most widely-accepted metric is mean males per lek. According to this metric, sage-grouse numbers declined substantially in the late 1990s and have remained somewhat reduced since then [106]. In general, local experts agree that this population of sage-grouse has declined and is at high risk of further decline in the future [106].

The cause of past declines in sage-grouse numbers is not known but is likely a combination of factors. Winter forage availability is a limiting factor for these birds, given the deep snow in Jackson Hole that typically buries all but the tallest shrubs, but it is not likely that snow itself has become any deeper over time. A more likely cause of sage-grouse decline is changes in the availability of high-quality habitat, which may put particular stress on the birds in the winter when food is limited. Increasing numbers of vehicles along roads within sage-grouse habitat and an increase in air traffic at the Jackson Hole Airport may also be impacting grouse, which are highly sensitive to noise [106]. Vehicles and airplanes can also hit birds — a source of direct mortality. All of these factors have likely combined to impact sage-grouse numbers.



Threats to sagebrush habitat, sage-grouse and sage-dependent species

The threats to the sagebrush habitat and sage-grouse are similar. The comprehensive Upper Snake River Basin Sage-Grouse Local Working Group Conservation Plan (2014) identified key threats to sage-grouse in their focal area; our list is adapted from theirs but tailored to the slightly different geography of this report.

- **Fire — High, extensive:** Fires in the GYE are expected to become more frequent over the next century as the climate warms, leaving fuels drier and more likely to burn [110]. Since sagebrush systems take many years to recover fully from fire, any increase in fire frequency could turn large areas into non-sagebrush cover for several decades. The impact of fire is reversible over time, if the area does not re-burn and if fire does not substantially advance the spread of cheatgrass or other invasive plants.
- **Invasive plants — High, extensive:** As the climate warms, future temperature regimes are expected to accelerate the invasion of cheatgrass and other invasive plants in this region [108, 111]. Cheatgrass poses a particular threat to the ecosystem because of its ability to promote fire and potential to dramatically transform entire landscapes from native shrub and grass dominance to cheatgrass dominance. Invasion by cheatgrass could effectively eliminate sagebrush habitat over large areas with little scope to reverse it.
- **Increased air and vehicle traffic — High, local (for sage-grouse):** The rising numbers of vehicles on roads and flights in and out of the Jackson Hole Airport will likely result in more birds being hit by vehicles and planes. The associated increase in noise and, potentially, active disturbance (to push birds out of airplane flight paths) may cause birds to abandon leks and breeding areas near the airport, which is in the core of remaining sage-grouse habitat. Although the Jackson Hole Airport has developed a Wildlife Hazard Management Plan to reduce the negative effects of the airport on grouse, it may be challenging to fully compensate for an increase in number of airplanes or potential expansion of the airport in the future.
- **Other infrastructure development — Moderate, local:** Other infrastructure development presents a high risk to sage-grouse but a moderate risk to the sagebrush ecosystem as a whole. Construction of new pathways, trails, or other infrastructure development in intact sagebrush provides opportunities for cheatgrass to establish and spread. For sage-grouse in particular, any increase in human presence or infrastructure can disturb nests and can cause an increase in predators such as foxes and ravens. Although each individual development may have a small footprint, these can add up to have substantial cumulative impacts on the habitat and its associated wildlife. For sage-grouse, these effects are generally difficult to mitigate or reverse.
- **Residential and commercial development — Moderate:** Although much of the sagebrush ecosystem is protected, patches of private land are at risk for development. Such direct habitat loss may be somewhat mitigated by restoration of sagebrush habitat (on site or elsewhere), but restoration is a long and costly process. Agricultural land that is dominated by pasture grasses but is, nevertheless, important habitat and movement corridors for many wildlife species, is at high risk of development.
- **Grazing — Moderate:** Livestock activity is limited to a few areas within our study area. A somewhat unique potential threat to this habitat type in the Jackson Hole area is the effects of large numbers of wild ungulates, particularly bison, on sagebrush and habitat quality for other species such as sage-grouse. Bison are primarily grazers and, similar to cattle, have the capacity to substantially reduce grass and forb cover, leading to a reduction in food (both plants and insects) and protective cover available to other species. However, managing bison numbers and movements is much more complicated than managing cattle numbers and pasture access. In

several years in the past when bison numbers in GTNP were well above the objectives for that herd, biologists observed very low grass cover in sage-grouse breeding habitat (B. Bedrosian, personal communication; K. McCloskey, personal communication). The bison herd has been at objective over the last several years and grazing impacts have reduced. Nevertheless, understanding and managing the tradeoffs among multiple conservation priorities (e.g. bison versus sage-grouse) is a challenge for this region.

- **Conifer encroachment — Low, local:** Conifer encroachment is currently a problem in a limited area and is not expected to become a more widespread problem.

Opportunities & Multi-Partner Cooperation

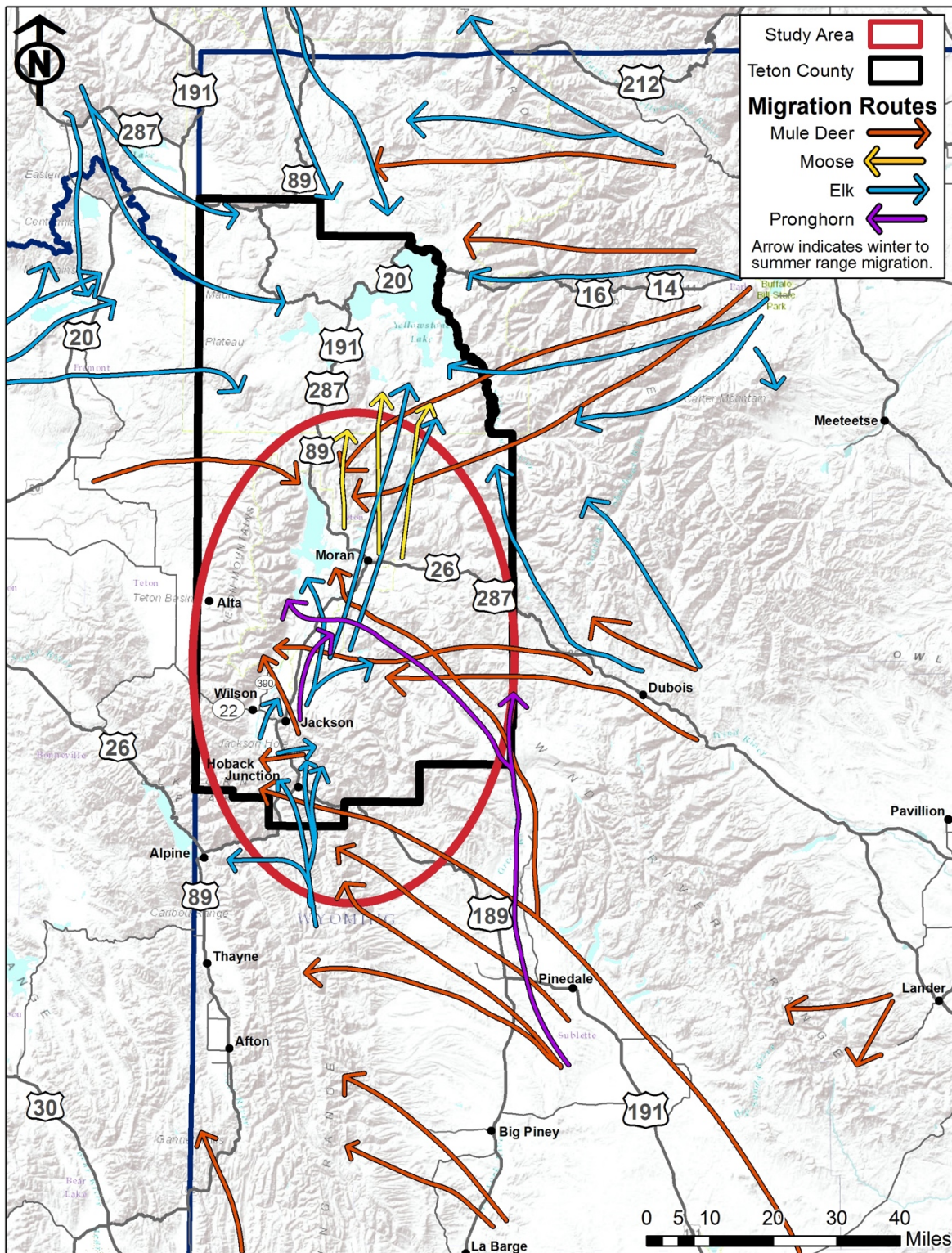
Although the threat of cheatgrass is a concern, the sagebrush community in the Jackson Hole area is considered to be one of the most cheatgrass-resistant in the entire western US; nevertheless, cheatgrass is present and increasing in the valley, and only with active management will it be possible to escape the cheatgrass-fire cycle. This underscores the importance of prioritizing management actions that keep the Jackson Hole sagebrush and grassland communities intact, including efforts to control cheatgrass and other invasive species and to restore habitat where possible.

For sage-grouse, the small size of the population makes it vulnerable. It is clear that thoughtful, forward-looking management will be necessary to ensure that this species remains in Jackson Hole. However, because this area is generally more protected and resilient to disturbances than sage-grouse habitat elsewhere in the West, there is good reason to be optimistic that Jackson Hole's unique population of sage-grouse can persist. The Upper Snake River Basin Sage-Grouse Local Working Group is an active group that includes members of the key agencies and NGOs and is doing much to improve knowledge and management of sage-grouse.

Information Gaps

- There is great need to identify more effective ways to control cheatgrass (for which research is ongoing at a national scale) and to test the effectiveness of different measures locally.
- There is need to continue studying and improving practices for restoring sagebrush, especially practices that can work over large scales.

[This chapter by Corinna Riginos]



Migration paths of deer, elk, moose and pronghorn antelope in and out of the Jackson Hole area.

Ungulate Migration

Overview

Large mammal migrations make up some of the most stunning and iconic images of wildlife in the world. The visage of large groups of ungulates struggling to travel great distances and facing numerous obstacles along the way captures the imagination of the general public and scientists alike. The Greater Yellowstone Ecosystem and the Jackson Hole area are home to some of the most intact large ungulate migrations in the world. Animals do not just migrate out of preference; migration is an essential part of their lives. We selected ungulate migrations as one of our conservation targets because the number, length, and relative intactness of migrations found in the Jackson Hole area are rare on a global scale; because they are important to sustaining populations of ungulates that are iconic and valuable in this area; and because migrations are highly vulnerable to anthropogenic habitat modifications.

Ungulate Migrations Around the World

Ungulate migrations were once a common phenomenon around the world. Some are very familiar popular images: the millions of bison that once moved across the Great Plains of North America or the hordes of wildebeest that still migrate in the Serengeti grasslands of East Africa. Ungulate migrations have historically occurred in many different places, on nearly every continent, and have involved many different species of antelope, deer, and even elephants [112]. The term “migration” indicates regular seasonal movements, and is different from “nomadism” in which animals move but in no fixed pattern. Migration routes are usually consistent from year to year in both space and time.

There are several reasons why ungulates migrate, and the process of migration is essential for keeping migratory herds as large as they are. Migration is thought to allow herds to be as much as ten times larger than they would be without migration [113]. The advantages of migration fall into two broad categories: (1) it helps ungulates to reduce their exposure to predators, and (2) it allows them to move seasonally to where food is most abundant or nutritious for that season [112]. Many predators are tied to dens and territories which mean that predators cannot follow migratory herbivores all year; historically this has allowed some benefit to migratory ungulate populations over resident ones. More recently in the GYE, predation risk has dropped for non-migratory ungulates because they spend the whole year near human settlements, which predators avoid. While the role of predator-avoidance in driving migration is somewhat variable, the nutritional benefits of migration are more universal. Migratory animals reap the benefits of being able to move to where the best food is available. In tropical climates, ungulates typically follow the rains and green grass or migrate to permanent water sources in dry times. In cold climates, such as the GYE, migratory ungulates move down in elevation to escape the deep snow that covers their food in winter, then return to those high elevation areas to capitalize on the high quality food found there in summer.

In many places, ungulate migrations no longer occur, and ungulate numbers have declined substantially as a consequence. The main causes of their declines, globally, include overhunting, habitat loss, and anthropogenic habitat barriers (e.g. development, fences, roads) [114–116]. Large ungulate migration as a phenomenon is imperiled in most parts of the world [114–116].

Ungulate Migrations in the Jackson Hole Area

The GYE harbors one of the most significant remaining networks of ungulate migrations in the world, and the Jackson Hole area is a hub of migrations within the GYE. Species that migrate in and out of this area include mule deer, elk, moose, pronghorn, bison and bighorn sheep. These migratory

ungulate species depend on migration corridors that traverse many types of land ownership, including many private lands as well as public lands in Yellowstone and Grand Teton National Parks, National Forest lands, the National Elk Refuge (U.S. Fish and Wildlife Service), Bureau of Land Management lands, and State and Wyoming Game and Fish Commission lands. Two of the most remarkably long terrestrial migrations in the world — and longest known migrations for their respective species — start in the Jackson Hole area: the Path of the Pronghorn from the Green River Basin to Grand Teton National Park (up to 160 mi or 258 km) [117], and the Red Desert to Hoback mule deer migration from near Rock Springs to southern Teton County (150 mi or 241 km) [118]. Below we list the major migration corridors into and out of Teton County.

Mule deer:

- The deer that winter near Rock Springs travel all along the western flanks of the Wind River range to reach their summer range in the Hoback area [118].
- Deer that winter south of Pinedale migrate north into the Hoback area for summer. Some of these deer even travel as far as GTNP (data from Hall Sawyer).
- Deer that winter north of Evanston migrate into the Wyoming Range, Salt Range and tributaries of the Snake River near Alpine and the confluence of the Snake and Hoback Rivers (Gary Fralick, personal communication).
- Deer that summer in the Gros Ventre and GTNP areas are now being found to migrate east, through the Teton Wilderness, to Dubois and Cody as well as west into Idaho for the winter (Sarah Dewey, personal communication).
- Deer that summer in the southern part of GTNP (e.g. Moose, Granite Canyon) and the Munger Mountain area migrate into the southern Jackson Hole valley where they winter on the hills and drainages around Jackson and the Game Creek area.

Pronghorn:

- Pronghorn migrate from their summer range in the sagebrush flats of GTNP southeast through the Gros Ventre range and then south past Pinedale. A portion of this herd continues further south into the heart of the Green River Basin [117].

Elk:

- Elk that congregate on the National Elk Refuge and state feedgrounds in the Gros Ventre drainage during the winter migrate north to the Teton Wilderness, Yellowstone National Park, Grand Teton National Park, and the Gros Ventre Range for the summer [119]. Some of these animals make a much shorter migration to the areas between Wilson and Moose.
- Elk that winter on state feedgrounds south of Jackson migrate to the Snake River Range, Salt Range and Gros Ventre range for the summer [120].
- Elk that winter on feedgrounds south of the Hoback Junction migrate north to the Hoback Junction and Hoback and Snake River canyon areas during summer.

Bighorn sheep:

- Bighorn sheep used to migrate between the high-elevation zone of the Tetons and the surrounding valleys, but this migration route has been cut off for more than 70 years due to early residential development, ranches, fences, and roads in Jackson Hole [121]. The Teton bighorn sheep herd is an example of a local ungulate population that has lost its migration routes due to human development and now persists at very low numbers [122].
- The Jackson Bighorn Sheep Herd is larger, and remains migratory, moving between high elevation summer ranges in the Gros Ventre Mountain Range and low elevation winter ranges on the National Elk Refuge (Miller Butte), Gros Ventre drainage, lower Curtis Canyon, Flat Creek, and the Camp Creek area east of Hoback Junction.

Moose:

- Major moose winter ranges for the Jackson Moose Herd are located in the Buffalo Valley, along the Snake River, Gros Ventre drainage, and some smaller areas in and around the towns of Jackson and Wilson. Little is known about the seasonal movements of the moose that winter in the Gros Ventre drainage and around the towns of Wilson and Jackson. Farther north, moose that winter in the Buffalo Valley migrate north into the Teton Wilderness for the summer [123, 124].
- The Sublette Moose Herd is located to the south of Jackson. Moose in the northern portion of this herd spend the winter along the Snake River and smaller drainages such as Fall Creek.
- See Moose chapter of this report for more on the status and threats to moose in the Jackson Hole area.

Bison:

- The majority of the Jackson Bison Herd winters on the National Elk Refuge, although some animals spend the winter in Grand Teton National Park and areas around Spread Creek, Elk Ranch, and Shadow Mountain. Bison migrate to Grand Teton National Park for the summer.

Conserving ungulate migration routes is vital to ungulate populations for at least two reasons. First, they are critical paths connecting winter and summer habitat. Second, as new research on ungulate migrations in western Wyoming and the GYE is showing, migration routes are in fact important habitat themselves. Whereas ecologists used to think of migration routes as transportation corridors, they are now recognizing that migration routes serve a much broader ecological role.

Our emerging appreciation for the importance of migration routes as habitat features relates to two new concepts in migration ecology: green-wave surfing and stopover ecology. The idea of green-wave surfing is that ungulates move from lower elevation winter habitat to higher elevation summer habitat in pace with the timing of spring vegetation greenup across the landscape [125]. This, in theory, enables migrating ungulates to eat the most nutritious, fresh plant material as they migrate — hence they are “surfing the green wave.” There has been some debate about whether all migratory ungulate species and populations do or do not exhibit this behavior, but recent evidence shows that mule deer in western Wyoming do track the green wave relatively closely [126]. Other ungulates in Wyoming and elsewhere surf the green wave with varying success [127]. Surfing the green wave is likely vital for helping ungulates regain body fat as they move out of the lean winter and into the nutritionally demanding lactation phase that many females are entering.

The related concept of stopover ecology is that ungulates stop for several days to weeks at certain key locations along their migration routes. These stopover locations may have especially good foraging opportunities for animals following the spring greenup and are important habitat patches used only during migration [128, 129]. In fact, deer spend approximately 95% of their migration time in stopover areas [128, 129].

Conserving migration routes and habitat connectivity is also a critical component of maintaining ungulate populations’ resilience to other disturbances. Animals that can move and migrate — and even change their movement and migration patterns over time — stand a far better chance of surviving in the face of threats such as a warming climate, habitat degradation, energy development, and diseases such as chronic wasting disease (deer and elk) and pneumonia (bighorn sheep). There is little that can be done to stop the spread of chronic wasting disease, which has not yet been detected in the Jackson Hole area but is expected to impact ungulates in this area in the near future; however, enabling animals to move, to exchange genes that may confer resistance to disease, and continue to reap the benefits of a migratory lifestyle will help to buffer their populations against the worst impacts of this disease. Similarly, maintaining habitat connectivity will help animals to adapt to a warming climate, unpredictable weather events, and changes in their habitat quality.



Current Status of Ungulate Migrations in the Jackson Hole Area

In the Jackson Hole area, as in the rest of the world, migratory animals can face a variety of obstacles and habitat alterations that affect their ability to migrate. Anthropogenic changes to the landscape, such as housing and commercial development, gas fields, fences, and roads, can broadly be arrayed along a gradient of permeability to migrating ungulates [130]. At low to moderate levels of development, these changes may have little to no impact on animal migrations; as the level of these developments increases, ungulates may change their migration behavior, e.g. speeding up to move through developed areas more rapidly; and at very high level of development, animals may no longer be able to cross through developed areas. Roads and fences are a particular concern for migrating ungulates because they can present a substantial to complete barrier effect, depending on the traffic volume and type of fence, respectively [131]. Anthropogenic habitat modifications can also affect ungulate migrations in less obvious ways; for example, where humans deliberately or inadvertently provide food for ungulates, it can change their migration patterns.

One concern about impeded and altered migrations is that they may be difficult to restore. Knowledge of migration routes is passed from cow to calf or doe to fawn, and animals show a high fidelity to their learned migration routes throughout their lives. If a migration route were cut off by anthropogenic barriers and subsequently those barriers were removed, it is unclear whether, or over what time scale, animals would successfully rediscover their historic migration routes.

WGFD is embarking on a multi-year effort, with partners from the Wyoming Migration Initiative, GTNP, NER, and others, to designate high-use migration corridors and stopover areas as “vital habitat” for deer, elk, and moose in western Wyoming. This designation gives these areas similar priority as crucial winter ranges under state management. WGFD recommends no loss of habitat function within designated areas. Although this is a positive step for protecting migration routes, it is also important to recognize that it still leaves many migration areas (with lower, but still significant, use) with no official designation or protection.

Ungulate migration patterns and corridors in the Jackson Hole area range from completely impeded to relatively intact and vary substantially from species to species. Of course, it is difficult to know what migrations looked like before permanent human settlement in the area, and it is likely that what we today consider to be the more intact migration routes are substantially altered relative to pre-settlement times.



Bighorn Sheep

Migrations of bighorn sheep are some of the most altered in the Jackson Hole area. As recently as 70 years ago, bighorn sheep from the Teton Herd migrated from their summer range in the alpine zone of the Teton Range to the surrounding valleys, including Jackson Hole, in winter [121]. Beginning about 100 years ago, human settlement and agriculture in the valleys began to cut sheep off from their winter ranges. Fences, roads, residential development, and competition with domestic sheep all contributed to the collapse of this migration [121].

Remarkably, a population of bighorn sheep still lives in the Tetons as non-migratory animals, wintering in what was historically their summer range [122]. These tenacious animals eke out a living in the very high, wind-swept ridges of the Tetons through the winter. Then, remarkably, they trek down to the mid-elevation zone in the spring to follow the spring greenup back up the mountain — essentially catching the second half of what used to be their migration route. The adaptability of these animals is remarkable; however, it is very likely that this population would be larger and more resilient to disturbances if it could migrate to its historic winter range rather than endure the extremely harsh winter conditions of the Tetons [122]. Further, although this population of bighorn sheep lives entirely within GTNP, it is still impacted by human activities. Sheep avoid areas used by backcountry skiers and snowboarders, even when those areas are otherwise good habitat [132]. This has resulted in as much as

a 30% reduction in habitat that is effectively available to some of these sheep that are already living a marginal existence. GTNP is working to reduce some of these impacts of backcountry recreation by testing the effectiveness of winter closures in important bighorn sheep habitat.

In contrast, the neighboring Jackson Herd of bighorn sheep continues to migrate between low elevation winter ranges on Miller Butte on the National Elk Refuge and on Bridger-Teton National Forest at Curtis Canyon, Flat Creek, lower Gros Ventre drainage, and Camp Creek areas. This herd is much larger (approximately 400-500 sheep) and more resilient than the Teton Herd (80-100 sheep), likely due to its ability to migrate along various routes to different low elevation winter ranges (A. Courtemanch, personal communication).

Elk

Elk migrations in western Wyoming and the JH area have been truncated for over 100 years. For example, a variety of historical sources indicate that the Jackson elk herd that currently winters in the National Elk Refuge used to migrate much farther south, through the Gros Ventre drainage and Hoback Canyon and into the Green River Basin and possibly even the Red Desert [133]. Migrations such as these may have initially been truncated due to human settlement in elk winter range, conversion of winter ranges to hayfields, and unregulated commercial hunting, which caused migrations out of Jackson Hole to dwindle.

As these long-distance migrations became less possible, shorter distance migrants that wintered in Jackson Hole started to receive supplemental winter feeding, which began on today's National Elk Refuge in 1912 and was then duplicated at state-operated elk feedgrounds. This practice was established for several reasons. First, and foremost, winter feeding of elk helps to prevent elk from mixing with cattle, which are ranched in the valley bottoms that were once elk winter habitat; this practice is done primarily to prevent the spread of diseases such as brucellosis from elk to cattle, and to prevent elk from raiding stored hay for livestock. Secondly, winter feeding helps prevent elk from starving during the winter, especially when they are no longer able to access their former winter range.

The establishment of winter elk feedgrounds has been effective at short-stopping elk migrations; fed elk currently migrate on average 12 miles (19.2 km) fewer than unfed elk [120], and it is likely that unfed elk once migrated even further. However, it seems that the act of feeding elk has altered their migration patterns in other fundamental ways. Fed elk are less responsive than unfed elk to typical spring migration cues such as greenup and more responsive to early fall migration cues such as cold temperatures [120]. In spring, this means that fed elk arrive on summer grounds later than their unfed counterparts and miss some of the nutritional benefits of the spring migration. In the fall, these same fed elk abandon the higher quality summer feeding grounds earlier than their unfed counterparts. These differences in behavior suggest that, should elk feeding be eliminated or reduced in the future, formerly fed elk may lack the cultural knowledge to take advantage of the nutritional benefits of the migration process.

More recent anthropogenic habitat changes appear to be further altering the migration patterns of the Jackson elk herd, as well as other elk herds in the GYE. Between 1978 and 2012, the proportion of "long-distance migrants" versus "short-distance migrants" in the Jackson herd decreased substantially, from an estimated 99% to 59% long-distance migrants [119]. Long-distance migrants follow migration routes from the National Elk Refuge, where they winter, to summer ranges in Yellowstone National Park, the Teton Wilderness, Grand Teton National Park, and the Gros Ventre mountains or Range. Short-distance migrants, in contrast, travel only 8-10 miles to summer on mostly private lands (largely agricultural and housing developments) between Moose and Wilson. The reason for this change is not entirely known but appears to be linked to higher reproductive success among the short-distance migrants [119]. This may be happening for several reasons, including (1) differences in predation pressure, (2) differences in food availability and quality, and (3) differences in elk vulnerability to harvest.

Short-distance migrants are exposed to fewer predators than long-distance migrants. Whereas wolf and grizzly numbers have increased significantly in the parks and wilderness areas in the GYE over the last several decades, these predators are relatively less abundant in areas of human habitation and agriculture, which they avoid. Thus, the combination of human development and an increase in carnivore abundance over the broader landscape may be driving changes in elk migration patterns. Additionally or alternatively, changing climate may be favoring resident and short-distance migrants over long-distance migrants. In the eastern GYE, declines in the reproductive success of long-distance migratory elk were tied to an increase in the rate of spring green-up [134]; faster spring green-up and shorter duration of spring may reduce the nutritional benefits of migration, favoring animals that do not migrate or migrate only a short distance. Furthermore, elk that spend the summer in and near irrigated agricultural fields and residential landscaping have a consistently higher quality food source, than long-distance migrants. Finally, short-distance migrants spend the majority of the summer and fall on private lands, making them less vulnerable to hunter harvest than elk on public lands. All of these factors have potentially combined to increase the productivity of short-distance migrants and have led to the recent decline in long-distance migrations in the Jackson Elk Herd.

Similar changes have likely occurred to some extent in the Fall Creek Elk Herd to the south of Jackson. However, elk that migrate long distances in the Fall Creek Elk Herd to the Snake River Range, Wyoming Range, and Gros Ventre Range are exposed to comparatively fewer large carnivores than elk from the Jackson Herd. Nevertheless, a trend toward more short-distance migrants that summer on private lands versus long-distance migrants is undoubtedly occurring in the Fall Creek Herd (A. Courtemanch, personal communication).

Because elk migrations stop short of historic winter range, elk have fewer major roads to cross than migrating deer and pronghorn. Nevertheless, roads do present an obstacle that elk face in parts of the Jackson Hole area. Elk must cross some of Wyoming's busiest two-lane roads as they move across Highway 22, as they cross Highway 89 north of Jackson on their way into and out of the NER, and on portions of Highways 89 and 191 south of Jackson and in the Hoback and Snake River canyons. Between 2011 and 2015, an average of 37 elk were hit each year on Teton County's roads outside of GTNP (C. Riginos and WYDOT, unpublished data), with more collisions inside GTNP.

Pronghorn

In contrast to elk and bighorn sheep migrations, the single major pronghorn migration in Teton County, the famous Path of the Pronghorn, is relatively intact. Archaeological evidence indicates that pronghorn have been migrating from their winter range south of Pinedale through the narrow Trapper's Point — a band of sagebrush sandwiched between a river and riparian area just West of Pinedale — for some ~6,000 years [115]. From there, these animals move north through another narrow band of sagebrush into the Gros Ventre Mountains, and northwest through several other narrow bottlenecks to reach GTNP [115, 117]. The portion of this migration corridor that is within GTNP and BTNF is officially protected and is the first migration corridor in the United States to gain federal protection. The remainder of the migration corridor passes through private and BLM land and is more imperiled.

Before 2012, the Trapper's Point area presented a significant bottleneck and problem to this group of migratory pronghorn. Trapper's Point is a natural habitat bottleneck along their migration corridor, but this bottleneck was made even narrower by housing developments, and even harder to traverse because it is bisected by the busy Highway 191 [117, 135]. In 2012, the Wyoming Department of Transportation completed construction of two highway overpasses and six highway underpasses, accompanied by 12.4 mi(20 km) of fencing, in the Trapper's Point area. This has provided a safe way for pronghorn and mule deer to cross Highway 191. Over the first three years since crossing structures were installed, more than 19,000 safe pronghorn crossings were observed (largely on overpasses) and collisions between vehicles and pronghorn dropped from an average of 12 per year to zero per year

[136]. The dramatically successful crossing structures at Trapper's Point have effectively removed the most significant barrier to the Path of the Pronghorn migration.

However, this migration still faces some serious challenges. Energy development in their winter range in the Pinedale Anticline region has substantially reduced the habitat available to this herd. Between 2005 and 2009, high-use pronghorn habitat in the Jonah and Pinedale Anticline Project Area gas fields south of Pinedale declined by 82% [137], which is likely to have a negative long-term impact on this pronghorn population. Future energy development in this area could further threaten the Path of the Pronghorn migration.

Fences pose another serious challenge for pronghorn. As of 2004, the pronghorn migrating from the Upper Green to GTNP had to traverse 105 different fences [115]. Pronghorn are reluctant to jump over fences so typically pass under the lowest wire [138]. When these wires are low and barbed, or if it is a woven-mesh (sheep) fence, it can be difficult or impossible for pronghorn to pass under the fence. Animals that attempt to jump over taller wire fences risk entanglement in wires and likely injury or death; this risk is particularly high for juvenile animals [138]. Replacing traditional fencing with "wildlife-friendlier fencing," which involves smooth top and bottom wires and specific guidelines about wire heights, can help alleviate the problem that fencing poses to migrating ungulates such as pronghorn [139]. However, private landowners cannot be mandated to change their fencing, and sheep ranchers prefer to use the woven-mesh fencing that is particularly challenging for pronghorn and deer. For a portion of the pronghorn that migrate from the Upper Green to GTNP, the ~20 m (~30 km) stretch of US 191 north of Farson that is lined with non-wildlife-friendly fencing appears to be a complete barrier, whereas pronghorn cross the same highway further north where the fencing changes to wildlife-friendlier fencing [135]. The challenge of unfriendly roadside fencing compounds the challenges that pronghorn already face in crossing this busy highway.

Mule Deer

There are multiple mule deer migrations into and out of the Jackson Hole area, and these face a variety of levels of impediment and threat. The major threats to these migration routes are various forms of development: roads, residential, and energy.

Deer that summer in the Teton Wilderness, northern GTNP, and the Gros Ventre, and winter to the east and northeast (e.g. near Cody and Dubois) face relatively few obstacles. Much of their summer and migration habitat is protected. These deer face some challenges as they move into their winter range, where there is more development. Agriculture around the towns of Cody and Dubois, for example, may already have altered deer winter habitat use and migration patterns. In the Dubois area, Highway 26 bisects deer winter range and is a significant source of mortality for migrating and wintering mule deer [140]. Where animals are frequently hit by vehicles on roads, it is typically a sign that these roads are challenging for animals to cross.

The portion of the Sublette Mule Deer Herd that winters in the Jackson Hole valley is significantly imperiled by development. These deer summer in protected areas in GTNP (e.g. Moose, Granite, and Death Canyon areas) and Munger Mountain, but their migration routes and winter habitats bring them into heavily developed areas around Jackson (e.g. the buttes in town and to the east of Highway 89 / 191 south) [141]. Although parts of their winter habitat are somewhat protected as Crucial Winter Range, other parts are not protected and are separated from the protected areas by major roadways. For example, deer cross Highway 89 frequently from East Gros Ventre Butte, High School Butte, and the hills east of Rafter J, likely to access riparian habitat and thermal cover. These same roads, as well as other obstacles, cut across these deer migration routes. New GPS collar data from GTNP show that another portion of deer that summer in Moose migrate across north Highway 89 (Cache Street) and along the southern edge of the NER to winter in the Cache Creek drainage (S. Dewey, personal communication). Along these routes, deer pass through residential and commercial

developments, over heavily-trafficked roads, and across a fast-moving river where their access is constrained by steep levees. More than 100 deer per year get hit by vehicles in a few concentrated areas along Highway 89/191 (Broadway/Cache), indicating that this road in particular is a major barrier to deer habitat connectivity.

Deer from the Sublette Herd that migrate into the southern Jackson Hole area from areas further south also face a variety of obstacles and threats. Deer that winter south of Pinedale live part of their year in an area that has experienced a great deal of oil and gas development over the last two decades. Deer have been shown to avoid using areas around well pads, especially those being actively drilled, resulting in habitat loss [142, 143]. Energy development can also be a partial barrier to deer migrating through these same areas [130]. Deer from this area used to face another partial barrier as they crossed Highways 191 and 189 west of Pinedale — both during migrations and all winter long — but they are now largely able to cross this road safely since the installation of the Trapper's Point underpasses and overpasses in 2012 [136]. These deer migrate to their summer range in the Hoback Basin at the southern end of Teton County and the Jackson Hole area..

Another portion of the Sublette Herd stretches farther south, all the way to winter ranges in the Red Desert, from their summer ranges in the Hoback Basin. In their long journey from the Red Desert (near Rock Springs), these animals' most difficult road crossing is on Highway 191/189 south of the Rim Station but north of the Trapper's Point crossing structures [140]. Interstate 80, at the far southern end of this herd's migration and winter range, creates a near-complete barrier for deer movements. The occasional deer is known to cross I-80; however, it is speculated that deer used to cross this road freely and continue their migration further south, especially during heavy snow winters [118]. Without the ability to do that anymore, these deer are likely experiencing greater winter mortality than they otherwise would.

Other bottlenecks and partial barriers along the migration route include several narrow passages between lakes at the base of the Wind River Range and human developments [118]. Recently a parcel of land at the south end of Fremont Lake was purchased and donated to the State of Wyoming to be managed as conservation land in perpetuity. This will help ensure that mule deer can continue to pass through the narrow bottleneck. However, two other similar bottlenecks, encroaching development and fencing, are still a challenge for this deer migration. Elk fencing around feed grounds are particularly challenging for deer; this highlights some of the challenges of managing for multiple species at the same time in a complex landscape of multiple human uses.

For all of these deer migrations, fences are a challenge. Although deer are able to jump many fences, any fence passage still carries a significant risk that the animal will get entangled [138]. Additionally, newborn fawns have a harder time navigating fences than adult deer. Fences can create a barrier to migration if they are too high or constructed of woven wire/mesh. As for pronghorn, minimizing fencing and making fences wildlife-friendlier helps to maintain a permeable landscape for migrating deer.

Other deer migration routes are still being discovered. A recent effort to collar deer in GTNP is beginning to show that animals move to at least six different winter locations in Idaho and Wyoming (S. Dewey, personal communication). As we learn more about deer movements, it will be important to incorporate new knowledge into land-use planning to understand and take action against any threats to these migrations.

Moose

The status and threats to moose populations in the Jackson Hole area are covered in a separate chapter of this report. In terms of migrations specifically, the status for moose differs from one area to another. Research on moose migrations in Jackson Hole have been limited to the animals that spend the winter in the Buffalo Valley/Spread Creek areas in northern Grand Teton National Park. These moose migrate into the Teton Wilderness, Togwotee Pass, and northern Teton Range areas for the summer. These migrations are relatively intact as they are almost exclusively within national park or designated

wilderness areas. The main threat to the continued existence of these migration routes may be the declining moose population itself. As fewer and fewer animals traverse the migration routes, some routes will likely disappear simply by attrition and loss of knowledge of historic migration routes.

Much less is known about the migration patterns of moose that winter farther south in the Gros Ventre drainage, near the towns of Jackson and Wilson, and in the southern Snake River corridor. Animals that winter near Jackson and Wilson likely experience some impediments to their movements and migrations due to development, roads, and fences. These are discussed in greater detail in the chapter on Moose.



Threats to Ungulate Migrations

We consider here the major threats to the ungulate migrations that move into or out of the Jackson Hole area. These threats may occur within the JH area or in portions of the migration corridor outside the JH area, or both.

1. **Roads — High, Local.** Rising traffic volumes in the Jackson Hole area and beyond mean that roads are likely to become more and more impermeable barriers for many ungulate migrations. Almost all of the ungulate migrations in and out of the Jackson Hole area are already impacted by roads, with roads presenting a partial to complete barrier. Wildlife-vehicle collisions are also a source of mortality for migrating ungulates; on average 2-4% of Wyoming's mule deer are hit on roads every year. Traffic volumes in the Jackson Hole area are already relatively high and continue to grow, especially as commercial and residential development expands and more

tourists visit the JH area. Once a migration route or other movement corridor is cut off by a road, it may be difficult or impossible to restore that migration corridor.

2. **Fences — Moderate, Extensive.** Like roads, certain types of fences are a considerable barrier to ungulate movements and migrations. Fences range widely in the degree to which they are permeable to wildlife, from completely impermeable to easily crossed. In the Jackson Hole area, organizations like the Jackson Hole Wildlife Foundation are working with public land agencies and willing private landowners to remove or convert less-permeable and hazardous fences and replace them with wildlife-friendlier fences. Teton County's Natural Resource Regulations also require that fences on non-agricultural lands meet wildlife-friendlier standards. In some places, fences put up to keep elk away from livestock impede the movements of other ungulate species (e.g. the fence along the west side of the NER). Identifying and removing or converting fences that exist within ungulate migration corridors should be a high priority in the future.
3. **Residential and commercial development — Moderate to High, Local.** Development in the private lands of the Jackson Hole area and beyond makes it increasingly difficult for ungulates to move freely through the landscape. Although each individual development has only a small impact, the cumulative impact of many developments can be large, and there may be thresholds of development beyond which animals are no longer able to move through an area. Furthermore, dense development within known migration routes and stopover sites can degrade important foraging areas. Development can also make it difficult to mitigate other threats, such as roads, on migrating ungulates. For example, it is difficult to provide safe wildlife crossings opportunities in an area that is heavily built-up. For some individual migration routes, the threat of development is high, whereas for others the threat is more moderate.
4. **Energy development — Moderate, Local.** Energy development, especially in southwestern Wyoming, is a threat to some of the migratory ungulates that move into and out of the Jackson Hole area. The threat is considerable for certain herds, but low to absent for other herds (e.g. those that migrate within Jackson Hole or through more protected lands around the JH area).
5. **Climate change — Low, Extensive.** Climate change is already impacting ungulate migrations and can be expected to impact them more in the future. Shorter, faster spring green-ups mean a shorter period of time for migratory ungulates to benefit from the highest quality, most nutritious grasses and forbs in the spring. With less of this high quality grass, animals can be expected to have lower body condition and lower pregnancy rates. It is not yet clear how well ungulates can adapt to these changing conditions or what the implications will be for their population sizes. A related threat from climate change is that it may contribute to animals switching from a migratory to resident strategy. If the nutritional benefits of migration wane due to climate change, resident strategies can become more dominant in the population. This could cause further competition between migrants and residents on limited winter ranges.
6. **Disease — Moderate, Extensive.** There are several significant diseases that pose a threat to migratory populations of ungulates. Chronic wasting disease (CWD) in cervids and pneumonia complex in bighorn sheep are just two important examples. Both diseases have contributed to population declines, and pneumonia has caused the elimination of several entire bighorn sheep herds in the state [144, 145]. Additionally, management strategies to curtail the spread of diseases, especially from wild animals to domestic livestock, poses a threat to migration. Elk migrations are short stopped at feedgrounds to prevent the commingling of elk and cattle, with the goal of preventing transmission of brucellosis. These management practices create an environment that increases exposure of wild elk to the brucellosis bacteria, causing a vicious cycle of greater prevalence among feedground elk [146]. While brucellosis is not a population-limiting disease among free-ranging elk [147], there is growing evidence that CWD is [144, 148]. By concentrating animals in one place, feedgrounds can increase the transmission of CWD in addition to brucellosis. Disease impacts are a pervasive threat to migratory populations, but

allowing animals to continue migrating may help diminish their exposure to disease and highly contaminated areas.

7. **Supplemental feeding — Moderate, Extensive.** Supplemental feeding includes elk that are fed at official feedgrounds and deer and moose that are fed at unofficial feed sites (usually places where private citizens put out food for animals). Supplemental feeding disrupts migration patterns by keeping animals near the supplemental food. It also contributes to disease risk and the associated threat to populations of migratory animals.

Opportunities and Cooperation

There are a number of things that can be done to reduce or manage the threats to ungulate migrations. The effects of roads can be mitigated by providing opportunities for wildlife to cross roads safely. These mitigations can range from public awareness campaigns to dedicated wildlife highway under- or over-passes. Highway under- and over-passes can be more than 80% effective at reducing wildlife-vehicle collisions and improving habitat connectivity for big game [136, 149]; however, they are not always feasible to install given costs, existing development along roadsides, and technical and social considerations. Currently, the Wyoming Department of Transportation is building six wildlife underpasses on Highway 89 between South Park Loop Road and Hoback Junction. Teton County has also commissioned a Wildlife Crossings Master Plan; this will provide recommendations for how to ensure safe wildlife crossings in priority areas in the rest of the county. Citizen groups and the Jackson Hole Wildlife Foundation have also been very active in promoting safe crossings along Highway 390, by installing fixed radar signs and dynamic message signs, working with WYDOT to reduce speed limits and raise public awareness about the presence of big game (especially moose) along this road.

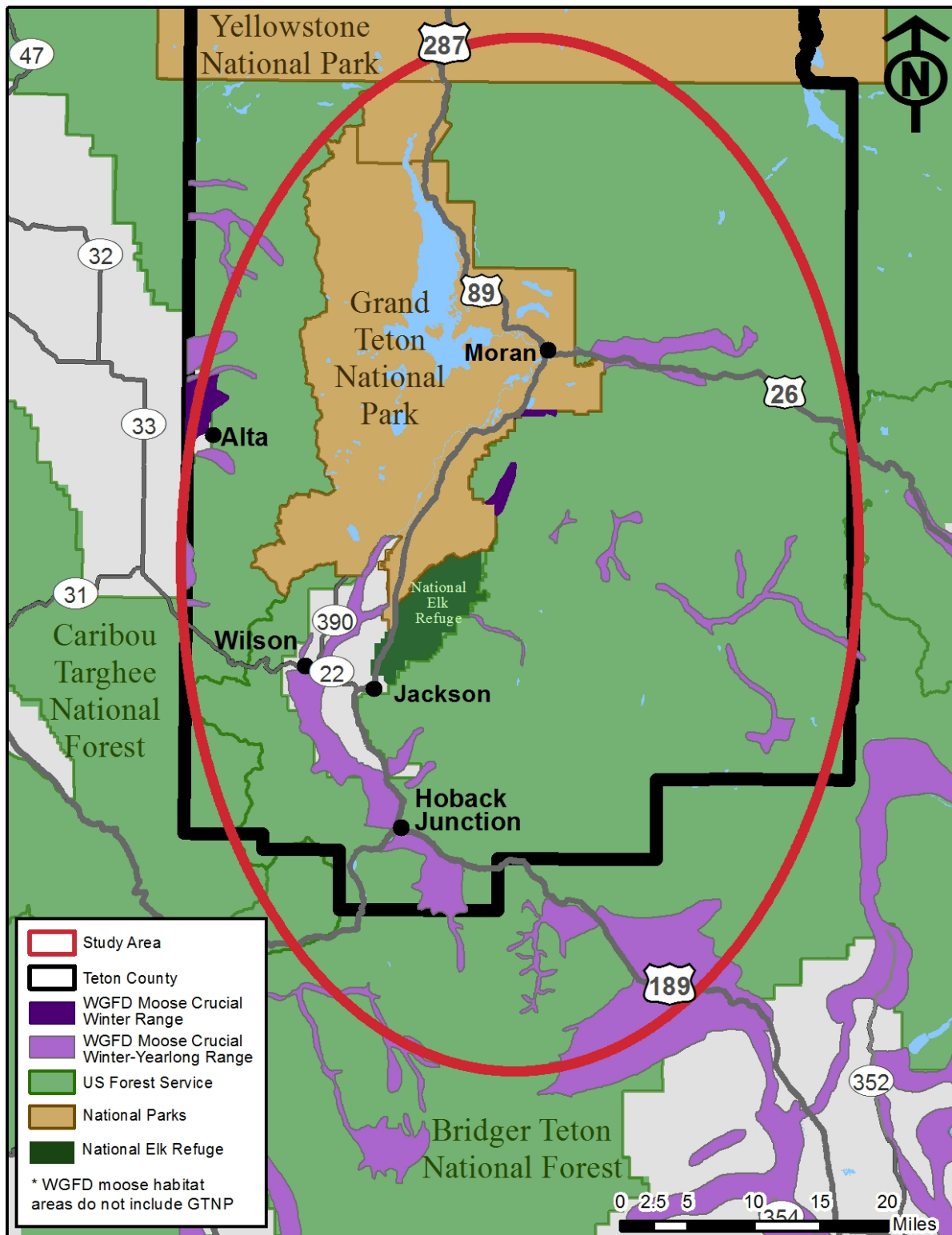
The effects of development can also be mitigated by protecting key migration corridors and habitat (especially winter habitat, which tends to be more developed). The Migration Assessment for Teton County, currently in development by the Wyoming Migration Initiative, and the recently completed Focal Species Habitat Mapping for Teton County, WY [150] can help to prioritize parcels of land for protection as conservation easements or limit development to minimize negative impacts on migratory wildlife.

Of course, conserving long-distance migrations that extend beyond the Jackson Hole area will require protections and partnerships beyond the Jackson Hole area. Although migrations are sensitive and easily disrupted, there has been a huge increase in public awareness and appreciation for ungulate migrations in Wyoming in recent years. This gives hope that diverse stakeholders will come together to conserve the Jackson Hole area's spectacular migrations for generations to come.

Information Gaps

- New migration routes are being discovered; documenting these routes is a key first step to conserving them.

[This chapter by Corinna Riginos]



Crucial moose habitat within the Jackson Hole area.

Moose

Overview

Moose is one of the most beloved and iconic species of wildlife in Jackson Hole. Traffic jams up when a moose is near a major road; tourist shops feature a huge range of t-shirts with moose on them; residents put up metal moose cut-outs to remind people to slow down for moose. Moose are very much a part of the cultural identity of Jackson Hole. And yet, their numbers have dropped dramatically in the last 25 years, and their future is far from secure.

Jackson Hole's moose are part of the Shiras moose sub-species, found only in the northern Rockies. Wyoming is home to nearly half of the world's Shiras moose. Although the sub-species is not currently considered threatened, many individual populations, including Jackson's, are undergoing precipitous declines. Protecting moose habitat may not be sufficient to conserve moose in Jackson Hole. We chose moose as a conservation target because of their recent declines, because their conservation needs are not fully met by our other targets, and because they are a culturally important species in this region.

Moose Ecology

Moose (*Alces alces*) is the largest member of the deer family. Moose are found in a belt that stretches around the northern hemisphere's boreal zone, including northern North America, northern Europe, and Russia; however, different areas are home to distinctly different sub-species of moose. Moose are thought to have arrived in North America via the Bering land bridge 10,000-14,000 years ago, and there are now four sub-species in North America. The sub-species found in the Rockies and Northwest, from Colorado to Alberta and British Columbia, is the Shiras moose (*A. alces shirasi*) — the southernmost in range and smallest in size in North America. Shiras moose weigh only about half as much as the Alaskan moose (*A. alces gigas*).

All sub-species of moose share some unique characteristics and adaptations. Most recognizable, of course, are the enormous paddle-like antlers that male moose sport for much of the year. Moose also have very long legs and two large, spreading front toes; these features help them to move efficiently on land and in water. Spreading toes help moose to distribute their weight so that they do not sink completely into deep snow. Long legs help them navigate through the deep snow in winter and over downed trees in the summer months. Long legs and spreading toes also allow moose to be extremely effective swimmers. Moose have unique nose flaps that shut underwater, enabling them to dive in shallow lakes and ponds, where they eat a variety of aquatic plants. They also have hollow hairs that are thicker at their ends than their bases; these features help provide insulation in the winter and give moose extra buoyancy in the water.

In general, moose prefer habitat near streams and ponds. Willows, found along streams, are a major part of their winter diet, and aquatic plants make up a significant portion of their summer diet. Moose also eat a variety of other trees (e.g. aspen), shrubs (e.g. antelope bitterbrush), and forbs. In the Jackson Hole area, they winter in low elevation riparian, shrub, and aspen habitats, and summer in higher elevation riparian corridors, montane meadows, and aspen habitats, with regular migration routes between winter and summer ranges. They may seek out conifer or aspen cover for shade in summer and shallower snow in winter.

Moose are very sensitive to temperature. They experience heat stress at temperatures above about 57° F (14° C) in summer and 23° F (-5° C) in winter [151], and exposure to heat stress has been linked to decreased body condition [152]. This may be one of the reasons that moose have declined substantially in recent decades in areas near the southern edge of their range, e.g. in Minnesota and

across the range of the Shiras moose in the Rockies [153, 154]. As discussed below, moose are being impacted by a variety of factors related to climate change.

History and Current Status of Moose in the Jackson Hole Area

Although moose are today an iconic feature of the Jackson Hole landscape, they were not always found here. There is no fossil evidence of moose living in this area, and early trappers and traders traveling through the Jackson Hole area in the 1830s-1860s did not observe any moose in the area [155]. All evidence indicates that moose began to appear in the Yellowstone and Jackson Hole areas in the late 19th century through a natural process of range expansion, possibly concurrent with human settlement, the rise of livestock production in the region, and predator reduction campaigns to protect livestock.

By 1912, there was a self-sustaining population of moose in Jackson Hole [156]. By 1950 there were about 600 moose in the area, by the early 1980s there were about 2,000, and by the early 1990s this number had exploded to somewhere between 3,000 and 5,000 moose in the Jackson Hole herd [156]. It is hard to imagine that moose were once reported to number as many as 50 per square mile in the Buffalo Valley and Spread Creek [155]!

Historically, as at present, the highest numbers of moose have been reported in the Buffalo Valley along the Buffalo Fork River, in the Pacific Creek drainage, along the Snake River, and along the Gros Ventre River and tributaries. The riparian vegetation, especially willows, provides essential food and habitat for moose. Moose that winter in the Buffalo Valley and the Pacific Creek drainage migrate north to higher elevation areas in the Teton Wilderness .



From a peak population estimate of 3,000-5,000 in 1990-1992, moose numbers have since plummeted at an alarming and persistent rate. Today, there are estimated to be about 500 moose in the Jackson herd [157]. Our study area also includes the Targhee moose herd on the western side of the Tetons, estimated to number 150-200 moose [158]. Due to budget limitations and the difficulty of the terrain, aerial surveys of this herd have been limited, but the herd is thought to be declining at a similar rate as the Jackson Hole herd.

Since the early 1990s, WGFD has dropped the number of hunting licenses permitted for the Jackson herd from 500 to 10, but the population of moose has not rebounded. Beginning slightly earlier, around the mid-1980s, the ratio of calves relative to cows also began to drop below 0.5 (1 calf for every 2 cows) and dipped as low as 0.2 (1 calf for every 5 cows) in the 2000s [157]. This ratio provides a good indication of the reproductive success of a population; the low cow:calf ratio shows that moose in the JH area are not reproducing as successfully as they are in other, more stable populations.

What has caused this precipitous decline in the moose population? In all likelihood, there are multiple factors at play [6, 157]. First, it seems that the high number of moose found here from the 1960s to early 1990s was not sustainable. Moose likely benefited greatly from the absence of predators and from colonizing a new habitat, but by the 1960s there was evidence that moose were significantly overbrowsing their habitat [155]. Managers and researchers generally believe that the moose population had exceeded the carrying capacity of this area and some kind of population decline was inevitable [154]. However, they also think that moose numbers have now dropped well below the expected carrying capacity. In fact, moose winter ranges are no longer overbrowsed [123], yet moose numbers have not rebounded. Research over the past decade points to a number of other factors impacting moose.

Beginning in the late 1990s, wolves and grizzly bears began to recolonize the Jackson Hole region, exerting new levels of predation pressure on moose. Although initial analyses indicated that wolves were not having a great impact on moose, potentially because of an abundance of easier-to-catch elk [124], new analyses show that wolf predation is actually the most important factor affecting moose population growth [159]. Studies of GTNP wolves also show that moose make up a variable and sometimes large fraction of wolf kills; in the winters of 2011-2013, the percent of located wolf kills that were moose ranged from 5-45% of all kills, and wolves seem to take down moose cows more than any other demographic category of moose [160–162]. However, the moose decline started before predators were re-introduced in the GYE so predators cannot be solely responsible for this decline.

The legacy of the extensive fires in the GYE, as well as several dry years in the 2000s, appear to have caused a decline in the overall quality of food available to moose. Moose captured in the Buffalo Valley in 2005 and 2006 showed evidence of nutritional stress, with surprisingly high adult mortality that was not linked to predation [124, 163]. A subsequent study found that forage quality was low in moose summer ranges in the Teton Wilderness, and individual animals that spent their summers in areas burned in the 1988 fires had lower rates of pregnancy and calf survival, leading to lower population growth rates than moose that summered in unburned areas [123]. A more recent analysis concluded that the 1988 fires have not have such a strong effect on moose, but instead a period of dry conditions from 2000-2007 had a substantial negative impact on their population growth [159].

Dry and hot conditions can challenge moose in several different ways, and a warming climate over the last 35 years has likely contributed to their decline. Dry spring and summer conditions, as well as rapid spring greenup, leads to less nutritious forage. A study across 18 Shiras moose herds in Wyoming, Utah, and Colorado found that dry spring and summer conditions and rapid spring greenup were both associated with lower moose reproductive success in the following year [154]. Starting in the 1980s, spring and summer conditions have become more hot and dry, and spring greenup has occurred more rapidly for these moose herds; these factors seem to have contributed to many herds' declines [154].

Warming temperatures are also probably stressing moose directly. Moose cannot tolerate heat well. They can shift their behaviors somewhat to avoid heat — by staying in the shade, for example. But doing this can limit their ability to forage in optimal habitat or forage for enough hours each day, leading to

lower body condition [152]. In the Shiras moose study, higher spring and summer temperatures resulted in lower moose reproductive success, probably because cows that experienced high temperatures entered their pregnancy with low body fat [154]. This was especially true in the 8 out of 18 herds that were declining, including the Jackson herd.

In recent years, two other processes related to a warming climate have also started to impact moose: increased tick loads and prevalence of carotid artery worm. Winter ticks tend to be more abundant on moose in warmer years and in animals living in the southern part of the Jackson herd's area [157]. Ticks cause moose to scratch themselves and lose hair, which exposes them to cold and stress, lowering body condition. Carotid artery worms (*Eleaophora schneideri*) have more dramatic effects on moose. These nematodes live in the carotid arteries of ungulates, substantially reducing blood flow to the head and brain. Infected animals can experience frostbite and gangrene on their ears, blindness, difficulty eating, and nervous system damage that leads to abnormal behavior (e.g. lethargy, aimless wandering). A survey of hunter-harvested moose from the Jackson herd in the 1970s found zero prevalence of carotid artery worm, whereas a survey in 2009 found that nearly 50% of moose were infected [164]. This dramatic increase in infection rate is probably linked to a warming climate; carotid artery worm is spread by horseflies that benefit from warmer conditions [164]. Although the effects of carotid artery worms are usually not directly lethal, they contribute to animals' poor body condition and chances of being killed by predators or vehicles.

Finally, human development has also probably contributed to declines in moose numbers. Although many of the Jackson Hole moose live in protected land in GTNP or BTNF, others live at least partially in the more developed private lands of southern Jackson Hole. Development has reduced moose habitat along the Snake River corridor, particularly between Moose and Wilson, and along the Flat Creek corridor through the NER, the town of Jackson, and residential areas south of Jackson. Although moose still use many of these areas, the amount of habitat and forage available to them is considerably less now than it would have been prior to human settlement.

Moose, like other ungulates, are also impacted by roads and vehicles. Roads cut through moose habitat in many places in the Jackson Hole area, threatening their habitat connectivity. The high traffic volumes on highways 22, 390, and 89/189 through GTNP make it particularly challenging for moose to cross those roads and expose them to the risk of being hit by vehicles. The junction of highways 22 and 390 and the first mile in all three directions from that junction together make one of the worst locations for moose-vehicle collisions in Wyoming.

Threats to Moose

1. **Climate change — warming temperatures and thermal stress — High, Extensive.** Moose are adapted to cold climates and have a limited capacity to tolerate heat. Behavioral changes can help moose reduce heat stress, but only up to a point. Climate change will bring a higher proportion of very hot summer days and winter days above freezing, placing a direct physiological stress on moose and inhibiting their ability to search for food. These conditions may make it difficult or impossible for moose to survive in the Jackson Hole area.
2. **Climate change — altered hydrological processes and forage quality — Low.** Hotter, drier spring and summer conditions, as well as associated changes to hydrological dynamics in riparian areas, are causing moose forage quality to decrease, impacting moose nutritional status and ability to reproduce successfully. This is likely to become more of a problem as the climate warms. However, the overall threat is probably less than some of the other threats posed by climate change; without other threats, moose might be able to cope with reduced forage quality.
3. **Increased frequency of forest fires — Moderate, Extensive.** Fires are expected to become much more frequent and extensive in the GYE over the next 50 years due to a warming climate. The impact of forest fire on moose forage quality is somewhat debated; small, patchy fires can

improve forage quality, whereas the extensive 1988 fires reduced forage quality. A greater concern is the impacts that frequent fires could have on forest cover and shade for moose. According to some predictions, large areas of the GYE may become treeless or covered in very small trees within the next 50-75 years [110]. This could have a serious impact on moose's ability to find the shade they need to survive.

4. **Increased incidence of vector-borne disease — Moderate, Extensive.** Carotid artery worms are already found in at least 50% of moose in Wyoming and are probably indirectly responsible for a large proportion of moose mortalities, since infected moose can lose vision and mental capabilities. Increases in this fly-borne disease are attributed to warmer climates that favor the host flies. Ever-warmer temperatures may facilitate further prevalence of carotid artery worm in moose.



5. **Roads — Moderate, Local.** Rising traffic volumes in the Jackson Hole area are making roads more and more impermeable for moose. Maintaining habitat connectivity is important for large mammals such as moose that have large home ranges. It is also critical for helping moose to cope with adverse impacts of a warming climate; animals that are constrained in their movements are less likely to have access to habitat features that help them thermoregulate, e.g. shade, water, and higher elevation areas. Roads are also a source of moose mortalities; although the total number of moose mortalities due to collisions with vehicles is small, every mortality is consequential for this declining population.

6. **Residential and commercial development — Moderate, Local.** Development is not a threat for moose in GTNP and BTNF lands, but it is a significant threat to moose in the private lands along the Moose-Wilson corridor and around Jackson. People tend to value real estate along rivers and streams, and valleys and bottomlands are the most developed and rapidly-developing areas in Jackson Hole. Thus development often falls right in the middle of moose habitat, reducing the forage available to moose and exposing them to the stresses of co-habiting with humans (e.g. being chased by dogs, getting trapped and entangled in fences and outdoor decorations, etc.).
7. **Recreation — Low, Extensive.** Hikers, bikers, and skiers often disturb moose from their habitat, likely stressing animals.

Opportunities & Multi-Partner Cooperation

Moose are a tremendously charismatic species and much-adored by residents and visitors alike. It is a species people are motivated to conserve. This is good, because the threats facing moose are considerable and their future survival in the Jackson Hole area should not be taken for granted. Climate change, ultimately the greatest threat to moose, is not something that can be stopped at a local or regional level. However, there is scope to help buffer moose against the worst impacts of climate change. Reducing other threats to moose is key. This includes minimizing further development in moose habitat and ensuring habitat connectivity through developed areas and across roads.

Moose are a WGFD Species of Greatest Conservation Need, and the decline of the Jackson and Targhee herds are a concern for WGFD and Grand Teton National Park. Citizen groups, particularly residents of the West Bank north of Wilson, are also motivated to protect moose. The Village Road Association, for example, has worked with partners and independently to raise awareness about moose on highway 390 and urge drivers to slow down and be alert. There is a significant need to know more about the movements and habitat use of moose in southern Jackson Hole in order to ensure that their habitat and connectivity among key habitat resources are both maintained. Conservation of moose in the Jackson Hole area will require vigilance, action to protect their habitat, and cooperation among multiple partners.

Information Gaps

- The effects of human disturbance, especially recreation, on moose are poorly understood.
- Key moose movement corridors and habitat use around Wilson and Jackson need to be studied.

[This chapter by Corinna Riginos]

Northern Goshawk — Indicator of an Intact Mature Forest Mosaic

Overview

Summer hikers along a deep-forest trail suddenly are alarmed by a high-pitched, rapid “kikikikikik” call and then they see a large bird diving at them, talons bared. Or in winter, a homeowner is looking out at his bird feeder to see a magpie disappear in a poof of feathers. These people have just witnessed a Northern Goshawk, the largest accipiter in North America.

Northern Goshawks — (*Accipiter gentilis* subsp. *atricarpillus*) — are year-round, but mostly unseen, residents in JH. To nest successfully, they require stands of older aged trees surrounded by an extensive mosaic of mixed coniferous forest. They will defend the area around their nests if anyone gets too close; and if continually disturbed, parents may abandon a nest site entirely. Goshawks can fly fast, weaving through trees to catch a variety of medium-sized birds (woodpeckers, grouse) and mammals (red squirrels, snowshoe hares) on the wing. In winter, goshawks will often move near residential areas in the valley where there is easy prey, such as birds and red squirrels at bird feeders. One may spy a mob of magpies harassing a goshawk out of a dense evergreen tree.

We have chosen Northern Goshawk as a conservation target to help focus attention on the large tracts of conifer forest that skirt the lower slopes of the Jackson Hole area. Connected forest provides habitat and corridors for larger mammals, such as moose, elk, mule deer, black and grizzly bears, as well as pine marten and rarely lynx. A suite of raptors — hawks and large and small owls — and many songbirds thrive in this forest. Squirrels, chipmunks, voles, and hares live within old snags, fallen trunks, and dense understory found only in older forests. Many of these species, including goshawks, are year-round residents and, therefore, rely on this forest for their persistence in our region. Goshawks need both extensive forest and a diversity of prey to sustain their populations, which makes them a good indicator species — a species that can be used as a proxy to determine the biological condition of a particular ecosystem — in this case the older-aged mosaic of lodgepole pine, Douglas fir, aspen, and some spruce and fir.

Threats to this forest include development, invasive exotics, forest management actions, and intense recreation, all of which can cause direct habitat loss and degradation as well as fragmentation. Stimulated by climate change, forest fires and pest outbreaks are expected to increase in their extent and intensity, adding to the changes to the forest mosaic.

Goshawk Ecology

Northern Goshawk is found in low densities in conifer and hardwood forests throughout most of northern North America where such forest habitats occur. Similar in size to Red-tail Hawk, the goshawk is the largest of three North American hawks in the genus *Accipiter*, which includes Sharp-shinned and Cooper’s Hawks. This genus has characteristic long tails, legs, and talons, all of which provide the agility to chase and capture prey through trees [165]. As opportunistic feeders, Northern Goshawks are successful in a variety of regional forest types — from boreal forests to ponderosa pine. In this region, they feed primarily upon red squirrels, Uinta ground squirrels, snowshoe hares, corvids (ravens, crows, magpies), grouse, and woodpeckers. They will sometimes consume small songbirds, raptors, and waterfowl. Their winter diet may vary from their summer diet to include more squirrels and rabbits. [22]

While they are often considered forest habitat generalists due to their use of a wide range of forest types, Northern Goshawks in fact have some particular requirements [166, 167]. In the western states, they are typically found in mature, older growth conifer forests and/or aspen stands during the breeding season. The type of nest trees can vary from region to region. In the Caribou-Targhee National Forest (CTNF), most goshawks use Douglas-fir for nesting (78%) [168]. However, a recent Jackson Hole

area study determined that here goshawks will nest in a diversity of suitable trees: 33% nested in spruce/fir forests, 25% in lodgepole pine, 25% in Douglas fir, and 17% in mixed conifer/aspen stands [169, 170].

Perhaps more important than tree species, a certain forest structure is required for breeding success [167]. In the CTNF along the western flank of the JH area, mature timber averaged 68% in the nest area [168]. Nesting birds often choose the oldest stand or tallest group of trees within the surrounding forest. Trunks of mature trees are relatively large in diameter and tall. Trees form a relatively high (70-85%) canopy cover — wide crowns (top branches) that together connect to shade the ground below. The forest understory is often relatively open with few saplings or entangled shrubs beneath, although this feature can vary. In lodgepole pine forests, the relatively even-aged stands typically have a high canopy cover. These high, dense canopies provide thermal regulation and cover from predators for nests, as well as provide open areas beneath for birds to seek prey [170]. It was previously thought that open woods enabled them to fly through the trees and that younger, denser growth would encumber flight and sight; however, goshawks are actually remarkably successful hunters even in dense forest stands (S. Patla, personal communication). Other research suggests that timbering can reduce nest occupation [171], emphasizing the need for larger tracts with older trees.

Nesting and foraging territory varies depending on region [166]. Most nesting occurs between 6,500 ft (2,000 m) and 9,000 ft (2,750 m) elevation, below the subalpine zone where subalpine fir and Engelmann spruce dominate. High intensity nest use in CTNF is estimated to be 200 acres (81 ha), and foraging territory around the nest sites was estimated to be 6,000 acres (2,428 ha). [168] In Teton County, WY, patch size for high intensity nest use may be 0.13-0.3 square miles (34-80 ha) and goshawk may need a foraging area of 9.3 square miles (24,087 ha) for sufficient food and undisturbed foraging [22, 170]. It is likely, that in the JH area, most territories where goshawks nest contain at least 50% mature forest habitat with the highest density of older trees surrounding the actual nest sites (S. Patla, personal communication). Whatever its territory, goshawks are particularly aggressive in defending it after the young hatch, often flying and screaming at intruders, including hikers and researchers.

Goshawks invest considerable time and effort in raising young each year. They start breeding in the JH area beginning in late March and early April. They lay 2-4 eggs by early May, with hatching occurring in early June. Young depend on adults and remain in the nest or nest tree for almost 5 weeks into the summer. For another two months, fledglings continue to depend on adults as they learn to feed themselves. Thus, for over six months this undisturbed core nesting and fledgling area is extremely important for reproduction and survival. Fledglings disappear by early to mid-September. Adults may move out of their summer home range between September and December, although not necessarily very far. Pairs seldom use the same nest tree year to year, and a territory may have up to 2-8 alternate nests in different trees. Adults will return to use earlier nest trees, sometimes years later. In two long-term studies, distance between nests used from one year to the next averaged over 1,600 feet (487 m) [167, 171]. In undisturbed habitat, goshawks can be found using the same territories for many decades (S. Patla, personal communication). Nesting is typically on northern or eastern facing slopes, perhaps because the trees tend to have larger canopies in more moist conditions [6]. To breed successfully, goshawks need large foraging territories with a variety of prey around traditional nesting areas [167].

As local migrants, goshawks may shift their foraging territory from summer on the mountain slopes to winter in the valley floor. Females range more widely, while males are more likely to stay within or near their breeding territory. Consequently, homeowners may see these birds in neighborhoods snatching birds at feeders. Also, these large accipiters have been observed in mixed conifer/cottonwood forest of the Snake River floodplain and coniferous forest at the base of the Tetons [170].

The JH area has a significant goshawk population, likely due to the large area of extensive forests covering gradual mountain slopes. Stands of lodgepole pine, Douglas-fir, mixed with some Engelmann spruce and subalpine fir, typically grow in a mosaic. The combination and density of tree species depends on the slope, soil, temperature, and moisture regimes, as well as fire history and other

natural disturbances. The large amount of conifer forest within the JH area is essential to the connectivity of conifer forest throughout the GYE [172]. The Bridger-Teton National Forest and Yellowstone National Park rank high in the ecological intactness analysis of forested areas compared with much of the Middle Rocky Mountain Ecoregion [172]. Presence of nesting goshawks is an indicator of the integrity of this regionally significant forest mosaic.

Status and Trends of Goshawks in the Jackson Hole Area

While goshawks are not endangered or generally rare, they are of interest to federal and state agencies. The U.S. Forest Service lists goshawk as a “sensitive species” and “management indicator species” [92]. When the U.S. Forest Service develops forest plans for timber harvest and thinning, managers assess the impact of these practices on nesting habitat and populations [173]. WGFD lists Northern Goshawk as a SGCN, Tier 1 species [22] and the Teton County NRTAB selected it as a focal species for the purposes of developing Teton County planning regulations [150].

Population assessments and trends are difficult to determine for goshawk. Birds are widely dispersed in large tracts of forest and their nests are hidden in high canopies. New models defining survey units incorporate slope degree (steepness) and aspect (direction of the slope), large unfragmented sections of forest, tree species, and age to help narrow the area for on-the-ground searches; but even so, it may take a team of surveyors many days to find a single nest [173]. It is impossible to tell older aged forest habitat from aerial photos, although experienced surveyors on the ground know it when they are in it (B. Bedrosian, personal communication). Often it is the response call to a recording or an aggressive parent bird that enables surveyors to zero in on the nest site. Determining nesting success, e.g. number of eggs and fledgling survival, to determine productivity, demands much more extensive efforts [173, 174]. Finally, survey parameters have been inconsistent over the years, making it difficult to compare the results of a survey some years ago with a survey today. However, survey parameters are now more consistent and models more refined, enabling researchers to track trends in the future [173].

National estimates indicate a decline in Northern Goshawk populations, as do more local surveys, but again trends to date can be difficult to establish. Federal and state biologists have conducted regional surveys in Wyoming and Idaho over the last decade or so [22, 171, 175]. Currently, it is thought that the Wyoming population is stable [22]. However, because this wide-ranging bird utilizes different habitats and prey in different locations, local assessments are important to assist with management. Teton County has mapped possible core nesting habitat for goshawks to indicate potential nesting habitat around the valley [170]. The USFS has commissioned an assessment of potential goshawk habitat within the proposed Teton to Snake Fuel Management Area [176]. This work can help determine where to concentrate survey efforts and what the JH area goshawk population may need in terms of forest patch size and forest type, age, and structure throughout the valley (S. Patla, personal communication).

Mature Older Age Forest

Goshawks require mature or older aged forest stands set within a mosaic of more extensive forested habitat — primarily lodgepole pine, Douglas-fir, and some aspen. Mature or older-aged forests (there is no formal definition of terms) differ from younger forests as different species of trees grow old in different ways. In general, an older forest will contain large living trees and snags (dead standing trees), numerous fallen trees, denser understory, a variety of different tree sizes, and more canopy openings. This variable structure creates habitat for a diversity of wildlife species for foraging, travel, security, and reproduction. Significantly, decaying trees are utilized by fungi, insects, and microbes that in turn provide food to many animals and increase the nutrients available for plant growth. Different types of prey are available, which are important for forest generalists and year-round predators such as goshawk.

Given the rugged topography and elevation changes in our area, the forest is rarely uniform in its mix of tree species or seral (development, or successional) stages. Disturbance from wind, fire, disease, and forestry practices have all affected this mosaic over time, particularly the age and size of stands of lodgepole pine and Douglas-fir on lower mountain slopes.

Tree species have different abilities to withstand fire. Lodgepole pine and Douglas-fir are both fire-adapted trees — they are resilient within certain ranges of fire frequency and intensity. With their thick bark, older Douglas-fir trees can withstand low flames of fire that kill the competing shrub and tree growth. They grow on relatively lower elevation or drier sites with typically more frequent, low intensity fires. Lodgepole pine does not have heat resistant bark, but the species can reseed readily after a fire. Seeds stored in “serotinous” cones — cones that stay closed on trees for years and then open after a fire — disperse on breezes into burned areas, where they germinate on newly exposed mineral soil in the sun, fertilized by ash without competition. As lodgepoles grow in relatively moist conditions with snow lasting into spring, most fires in this forest type are small, if at all. Only in exceptionally dry years are the conditions conducive to extremely large, stand-replacing fires such as the 1988 fires in Yellowstone National Park [7].



Wildfire occurs on different scales and intervals. Naturally ignited by lightning, fires start from random strike points and spread to a lesser or greater extent depending on a variety of factors such as fuel load, slope aspect, and weather. Burn patches restart succession in different locations over different years, adding to the mosaic of age classes within the larger matrix of forest over centuries. Historically these patches have been relatively small, except in extreme drought years. Some tracts have the chance to grow old trees while other areas are set back to earlier stages of growth. In a large, intact forest area, these older growth areas are able to move around the landscape over the centuries, always providing habitat, although in different places, for wildlife dependent on mature forests.

Insect outbreaks play a similar role as fire in forming the forest mosaic. Mountain pine beetles (*Dendroctonus ponderosae*) kill larger (>8-inch {20-cm} diameter), older (>90 year-old) lodgepole pines, thereby recycling nutrients and opening up new areas for seedlings that require sun. Over the years, infestations move around the landscape. These patches were relatively small in the past as the beetles were killed by extremely cold winters in the high mountains before they could multiply and spread extensively [177]. Douglas-fir beetle (*Dendroctonus pseudotsugae*) is another species of bark beetle specialized on weakened or drought stressed Douglas-fir [92]. Douglas-fir beetle infestations typically run for 2-4 years and can claim 100 trees in a patch [178]. Large forested landscapes can absorb these disturbances while retaining enough older aged habitat for goshawks and other mature-forest species.

Other Species that Require Large Tracts of Forest Habitat

Below are a few highlighted species that depend on older aged forests, some with extensive area requirements. Note, not all use the exact same mix of forest types — some use more aspen, others more spruce and fir interspersed with or surrounded by lodgepole pine and Douglas-fir; however, these creatures depend on this broad forest mosaic, particularly older aged trees, for a significant part of their livelihood. Loss of goshawk habitat could affect these species as well.

Raptors

Older aged and mature forest habitat provides for a complex of raptors — both hawks and owls. During the day, Cooper's and Sharp-shinned Hawks are able to navigate quickly through trees to pick off forest birds. Cooper's Hawks eat larger prey compared to Sharp-shinned Hawk — including collared-doves at bird feeders, while Sharp-shinned Hawks are more likely to predate upon smaller birds, such as Mountain Chickadees, Red-breasted Nuthatches, Pine Siskins, and Ruby-crowned Kinglets. Highly adaptable Red-tail Hawks hunt a variety of prey in open habitats and nest in trees often on the edge of in forests.

In the JH area we have six owls of all sizes that feed on prey from moths to pocket gophers between dusk and dawn. Common owls include Great Horned Owl, Saw-Whet Owl, and Boreal Owl. Three owls are SGCN: Great Gray Owl, Northern Pygmy-Owl, and Flammulated Owl. For many years, little has been known about the presence of owls, as they are hard to detect. Recent research, with the help of call-back tapes and now nighttime recordings, is helping managers understand where owls live and what they require. Managing for goshawk populations will help preserve this suite of species.

Great Gray Owl (*Strix nebulos*)

The largest owl in North America, measuring 27 inches (68 cm) tall, the Great Gray Owl is rare in Wyoming. This global species is found in North America and Eurasia in boreal and taiga forests. Except for a disjunct population in the Sierra Nevada of California, the southernmost population of Great Gray Owls in the U.S. breeds in the mountain ranges of northwest Wyoming. These statuesque owls, which can be seen along the Moose-Wilson Road in summer or Spring Gulch Road in winter, are a particularly popular subject of photographers and nature watchers in JH area. They are a state SGCN and NRTAB focal species.

In our area, Great Gray Owls prefer mature deciduous and coniferous forests comprised of lodgepole pine, Douglas-fir, aspen, and narrow-leaf cottonwood, along with spruce at lower elevations than most goshawks. Nest locations are generally in close proximity to foraging habitat, which can include some small to medium clearings, such as wet meadows and openings in mature forests. They regularly forage in closed canopy forests [170]. Cottonwood riparian habitat in the Gros Ventre and Snake River

drainages has been found to provide nesting habitat and important wintering habitat in the JH area [80]. In the non-breeding season, Great Gray Owls will also use more open areas to forage. The presence of suitable prey — primarily pocket gophers and voles — affects their movements both summer and winter [22, 174]. Remarkably, owls can detect and catch pocket gophers under two feet of snow [179].

Recent research adds to our knowledge of these great birds in the JH area [80]. Similar to goshawk, Great Gray Owls require large territories with mature forest habitat that features high canopy and alive or dead trees with large diameters for nesting. Nests are widely spaced — averaging almost 3,000 ft (1000 m) apart — well away from roads and undisturbed by humans. Core nest areas are estimated at 0.3 square miles (77 ha) and a foraging area of 3.2 square miles (829 ha). Great Gray Owls cannot manipulate twigs with their beaks to construct their own nests. They use large snags for nesting — often situated in the top of broken-off trunks, alternate goshawk nests, and witch's brooms. With the decline in the number of large broken-top snags, the use of goshawk nests may become even more important in the future for nesting Great Gray Owl.

Status and Trends: Although population trends in North America are considered stable, historical and recent trends for Great Gray Owl in Wyoming are unknown. One recent study in western Wyoming reported a decline in mean productivity from 3.0 fledglings/nest in the 1980s to 1.7 in 2013 — 2015. Nest structures and optimal locations including sufficient prey have been shown to be limiting factors for breeding in some areas [22].

Specific threats: Residential development in Snake River riparian forests from Moose to Snake River Canyon could reduce nesting and wintering habitat [170].



Northern Pygmy-Owl (*Glaucidium gnoma* subsp. *pinicola*)

This diminutive owl lives at the eastern edge of its range, which extends from Canada into Mexico, here in JH area. It is considered rare in Wyoming, having been documented breeding only in the northwestern mountains of the state. It does not migrate but may move to lower elevations in winter. The population status is listed as unknown by WGFD [22]. It is probably common where habitat is suitable (S. Patla, personal communication). The Northern Pygmy-Owl stands just under 7 inches (17 cm) tall. Its body is mostly gray-brown with a relatively long, barred tail and a streaked breast. It is distinguished from some other small owls by a white-flecked facial disc and two large eye-like spots on the back of its head, which help deter predators.

Northern Pygmy-Owl uses various forest types across its wide range. Observations in Wyoming record the species in mature spruce-fir forests dominated by tall, large-diameter trees as well as in mixed conifer lodgepole and Douglas-fir habitat. Other habitat elements within its range include mature, structurally diverse hardwood, conifer, and mixed forests and forests with high (> 50%) forest cover. Northern Pygmy-Owl is a secondary cavity nester, using either natural tree cavities or those made by woodpeckers. Several of these habitat elements are found in the forest mosaic preferred by goshawk. [22]

Status and Trends: Unknown. Wyoming Game and Fish Department and collaborators have conducted surveys for Northern Pygmy-Owl most years since 2009, including Bridger-Teton and Shoshone National Forests, along with an earlier survey for owls in the Grey's River. In all studies, Northern Pygmy-Owl was either one of the least-detected species or was not detected at all. Notably, these surveys did not include early morning surveys designed specifically for this crepuscular/diurnal owl, and therefore the low detection is likely an artifact of sampling method.

Specific threats: Loss of large trees and snags, loss of woodpeckers that create cavities in older trees, as well as pocket gophers and other prey, could affect breeding success.

Flammulated Owl (*Psilosops flammeolus*)

Almost the same size as Northern Pygmy-Owls at 6.75 inches (17 cm), Flammulated Owls are finely streaked and heavily mottled and sport tiny ear tufts similar to Great Horned Owls. Unlike other JH area owls, which are non-migratory, Flammulated Owls appear in early May after wintering in the Neotropics. They arrive after other owl surveys have occurred (typically mid-March to April) and, therefore, were not detected until recently when surveys were conducted in May [22].

The first documented breeding of Flammulated Owls in Teton County occurred in 2016 [180]. Flammulated Owl call-back surveys in mid-May and June were conducted at 160 sites in the Bridger-Teton National Forest, the National Elk Refuge, and on private lands in Teton County. Flammulated Owl was detected at 10% of the sites surveyed or a total of 18 individual detections, indicating a potential for 14 nesting territories. Results reveal that owls occur primarily in aspen trees within 110 feet (100 m) of conifer forest. Woodpeckers create nesting holes in the soft wood of aspens, and moths, the primary food for the owl, live in nearby conifers. This is significant new information.

Information gaps: There is still much to know about nesting habitat quality, migration routes, and wintering areas for Wyoming Flammulated Owls. Also, studies are needed on how management activities (e.g. timber thinning and harvesting and prescribed fire) affect nesting populations [22]. Consequently, at this time, there is insufficient information on trends and status and likely threats.

Mammals

Many mammals — both common and rare — depend on older coniferous forests in the JH area. Researchers have documented a variety of connections between individual animal species and the

complex nature of the conifer forest itself. Older aged forest has many decaying trees that nourish fungi. Red squirrels, flying squirrels, and southern red-backed voles eat or store mushrooms, thereby dispersing fungal spores. This activity helps to spread fungi throughout the forest. Fungal strands (mycelia) grow in and around fine tree roots and extend out into the soil beyond, relaying phosphorus and other nutrients to the trees, while using the carbohydrates generated by the trees for their sustenance. The health of forest trees depends on this fungal network [181].

Red squirrels stockpile cones of different conifers — lodgepole pine, Engelmann spruce, and more rarely Douglas-fir — in middens. Middens are heaps of scales left over after cones have been devoured for their seeds [182]. Squirrels store freshly harvested cones in these piles for their winter food supply, and they defend their stashes vigorously and vociferously. Squirrels often will burrow into these mounds, which are several feet wide and high, for winter cover as well. Red squirrels choose groups of older trees with high cone production for their central territory. Pacific martens are more likely to den in or around these middens, preying upon red squirrels and using their tunnels themselves [183]. Industrious red squirrels can harvest enough cones to affect movements of nomadic Red Cross-bills — these avian cone specialists must find their food elsewhere [181]. Red squirrels are significant players in the ecology of the forest.

Flying squirrels are also found in older forests: they use taller trees for long glides, feed on fungus and lichens, and den in decaying trees or holes created by woodpeckers. They are primarily nocturnal and, therefore, are rarely seen except perhaps at bird feeders in winter. Flying squirrels are preyed upon by owls and martens. Southern red-backed voles are found primarily under decaying, coarse woody debris and serve as prey for Boreal Owls, Pacific marten, and other weasels. [181]

Many other small mammals — often overlooked — reside here as well. Chipmunks, including two SGCN species — Yellow-pine and Uinta, both edge-of-range species — use a combination of mature forest types. Snowshoe hares, which were the most common prey of goshawk in a CTNF study [168], can attract endangered Canada lynx, albeit extremely rarely. (No evidence of lynx has been found in recent surveys of the JH area {J. Wilmot, personal communication}). Bats, pygmy shrew, golden-mantled ground squirrel, western heather vole, and western jumping mouse add diversity. Porcupines perch in trees and eat twigs and bark [22, 181]. These quilled creatures are now rarely seen in the JH area (B. Raynes, personal communication). Most of these critters are potential prey for larger birds and carnivores.

Many of these species do not travel far beyond the safety and food of the forest. Some species will not cross clearcuts or other large open areas, and therefore small populations can be diminished and cut off, potentially affecting the viability of their populations [181]. Undisturbed forest habitat is essential for the livelihoods of many small mammals.

Also, it is important to note the other mammals found in these forests: elk, whitetail and mule deer, moose, and black and grizzly bears all use the forest habitats for forage, cover, and movement. Contiguous forests provide routes both north and south and to higher and lower elevations depending on the time of year. The forests in the JH area help connect large mammals throughout the GYE.

Status and Trends: Most of the small mammal species described above are not monitored either because they are considered sufficiently secure or because they are difficult to study. Pacific martens are no longer considered SGCN [22] and may no longer be considered a management indicator species in future U.S. Forest Service reports. State game records provide limited useful information on the population trends of trapped animals. Still these wide-ranging, mature-forest species are worthy of attention.

Information Gaps: While most species described above do not require as large a territory as Northern Goshawk, together many species utilize large, intact, older forest to thrive. Little is known as to the amount and configuration of the forest mosaic necessary to sustain viable populations of these species. Reduction in older aged forests may cause declines in species diversity.

Threats to Northern Goshawk, its habitat, and associated species

Threats to Northern Goshawk are primarily threats to its extensive, undisturbed forest mosaic and prey. Several interrelated factors determine the loss, degradation, and fragmentation of this forest. Fire, insect outbreaks, and exotic species invasions are becoming more extensive and intense in part due to climate change. Development for new houses and commercial purposes can fragment the forest while also creating social pressure for forest thinning programs in the wildland-urban interface (WUI). Other agency management plans, policies, and actions can have beneficial or perhaps negative impacts on older forests. Many of the threats are interrelated and synergistic.

Wildfire — High

With climate change, the frequency and extent of wildfires are expected to increase; however, it is very difficult to predict to what degree and where and what the impacts may be. Some predictions indicate that fire rotations (the time it takes for a fire to return to the same location) to be reduced to less than 30 years vs. the historic return of 100-300 years by mid-century [110]. This could shift the vegetation to more Douglas-fir forest or even predominantly juniper at lower elevations, while higher elevations trees that require more moisture, such as spruce and fir, will not be able to reseed into current locations due to increased warmth and drought.

Invasive Plant Species — Low to Moderate

Invasive exotic plant species can alter the ecology of forests by overwhelming native plants, altering soil chemistry, degrading forage for elk and other animals, and increasing fire frequencies. Plant species invading forests in the JH area include thistles (*Cirsium arvense* and *Carduus nutans*), several knapweeds (*Centaurea* spp.), and leafy spurge (*Euphorbia esula*) [92]. Of high concern to forest managers is the progress of cheatgrass as it extends north from Sublette County into Teton County forests and sagebrush/grassland habitats (M. Daluge, personal communication).

Cheatgrass (*Bromus tectorum*), an annual grass introduced from Eurasia, is an increasingly pervasive threat in disturbed forest communities. The grass germinates in late fall to early spring and grows, flowers, and fruits faster than many native grasses and wildflowers in the spring. The original plant then dies, leaving behind dozens of seeds per plant. These inconspicuous grains or seeds are encased by stiff points called awns, so sharp that wildlife and stock animals will not eat the ripened grass. The 1/2 inch (10-15mm), brittle spikes enable the seed to spread by wind or to attach to fur, clothing, and equipment including vehicles for dispersal into new sites. Seeds readily germinate in a variety of soils, exponentially increasing plant numbers the following year and for several years to come. Soon they can overwhelm and shift the diversity of vegetation to primarily cheatgrass. [184]

In forests, seeds travel easily along disturbed routes of forest roads and trails. When a fire occurs, cheatgrass is positioned to disperse its abundant seed even more widely onto the exposed ground. Furthermore, its dried dense grass is readily ignited by lightning strikes, campfire sparks, or a lit cigarette. More area is exposed to more colonization, and the cycle continues exponentially. Extensive stands of cheatgrass fuel more frequent, larger fires, thereby eliminating trees, overwhelming native understory plants, and changing the habitat altogether. Of particular concern are south facing slopes (M Daluge, personal communication).

Mountain Pine Beetle — Currently low, potentially moderate

Mountain Pine Beetle (*Dendroctonus ponderosae*) is a native insect whose numbers have increased significantly over the last 20 years throughout the Rocky Mountains. Infestations affect large tracts of primarily lodgepole pine, but also limber pine and high-elevation whitebark pine (also see whitebark pine chapter). At one time, outbreaks of this native species were relatively small in extent or short-term as the beetles were curtailed in part by winter cold and a 1- to 2-year (or more) lifecycle.

However, with warmer temperatures, in many locations they have adapted to a shorter, one-year life cycle. Also, pines are more stressed by drought and therefore more susceptible to infestations. Historically, an interspersed of younger successional (seral) stages of trees due to natural fires prevented extensive insect outbreaks. In some areas, fire suppression policies since the 1950s have contributed to much larger stands of older trees, which are particularly susceptible to mountain pine beetles. Outbreaks of mountain pine beetle have been more extensive, particularly to the south of GYE. The concern is that as the climate warms, mountain pine beetle infestations will continue to expand, causing large gaps in the forest mosaic. This effect may be compounded by other effects of climate changes (see below). [177]

Of note: So far, the forest in the JH area is relatively untouched by mountain pine beetles [172] and the current outbreak is dwindling [185]. This region may have the greatest long-term prospect of resisting the devastation of the beetle [172] in the Middle Rocky Mountain Ecoregion.

Fragmentation by Development — Moderate, local

Private and U.S. Forest Service lands are being developed with increasing density locally along the base of the mountains between 6,200-7,800 feet (1890-2380 m) in Jackson Hole. The relatively gradual slopes, accessibility, and forest setting with scenic vistas make private homes highly desirable, such as in Wilson along Fish and Fall Creek Roads and above the town of Jackson. Snow King and Jackson Hole Mountain Resorts lease U.S. Forest Service lands for commercial and recreational attractions. Jackson Hole Mountain Resort has expanded its footprint of ski trails in the past few years. At this time, Snow King Resort is requesting permits to add new ski trails and features. All these activities require additional roads, tree clearing, and grading. Occupied houses, commercial buildings, and recreation areas add noise and often pets to the disturbance of intact habitat. Goshawks and Great Gray Owls in particular are sensitive to commotion during nesting season. Finally, once an area is developed, property owners want to be safe from wildfires. Federal land agencies are obligated to protect these wildland-urban interfaces (see below).

Recreation — Moderate, extensive

Recreational use of National Park Service and U.S. Forest Service trails by hikers, backcountry skiers, mountain bikers, and in some places off-road vehicles is increasing. Demand for new routes, such as the recent development along the crest of Snow King and in the valley of Cache Creek, continues. The request to open Wilderness Study Areas is also driven in part by recreation demand (see below). Unfortunately, trails can fragment the forest with increased presence of people, often with dogs. Bikers can come across animals unexpectedly. The noise and visual impacts often extend well beyond the path itself and can be a disturbance to goshawks and Great Gray Owls in particular, but also to small and large mammals, which are wary of canines. Off-road vehicle use can greatly magnify these disturbance effects. More subtle than many other impacts, trails are a form of fragmentation and degradation of forest habitat. Many wildlife species avoid trails and roads and adjacent areas beyond.

Indirect Threats or Contributing Factors

Wildland-urban interface plans and fuels management practices

The U.S. Forest Service and other federal landholding agencies are required by federal law to prevent encroachment of wildfires from federal land onto private lands. Consequently, the Bridger-Teton National Forest is working with the Interagency Fire Management Team to develop wildland-urban interface (WUI) plans. One example is the Teton to Snake Fuels Management Plan. The plan covers almost 80,000 acres (32,375 ha) west of the Snake River from Teton Village south to South Park along the Teton and Snake River Ranges and involves 1,679 private lots [176]. Such Interagency Fire plans include reducing snags for firefighter safety and clearing out understory plants within at least ¼ mile (400 m) of private property to prevent fires from using these “ladder” fuels to climb into tree tops, thereby

supporting high-intensity crown fires. The practices can include prescribed burns or thinning tracts with heavy fuel loads to reduce flame heights or to interrupt rampaging fires. These activities — which may be beneficial to other types of wildlife and for human property and safety — can eliminate crucial elements of an older aged forest that benefit Northern Goshawks, Great Gray Owls, Northern Pygmy-Owls, and other forest dependent associates, including small mammals.

The 2017 revision to the Teton to Snake Plan incorporates prescriptions for birds: Northern Goshawk, Great Gray Owls, Boreal Owls, Bald Eagles, and other raptors; mammals: wolf dens, bears, elk calving, and small mammal habitat; as well as mature stands. Research is necessary to determine the success of maintaining sufficient older aged habitat for this suite of wildlife in the years to come. Other U.S Forest Service lands adjacent to private land are targeted for additional WUI plans. Management decisions regarding fuels management practices will continue to be complex from both a societal and ecological perspective.

Changes in Wilderness Study Area Status: Palisades, Shoal Creek

Another factor in the future of older aged forest is the status of Wilderness Study Areas (WSA). Wilderness Study Areas are lands designated by Congress for additional review before being designated as “wilderness”. During the interim, such areas are managed in the same way as wilderness areas. Under the Wilderness Protection Act of 1964, “wilderness” is a legal classification of national public lands that are essentially untrammeled, free, and wild. At this time, the status of Wilderness Study Areas in Wyoming is under review. Some lands could have protections strengthened, others weakened.

Currently, a stakeholder group organized by Teton County Commissioners, as part of the Wyoming Public Lands Initiative (WPLI), is reviewing the status of Palisades and Shoal Creek WSAs. Wilderness designation would provide maximum protection from timber management, other extraction activities, and recreational development. These areas were designated as WSAs in part because they are roadless, undisturbed lands, which in this case include large tracts of forest. The Palisades WSA stretches south from Teton Pass to the Snake River Canyon and into Idaho. It encompasses a total of 134,417 acres (54,400 ha) with 71,780 acres (2,900 ha) in Teton County. This is a large block of forested land in the heart of the JH area and contiguous to forests extending south [186]. The Shoal Creek WSA is adjacent to the southern border of the 285,413 -acre (121,00 ha) Gros Ventre Wilderness Area, and ranges into Sublette County. Of the total 32,373 acres (13,1000 ha), over one-third is within Teton County. It specifically contains goshawk habitat [187]. Loss of these areas to other management options, particularly the demand for mechanical recreational opportunities or resource extraction, could increase forest fragmentation not only within the WSA areas but also the surrounding forest.

Forest Management Plans

As with all national forests, Bridger-Teton National Forest has a mandate to manage for multiple uses including timber management, recreation, and in more recent years, biodiversity. Resource extraction is currently minimal in the JH area. The most recent BTNF plan update [92], which covers a significant portion of the JH area, provides guidelines for maintaining natural ecological processes, managing a variety of successional (seral) stages, and sustaining biodiversity to the “fullest practical extent”. The plan proposes a future condition where “12% or more of existing old-growth forest has been retained to provide for old-growth dependent animals.... There will be old-growth islands within the overall forested area.” The plan states that old-growth dependent species of pine marten and goshawk would be replaced in some areas by animals that live around openings. These proposed actions cause concern that various silvicultural practices will be used to replace extensive tracts of intact forest with a greater diversity of more common species, at the expense of rare goshawks, Great Gray Owls, and other older-aged forest-dependent species. A more comprehensive update of the Bridger-Teton National Forest management plan is scheduled for 2020 (P. Bode, personal communication). The revision of the plan for

the adjacent Caribou-Targhee forest is also due in the next few years. Any such planning is complex, requiring an assessment of a variety of ecological [188] and social factors.

Lack of adequate support for weed control programs

Agencies in Sublette and Teton County are working together to try to control cheatgrass from invading the Bridger-Teton National Forest and other federal and county lands. Several herbicides are currently being sprayed from backpack sprayers and a more recently proposed measure is to spray from helicopters. There is hope for a bio-control that fosters a root-rot specific to cheatgrass [184]. A cooperative effort to develop new control agents, to locate new occurrences of cheatgrass, and administer control measures on the ground are critical for curbing cheatgrass. Diminishment of county or federal funding for these projects would limit this control, although many adjacent landowners see the visible benefits of these programs and are likely to speak up for continued funding.

Information gaps:

1. Regional population numbers and needs of Northern Goshawk, Great Gray Owls, Flammulated Owls, Northern Pygmy owls, etc., including their prey base.
2. Impacts of forest management practices on these populations.
3. Extent and impacts of recreational use on goshawk and associated species.
4. Climate change impacts on frequency and extent of pine bark beetle, wildfires, and changes in vegetation.

[This chapter by Frances H. Clark]

Whitebark Pine

Overview

Whitebark pine (*Pinus albicaulis*) is an iconic keystone species found at timberline and subalpine zones in the mountains of the JH area. These broad-crowned, often multi-trunked evergreens grow for centuries on cold, windswept, dry slopes and ridges where other trees cannot survive. Yet, despite their age and adaptability over millions of years, whitebark pines are now challenged by the combined effects of mountain pine beetle (*Dendroctonus ponderosae*) outbreaks, fire exclusion policies, and the exotic fungus white pine blister rust (*Cronartium ribicola*), which are all potentially amplified by climate change.

Adding to their unique nature, Whitebark pines have an essential, mutualistic relationship with Clark's Nutcrackers (*Nucifraga columbiana*), a flashy, noisy, black-white-and-grey bird. This relative of jays caches the highly nutritious pine seeds for its winter food supply and, in the process, plants the pine's future in ideal habitat. Without Clark's Nutcrackers dispersing seed, whitebark pine would not survive as a species. Such a tight dependence between a plant and animal species is rare.

Whitebark pines also provide essential food and services for other high elevation plants and wildlife. Grizzly (*Ursus arctos*) and black bears (*Ursus americanus*), red squirrels (*Tamiasciurus hudsonicus*), other small mammals, and mountain songbirds feast on the "nuts". The trees' presence serves to initiate forest succession, retain snow, slow spring runoff, increase summer stream flows, and maintain water quality—important ecological functions not only for wild communities on high but also for human settlements far below. Finally and ironically, this timberline tree may, in some ways, be more resilient to climate change than any forest tree that might replace it [189].



Unfortunately, the unique plant community centered on the whitebark pine is critically threatened throughout its range, including here in Grand Teton National Park and Bridger-Teton National Forest. We can see dead-gray forests while driving across Togwotee Pass, hiking to Amphitheater Lake, or exploring the Wind River Range. These ghost forests have succumbed to synergistic threats including fire exclusion, native mountain pine beetles, and currently most pervasive of all: white pine blister rust, an introduced fungal disease from Asia. These threats are enhanced in part by climate change and fire suppression. In other areas around the Rocky Mountain West, whitebark pine populations have declined by 90% over the past few decades [190]. In the GYE, roughly 50% of whitebark pine has been lost or compromised [191]. The loss of this keystone species will impact biodiversity, ecological services, as well as aesthetic and recreational qualities throughout our region.

Resource managers and researchers have been concerned about the future of whitebark pine and associated species and benefits for many years. *Whitebark Pine Communities: Ecology and Restoration* edited by Tomback, Arno, and Keane 2001 [192] provides extensive baseline knowledge drawn upon for this report. In addition, the Greater Yellowstone Coordinating Committee formed the Greater Yellowstone Whitebark Pine Subcommittee that has produced a Whitebark Pine Strategy for the Greater Yellowstone Area [191] and continues to update an Adaptive Action Plan [193] to provide a coordinated strategy for preserving and restoring key stands. The Whitebark Pine Foundation is another depository for the latest research. Selecting rust-resistant seed, managing key populations, growing and planting out seedlings, and restoring natural fire regimes are all elements of this complex ecological conservation effort.

We have chosen whitebark pine as a target species for its unique and essential ecological role in the JH area and throughout the Rocky Mountain West. This tree is irreplaceable, and its loss will affect the presence of Clark's Nutcracker, grizzly bears, and other wildlife in our region. While the prospects are daunting, especially in light of the prevalence, variability, and adaptability of white pine blister rust, a recent model indicates hope for maintaining and restoring viable whitebark pine populations over the long term [194]. Furthermore, this species may be more adaptable to warm weather and blister rust than previously thought [195]. The work and experience developed during the application of these adaptive management strategies can benefit other conservation challenges as well. Continued support of research and management action remains critical for the future of this iconic keystone species.

Description and Ecology

Whitebark pine is distinct and essential to the subalpine ecosystem in several ways. *Pinus albicaulis* is one of five "stone pines" in the world, with only one species in the Western Hemisphere, making it genetically unique in North America. It may have come across the Bering Strait land bridge between 600,000 to 1.3 million years ago, likely with the aide of its co-mutualist, a nutcracker (*Nucifraga* sp). Indeed, all the stone pines rely on nutcracker species to disperse their heavy seeds.

Whitebark pines grow in two broad areas of North America, one following the British Columbia Coast Ranges, the Cascade Range, and the Sierra Nevada, and the other covering the Rocky Mountains from Alberta to Wyoming, with its southernmost extent in the Rocky Mountains in the Wind and Salt River Ranges. Historically, it dominated many of the upper subalpine plant communities of the Western United States and has been a major component (10-15%) of subalpine forests in the northern Rocky Mountains. The GYE contains approximately 53% of whitebark pine in the U.S. [191, 196]. Grand Teton National Park includes 28,500 acres (11,535 ha) of whitebark pine. In roughly two-thirds of this area, it is co-dominant with other trees such as subalpine fir (*Abies lasiocarpa*) and Engelmann spruce (*Picea engelmannii*). In other areas, it stands on its own [197]. Only a very small percent (5%) of Wyoming harbors this tree [6]. The higher elevations of the JH area include a critical portion of this unique species' distribution for the GYE, Wyoming, and the western United States.

Often growing as wide as tall, particularly in open subalpine habitat, whitebark pines feature evergreen crowns studded with thick cones and supported by hefty, often multi-stemmed trunks. At 20-30 years of age, trees begin to produce purplish 3-4 inch (7.6-10 cm) cones, but they do not produce significant cone crops for another 50-80 years. Trees can remain fertile for over 1,000 years. Whitebark pines produce bumper crops of cones intermittently. This “masting” every 3-4 years may vary in location from year to year and can affect local wildlife populations [198].

As with all stone pines, cones are thick and do not open to disperse their seeds. Most of our North American pines have cones which open wide and release winged seeds light enough to disperse by wind. Whitebark pine cones are co-adapted with Clark’s Nutcrackers to disperse the embedded heavy seeds. Whitebark pine seeds have a mean weight of 175 mg compared to limber pine (*Pinus flexilis*), the next heaviest, at 93 mg, and to the familiar lodgepole pine (*Pinus contorta*) at 4 mg [192]. Whitebark pine seeds consist of 21% carbohydrate, 21% protein, and 52% fat. They contain more calories per pound than chocolate [199]. The protein includes sixteen amino acids, including lysine, which is particularly important for birds. Also, the fat provides high-energy food needed by wildlife in winter, such as hibernating bears. These seeds or “pine nuts” play a key role in supporting the subalpine to timberline wildlife community.

The seeds have particular germination and growth requirements. Only Clark’s Nutcrackers can disperse these weighty seeds for successful germination. Using their bills, the birds plant the seeds ½-¾ inches (1.2- 2.2 cm) deep in burned areas, openings, and exposed slopes at timberline and below in subalpine to montane zones. Fire is often important in clearing out plant competition, especially at these lower forested sites. Unlike other pines, and indeed other conifers, whitebark pine seed has complex dormancy requirements and may take 2-3 years to develop its embryo and sprout. As such, a seedbank remains viable for a few years after dispersal, allowing for at least a couple of chances to establish in favorable growing years.

Whitebark pines are particularly adapted to cold, exposed, windy conditions found at high elevations. They can also grow at lower elevations with sufficient sun, as found in fire-cleared areas; however, in these relatively moist, warmer, protected sites, lodgepole pine, subalpine fir, and Engelmann spruce are also well adapted. These species will eventually overtop and shade out whitebark pine by succession. Whitebark pine has the unique competitive edge only on the higher aspects of mountains, where it can become a climax tree. [200]

Key Associations

As a keystone species, whitebark pine serves a greater ecological role compared to other species in a given area. As a “foundational” species it defines the ecosystem structure, function, and process. It supports a range of species and services due to its large nutritious seeds and its ability to provide cover and structure in otherwise inhospitable habitat [191].

Clark’s Nutcrackers

Clark’s Nutcrackers have co-evolved with the only North American stone pine: whitebark pine. It is a truly remarkable species for its behavior and intelligence. Related to jays and crows — other members of the Corvid family — this medium-sized bird is readily identified by its long, strong bill, slate-gray head and body, with a contrasting flash of white and black on its wings and tail as it flies. While hiking at high elevations in summer, one often hears the raucous calls of family groups. Perched in the tops of trees and using their strong bills, nutcrackers jab open the thick resin-coated cones, deftly pick out the seeds, and toss up to 150 (usually an average of 77) seeds back down into a special sublingual (beneath their tongue) pouch to transport the seeds to cache sites. With bulging throats, birds will travel a few yards to several miles to an open, dry, often steep mountain slope, including areas where there are

high snow loads, poor soil development, and short growing seasons [191, 193]. Often nutcrackers prefer caching seeds in recently burned areas.

Nutcrackers are remarkable in their diligence and memory. A nutcracker will use its bill to swipe open a hole $\frac{1}{2}$ "- $\frac{3}{4}$ " (1.2-2.2 cm) deep, chuck up the seed from its sublingual pouch to the front of its beak, and place the seed in the hole, for an average 2-5 seeds per hole. It sweeps soil over the hole, obscuring the location, and then pauses to calculate the position based on surrounding features. Then it starts another hole near by. It is estimated that a nutcracker can bury over 32,000 seeds in thousands of locations, remembering the exact spots for at least 180 days, if not a year [201]. They typically retrieve about half of the total harvest. This will be the critical food supply for adults in winter and families later in the season. Often other nutcrackers will choose the same area, thereby forming communal stashes.

In the GYE, nutcrackers feed on invertebrates and conifer seeds — particularly Douglas-fir, whitebark pine, and occasionally limber pine [202]. When whitebark pines have a low production year, nutcrackers fail to breed, likely due to insufficient nutrition from their seeds [203]. In productive years, nutcrackers will arrive in pine stands in June and by August start harvesting seeds for the winter. Nutcrackers breed in early March to mid June in the JH area [202]. Both parents have brood patches to take turns incubating the eggs through the cold. In some populations, hatchlings are fed the high-fat, protein-rich seeds retrieved from windswept slopes or other areas where snow melts relatively early. For several months thereafter, fledglings travel in noisy family groups, watching their parents find and stash seed. Juveniles must learn this essential survival behavior by early fall when they have to do it all on their own. In low mast years within a region, nutcrackers will travel widely to look for other whitebark stands or instead forage in Douglas-fir, limber, pinon, and ponderosa pines, often helping to disperse these species' seeds as well. However, while nutcrackers can survive on other foods, whitebark pines absolutely depend on nutcrackers to spread their seeds; an unusual obligate mutualism between a plant and bird species.



Grizzly Bears, Red Squirrels, and Whitebark Pine

Whitebark pine is key to another intriguing relationship: in this case between the common red squirrel and endangered grizzly bear [198]. Red squirrels clip off ripening whitebark pine cones held high in the tree's canopy, far out of reach of bears, and store the cones in middens for their winter food supply. At higher elevations, red squirrels live in dense spruce-fir or even lodgepole pine forests and forage upslope for whitebark pine. Red squirrels are vociferous in defending their caches, but by making so much noise they help attract bears to the middens. In bountiful years, grizzly bears will raid these middens and eat primarily whitebark pine seeds from summer to fall until they hibernate. The bruins may even return to squirrel middens the following year. The large seeds are highly nutritious, with high fat content which readily converts to animal fat needed for hibernation. Grizzly bears are also known to eat a squirrel or two while they root for the cones. It is interesting that bears carefully remove the surrounding cone parts to consume only the seeds, not the bracts or scales. Any seeds that happen to be left behind do not germinate.

Whitebark pine seeds benefit grizzly populations in the GYE in several ways. Female grizzlies consume twice the amount of seeds compared to males. With the added nutrition, sows are more likely to raise three vs. one or two cubs successfully. Also, the high-elevation food source diverts the bruins from seeking food at lower elevations where they are more exposed to people around developments, ranches, and roads. Consequently, fewer bears are trapped or shot as nuisances or killed accidentally by vehicles [198].

This relationship of grizzly bears and whitebark pine seeds is, for the most part, characteristic in the GYE [198]. While grizzlies eat a variety of foods, in the GYE whitebark pine has been one of their four top food items, which include elk, cutthroat trout, and army cut worms. Introduced Lake Trout have significantly reduced the numbers and accessibility of spawning Yellowstone Cutthroat Trout. Elk numbers have declined over the years for a variety of contributing causes [204]. In the GYE, the reduction of whitebark pine by over 50% is a concern for sustaining grizzly populations in the JH area national parks and forests. However, others cite recent research indicating the grizzly bear as adapting well to other food items such as ungulates, roots, and truffles and assert that the bear population is reaching its carrying capacity, not declining due to lack of pine seeds [197].

Other Associates

While few other creatures benefit as directly as Clark's Nutcrackers and grizzly bears, other birds and mammals utilize the nutritious seeds and benefit from the structure of whitebark pine habitats. Several songbirds, such as woodpeckers, nuthatches, and Pine Grosbeaks, often forage, perch, and nest where whitebark pines grow. At timberline, whitebark pines provide nurse sites for other trees, shrubs, and wildflowers to become established. Yellow-pine chipmunks and golden-mantled ground squirrels harvest cones, often to have them taken by ravens, crows, or Stellar's Jays. Dusky Grouse feed on needles and buds in winter. None of these species are dependent on the whitebark pine community; however, the trees' presence enhances species diversity and numbers at otherwise inhospitable elevations.

Ecological Services

Depending on the location and situation, whitebark pine provides significant ecological services. Over time, seedlings grow up to provide shade and trap snow which help to provide shelter and moisture for seedlings of spruce and fir and other plants, beginning the successional process and slowly altering organic matter, soil nutrients, and water-holding capacity. Stands in alpine areas help to stabilize soil and

accumulate snow, retard spring run-off, reduce flooding and erosion, and improve water quality. These services also benefit wildlife and human communities downstream [22].

Status and Trends of Whitebark Pine in the Jackson Hole Area

Whitebark pine is receiving considerable attention from federal agencies, researchers, land managers, and non-governmental organizations (NGOs). *Pinus albicaulis* is listed as a candidate species under the Endangered Species Act and may be proposed for listing when funding and workload priorities for other listing actions allow [205].

The Wyoming Game and Fish Department emphasizes the whitebark pine community in its State Wildlife Action Plan and designates the closely associated Clark's Nutcracker and grizzly bear as SGCN [22]. Regionally, the Greater Yellowstone Coordinating Committee has taken a leading role by appointing the Greater Yellowstone Whitebark Pine Subcommittee to study the species' regional decline and management actions to restore it on the landscape within the GYE. Grand Teton National Park monitors and tracks whitebark pine.

These sources indicate a concern about whitebark pines decline. The Whitebark Pine Strategy for the Greater Yellowstone Area cites 40% of the GYA stands contained some level of canopy mortality in 2007 [191]. A 2008 study indicated mountain pine beetle activity in 50% of stands. A 2009 survey throughout the region showed 50% of all stands having high to complete mortality of overstory trees. Blister rust infection rates in some research plots were as high as 84% mortality. The SWAP states an 80% mortality of whitebark pine in the GYE [22], and the Whitebark Pine strategy report [191] states mortality of trees in some regions of the Rocky Mountains is as high as 90%. Whatever way measured, the species has been in serious decline.

Threats

Historical forest management practices, two pests — native mountain pine beetle and nonnative white pine blister rust — and effects from climate change are interrelated threats to whitebark pine and its high-elevation associates. Loss of support of cooperative research, planning, and management action would reduce hope for the trees' long-term survival.

White Pine Blister Rust — High

While mountain pine beetle infestations are variable and are waning in the GYE for the time being (see below), blister rust is becoming more prevalent and is killing trees of all ages throughout much of the area. White pine blister rust is an introduced fungal disease that arrived in the U.S. from Asia via Europe in the early 1900s on forestry stock. It infects five-needled pines, such as towering eastern and western white pines, heavy-seeded limber and whitebark pines, and ancient bristlecone pine. The life cycle of *Cronartium ribicola* is complex with 5 different kinds of spores alternating on four host species: from white pines to primarily shrubby *Ribes* sp. — wild currants and gooseberries — or to a lesser extent colorful paintbrushes (*Catilleja*) and louseworts (*Pedicularis*). Fungal spores circulate by wind, land on hosts at particular stages of growth, and colonize readily with conditions of high humidity and cool temperatures. Thus, the spread of blister rust varies depending on the weather and climate, topography, proximity of infected plants, the individual pine's genetic resistance, and the particular genetic strain of the rust itself. [177, 206, 207]

Blister rust spreads unseen at first. Travelling by wind from *Ribes* leaves, spores lodge on the stomata (tiny openings) of pine needles or on open wounds. They quickly germinate and begin to colonize into the vessel system of twigs and eventually spread down into the tree trunk. Blister-like cankers erupt, exuding a different type of spore that will continue to infect and reproduce until the tree's vessel system is so clogged and the protective bark is so ruptured that the tree dies. Visible evidence of

blister rust includes reddish dead needles, orange swellings or blisters on twigs, dead twigs, and trunks with wounds seeping resin. Rodents will gnaw at these wounds, adding to a tree's vulnerable condition. It can take at least a year for signs of infection to appear. [177]

All sizes of pines succumb to blister rust, either within months for seedlings or years for large trees. In large whitebark pines, blister rust can reduce growth, cone production, and seed size for years before rust girdles the trunk, killing the whole tree. Meanwhile, rust continues to spread infectious spores throughout the pine community.

In areas of high blister rust infection and consequently low seed production, researchers are concerned that Clark's Nutcrackers will consume most of the seeds instead of leaving some cached seed for regeneration. In Glacier National Park, which has lost a significant component of whitebark pine, Clark's nutcrackers are now a rare visitor [199] (D. Reinhart, personal communication). The reduction or loss of nutcrackers in the region would further reduce whitebark pine reproduction [191, 202].

Mountain pine beetle — Medium

Mountain pine beetle (*Dendroctonus ponderosae*) is a native species with intermittent outbreaks on pine species across the west. In the past, cold winter temperatures have limited infestations to primarily lodgepole pines at lower elevations and to one brood cycle every couple of years. However, climate warming and beetle adaptations have shortened and synchronized the beetle's generation time to only one year in many areas. Within the last two decades, beetles have infested areas of high elevation ecosystems that were once considered beyond threat [191, 208]. Drought can also increase vulnerability to infestations. Fortunately, at this time in the GYE, mountain beetle infestations appear to be waning [197].



More specifically, these small beetles attack large, mature whitebark pines, as well as limber and lodgepole pines. Beetles require trees with sufficient cambium (the vessel and growth cells just under the bark) to support larvae. Typically, infected trees tend to be greater than 8 inches (20 cm) in diameter and older in age, such as 80 years old for lodgepole pines. Under certain conditions, female beetles mass attack the lower 15 feet (4.5 m) of tree trunks, boring through the bark, then creating vertical galleries into the phloem or sap system just underneath to deposit eggs. Coincidentally, adult beetles transport fungal spores into the tree which grow fungal strands (mycelia) into the phloem and sapwood (outer wood). Larvae excavate galleries horizontally while consuming the plant's sap and also the fungus. Together, the beetles and fungus deprive the tree of nourishment and water, clog transport vessels, and limit resin defense systems [177]

Healthy trees can “pitch out” (overwhelm with resin) attacking females, a reaction indicated by scattered wads of consolidated resin, sawdust, and beetles around holes on the tree trunk. But with trees weakened by drought or other pests such as blister rust, beetles overwhelm the tree's defensive resin system. Often within a year or two, the whole tree will die, leaving clues as to the cause; rusty-red needles, a trunk peppered with tiny holes often obscured by mounds of cream-to-red exudate, and fine sawdust at its base. Bark flakes off, revealing the extensive system of beetle galleries. Trees may also have large holes from woodpeckers prospecting for beetles. Sawed logs exhibit a bluish-gray discoloration on the outer rings of wood caused by the fungus. [177]

As pines have co-evolved with mountain pine beetles, there is a historical resilience to intermittent epidemics. However, with additional stressors of climate change causing drought, shorter beetle generational times, and increased incidence of fire, ecologists are concerned that both lodgepole and whitebark pine communities will shift to different community types.

Climate change, direct effects — Medium

Climate change can exacerbate current declines, potentially limiting populations to mountain tops or northern portions of the species' range [191]. Warmer temperatures both in summer and winter, as well as drought, could create novel types of environments which are not suitable for growth. More tolerant species such as spruce and fir may be able to succeed into higher elevations where whitebark once dominated. Increased frequency and severity of fires or mountain pine beetle outbreaks may eliminate whitebark pine trees before they reach sufficient reproductive age at 40-80 years old. Finally, the enhanced spread of white pine blister rust can eliminate trees of all ages.

On the other hand, some researchers propose that whitebark pine may be more adaptable than first thought [195]. Pollen samples from lake-bottom cores indicate that whitebark pines grew at a variety of lower elevations and higher temperature regimes thousands of years ago. The trees' distribution was eventually limited by succession of other species slowly returning after the retreats of glaciers. Still, while whitebark pine has the genetic capacity to adapt to warmer summers, it may not be to the warmer winters predicted in climate change. Other stressors may inhibit population establishment and increase [191].

Indirect Threats or Contributing Factors

Loss of support for research and cooperative work

Ongoing support for research and planning is essential to the future of whitebark pine. While the task to sustain whitebark pine communities appears daunting, the species is unlikely to maintain viable natural populations without management intervention.

Devising effective management plans is complicated not only by the ecology of the whitebark pine community and its threats [196], but also by our cultural restrictions. Working groups (see below) are researching genetics, climate change predictions, seed collection and propagation techniques, as well as planting practices and microsites. They are developing cooperative plans for fire and disease

management, along with reintroductions using sophisticated models incorporating on-the-ground observations to discern best options for the long term. However, some ideas meet social resistance: translocating different phenotypes to new locations or “assisted migration,” conducting experiments within designated Wilderness Areas and National Parks, and thinning and burning treatments. In addition, securing federal grants for these types of programs is always a challenge. Indeed, maintaining whitebark pine on the landscape is a decades-long conservation investment.

Forest management practices and succession

Historical fire exclusion efforts in some areas have prevented fires from spreading into whitebark habitats. Consequently, spruce and fir have succeeded to overtop this shade-intolerant species [190]. Stressed from competition with spruce and fir, whitebark pines may be less resistant to mountain pine beetles. Also, with denser, more extensive spruce-fir forests, reintroduction of natural fire becomes a complex management challenge. One author argues that “Restoration and maintenance of native fire regimes... is the most important management action... to ensure persistence of whitebark pine” [201].

Future management plans can impact the persistence of whitebark pine. The natural fire return interval for whitebark pine communities is complex and variable, ranging from 60-300 years [190]. Prescribed fires can reduce competition from Engelmann spruce and subalpine fir and expose soils for seed establishment by nutcrackers, thereby facilitating early successional stands of whitebark pine. Furthermore, periodic fires typically prevent the growth of extensive, dense tracts of forest with accumulated fuel loads and continuous canopies, which increases spread of stand-replacing fires, diseases, and insect pests, such as mountain pine beetles. Periodic fire helps to clear out dead and old conifers, opens areas to light, and recycles nutrients, thereby encouraging establishment of young stands to grow once again into ancient trees.

Cooperation and Opportunity

While threats to whitebark pine appear overwhelming, many groups are coordinating priorities to sustain the species in the region. Here is a summary of some recent findings and efforts that provide encouragement.

Recent findings

- A recent model indicates that with a “low to moderate level of management action” it is possible to maintain and restore viable whitebark pine populations on the landscape [194].
- The JH area has substantial Douglas-fir forests that have sustained Clark’s Nutcracker populations in low whitebark pine mast years [202]. Perhaps this alternative food source will be sufficient to attract enough nutcrackers to this region to distribute whitebark pine seeds naturally in years to come.
- Whitebark pines have an ancestral genetic resistance to white pine blister rust. Both whitebark pine and the white pine blister rust evolved together in Asia millennia ago, before travelling their separate ways to the western United States. It is likely whitebark pines retain rust-resist genes. In fact, resistant strains have been found here in the JH area [195].

Cooperation

In 2000, the Greater Yellowstone Coordinating Committee established the Whitebark Pine Subcommittee to coordinate whitebark pine efforts. This workgroup, which consists of several federal agencies, has produced and continues to update an Adaptive Action Plan [193]. It maintains an annotated

bibliography of published research and holds annual meetings to present current research findings. Furthermore, in 2010 it established a whitebark pine distribution and condition assessment for the GYE in partnership with the Greater Yellowstone Monitoring Network (GRYN) to develop monitoring protocols. They plan to monitor the health, status, and populations of the pine in the GYE indefinitely [191, 193].

The Whitebark Pine Subcommittee is applying this research to on-the-ground actions. It has determined “priority resource zones,” rust resistant “superior” trees, and “restoration target areas.” It works with the U.S. Forest Service and Grand Teton National Park to collect, test, and propagate rust-resistant strains for outplanting into “restoration target areas.”

More specifically, the JH area has several components described in the Adaptive Action Plans. A cluster of 5-6 “seed source protection priority areas” lie within the Tetons, with additional sites south of Jackson. These are at the core of the protection areas covered for the GYE. “Genetically unique areas and rust-resistant elite tree locations” have been found within Grand Teton National Park and Caribou-Targhee National Forest to the west. Indeed, Grand Teton National Park protects the 1st and 4th most rust-resistant trees tested to date in the GYE [185]. Furthermore, the JH area encompasses “restoration target areas.” The JH area has a central role to play in efforts to retain whitebark pine in the GYE.

Also, the Wyoming Game and Fish Department supports whitebark pine efforts. Its most recent plan outlines steps for management of whitebark pine habitat, including restoration of native fire regimes, removal of insect and diseased trees in surrounding areas, collection of and eventual planting of rust-resistant seed, and thinning existing stands of whitebark pine to increase individual tree vigor [22].

In short, we have a committed community of agencies, researchers, and supporters to help sustain these iconic trees and their wildlife communities in the mountains that surround us.

[This chapter by Frances H. Clark]

Watch List

These species and habitats are ones we did not select as top-priority focal conservation targets for the Jackson Hole area. Nevertheless, they are species and habitats of importance and conservation concern. We highlight them here to acknowledge their importance and need for protection, and to explain why we did not choose them as conservation targets.

Large carnivores (wolves, grizzly bears, mountain lions)

A healthy population of large carnivores is one of the hallmarks of the Greater Yellowstone Ecosystem and something that sets this region apart from many others in the continental United States. Wolves, grizzly bears, and mountain lions are all integral players in the ecosystem. They are also all threatened in various ways. However, wolf and bear populations have increased substantially in the last two decades and are stable for the time being. Mountain lion populations are declining in the Jackson Hole area, but they are not a globally threatened species. Conserving these species in the JH area and the GYE is a high priority, but will require coordinated efforts at a regional scale. For these reasons, we did not choose any of the large carnivores as conservation targets, but we recommend that their status be closely monitored.

Aspen

Aspens are one of the most valued habitat types in the western US and are second in wildlife diversity to riparian habitats in Wyoming. They support 17 SGCN in the JH area. With their rich understory of shrubs and wildflowers, aspen stands provide habitat for many animals. Large mammals such as elk, moose, and deer feed and find shelter in their stands. Small mammals such as porcupines, squirrels, pocket gophers, mice and voles use aspen part of the year. Beaver cut aspen for food and construction materials. The soft-wooded trees provide essential nesting sites for woodpeckers and sapsuckers, whose holes later are used by breeding American Kestrels, Flammulated owls, and many smaller birds such as chickadees, nuthatches, Mountain Bluebirds, and Tree Swallows. Many aspen forests are renewed by fires, and if they do not burn periodically, some areas will become dominated by conifers. They have been the focus of management efforts for years to retain their biodiversity and value for preserving stream flows.

The status of aspen in the Jackson Hole area and the degree of decline, and therefore threats, are difficult to determine. Members of an informal Aspen Working Group are researching the extent of historical stands; burn history e.g. location and frequency of burns; and current health and age of populations. Aspen are common in the low hills and lower mountains slopes around the JH valley, extending into the Gros Ventre and Wind River Ranges. Several stands have burned over the last 10-20 years — either through controlled or wildfires, adding to the diversity of age-classes. Climate change could affect these forests by increasing drought that could stress and kill the trees, and/or the frequency and intensity of fires. Determining management strategies amidst this uncertainty is particularly complex. We place this important plant community on our watch list because it is currently relatively abundant and because of the high uncertainty about how future drought and fire frequency will affect aspen stands and their associated species.

Pika

Pika are small mammals that live in the rocky screes of the alpine zone of the Tetons and mountains across the West. They are significantly threatened by climate change in the GYE and across their range. Pika cannot tolerate high temperatures in the summer and rely on deep snowpacks in the winter to protect them from exposure. As the climate warms, summers are getting hotter and winter

snowpacks are becoming less reliable. Although the threat of climate change is considerable, recent research indicates that pika may be more adaptable than previously thought (E. Hall, personal communication). Pika inhabit a unique habitat; they would not be considered an umbrella species. For these reasons, we put pika on our watch list but did not choose them as a conservation target.

Loons, harlequin ducks, trumpeter swans, and amphibians:

See Snake River and Wetlands Complex chapter.

Meso-carnivores (lynx, wolverine):

Lynx and wolverine are both vulnerable species throughout their range. Wolverines are particularly threatened by climate change. Wolverines are known to occur in the Jackson Hole area, and lynx have been found here historically. However, detecting these animals and surveying their numbers is extremely difficult, making it virtually impossible to assess any status or trend relative to historic numbers. For this reason we do not include lynx and wolverine as conservation targets, although we recognize the considerable conservation need surrounding these species.

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Long-term impacts of ski piste management on alpine vegetation and soils

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Summary

1. Downhill skiing, the machine-grading of slopes and the use of artificial snow induce major disturbances to the environment of alpine ski resorts. Our study aims to quantify the impacts of different ski piste management types (graded/ungraded; with/without artificial snow) on the environment and its development over time.

2. We re-sampled study plots established 8 years earlier and compared vegetation and soil characteristics on different types of ski pistes to adjacent off-piste control plots, and analysed vegetation changes over time.

3. Generally, machine-grading led to a decreased plant cover and plant productivity, and increased indicator values for nutrients, light and soil base content compared to control plots. Ungraded ski pistes and artificial snow led to increased vegetation indicator values for nutrients and soil humidity.

4. Soil analyses conducted in 2008 generally confirmed the changes shown by the vegetation indicator values in 2000 and in 2008. Machine-grading had the greatest effects on soil characteristics by increasing soil density by more than 50%, by increasing pH and C/N ratio, and by decreasing total nitrogen concentrations.

5. The differences between piste and off-piste plots were similar to those found 8 years ago, but their proportions changed. The vegetation cover on machine-graded ski pistes decreased over the 8 years, showing no sign of recovery or succession. Ungraded ski pistes showed increased differences in indicator values for reactivity and humus between piste and control plots compared to the results obtained 8 years earlier.

6. *Synthesis and applications.* Machine-grading of ski runs and downhill skiing in general induced long-lasting impacts on vegetation and on both chemical and physical soil characteristics. Even though few impacts of artificial snow were significant, our results suggest that it may change moisture status of the vegetation, and thus caution is warranted when used in dry and nutrient-poor habitats. The vegetation cover on machine-graded pistes deteriorated over a period of 8 years, illustrating that natural recovery did not occur in these alpine habitats. Consequently, the construction of new pistes by machine-grading in alpine habitats should be avoided, and existing pistes should be managed to avert further disturbances.

Key-words: alpine vegetation, artificial snow, biodiversity, long-term impact, machine-grading, soil, vegetation recovery, winter tourism

Introduction

Ski resorts attract millions of visitors and represent a major economic factor in alpine regions (Elsasser & Messerli 2001;

Isselin-Nondedeu & Bédécarrats 2007). In the Swiss Alps alone, 220 km² are directly affected by ski pistes (Amacher-Hoppler & Schoch 2008). The construction and use of ski pistes severely alter landscape aesthetics and potentially threaten the fragile high-mountain ecosystem biodiversity and erosion control (Tsuyuzaki 1995; Rixen 2002; Wipf *et al.* 2005;

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Delgado *et al.* 2007; Burt & Rice 2009; Pohl *et al.* 2009). These ecosystems are typically highly sensitive towards changes in environmental conditions and have low resilience after disturbance (Körner 1999). Ski pistes are often visible in the landscape during summer due to damaged vegetation, which also impedes tourism.

Building and maintaining ski resorts often incorporates the use of heavy machinery during summer for the levelling and drainage of the slopes. Many ski pistes are machine-graded to smooth the slope surface, whereby rocks and obstacles, but also the natural vegetation and most of the organic topsoil, are removed, resulting in major disturbance to plant and soil composition (Mosimann 1985; Wipf *et al.* 2005; Isselin-Nondedeu & Bédécarrats 2007; Delarze & Gonsseth 2008). What remains after grading is usually a mineral substrate with low organic matter content and poor water holding capacity (Krautzer *et al.* 2006; Burt & Rice 2009). Plant cover and diversity play a major role in retaining sediments and nutrients in alpine ecosystems (Isselin-Nondedeu, Rey & Bédécarrats 2006; Pohl *et al.* 2009) but natural re-vegetation processes on these mineral soils are difficult and slow (Barni, Freppaz & Siniscalco 2007).

During winter, snow-grooming vehicles and skiers compact the snow cover and potentially damage vegetation and soil. The compaction of snow decreases the thermal insulation and gas exchange capacity of the snow cover (Rixen, Stoeckli & Ammann 2003; Delgado *et al.* 2007), which can lead to frost damage of plant vegetative parts and fine roots (Tierney *et al.* 2001; Rixen, Stoeckli & Ammann 2003). However, little is known about how vegetation may respond to these perturbations over the long term. Only a few studies have looked at changes in soil processes under ski pistes (Freppaz *et al.* 2002; Burt & Rice 2009), and even less is known about the combination of soil and vegetation responses under these conditions. Furthermore, many conclusions about impacts of skiing have been drawn from case studies in single ski resorts (exceptions: Wipf *et al.* 2005; Burt & Rice 2009), whereas studies from multiple locations are needed for conclusions of general value.

Sufficient snow cover from early winter to spring is very important for the economic success of alpine ski resorts (Elsasser & Messerli 2001). To mitigate climate change effects and to guarantee sufficient snow, a rising number of ski pistes are equipped with snow-making facilities (33% of ski pistes in Switzerland, 59% in Austria, and 70% in Italy in 2008; Amacher-Hoppler & Schoch 2008). Artificial snow possesses different physical and chemical properties than natural snow (Fauve, Rhyner & Schneebeli 2002), leading to both denser and deeper snow cover on ski runs (Rixen 2002). Due to the additional amount of snow, more water is released during snow melt in spring (Mosimann 1998), and the postponed snow melt shortens the plant growing season by up to 4 weeks (Rixen 2002). As the water for snow production is commonly taken from streams or lakes, it contains more ions and nutrients, and thus has a different pH than rain water (Kammer & Hegg 1990; Rixen 2002). Changes in vegetation composition have been observed where artificial snow is used, favouring

nutrient- and moisture-demanding species (Kammer & Hegg 1990; Wipf *et al.* 2005). Moreover, the increase in meltwater can enhance soil erosion rates (Isselin-Nondedeu & Bédécarrats 2007). As artificial snow is applied every year, a cumulative effect over time is likely (Kammer 2002) but long-term comparative studies are needed.

The present study aimed to evaluate the impacts of ungraded ski pistes, graded pistes and pistes with artificial snow on vegetation composition over an 8-year time period and on important soil parameters. The study was based on a pair-wise design of permanent plots situated on and next to ski pistes located in 12 Swiss ski resorts. In each plot, the vegetation composition was recorded along with soil physical and chemical aspects. Our sampling was a re-visitation of plots from a previous vegetation study (Wipf *et al.* 2005); therefore longer-term impacts (8 years) of ski piste management were evaluated by comparing results from the two studies.

We expected that ski pistes in general, and graded ski pistes in particular, would decrease vegetation cover, vegetation productivity and species richness as found previously (Wipf *et al.* 2005). We also expected changes in vegetation characteristics due to ski piste management to be reflected in soil chemical and physical properties, especially soil bulk density. Over the course of 8 years, we expected that impacts of artificial snow would increase. As machine-grading is a one time treatment, graded pistes were expected to show signs of succession and vegetation recovery over time.

Materials and methods

STUDY SITES

In 2000, permanent plots were chosen in pairs consisting of a 4 × 4 m piste plot and an off-piste control plot of the same area, and were revisited for the purpose of the present study. The pairs were located on 37 ski runs differing in altitude (ranging from 1700 to 2500 m a.s.l.), aspect (8–30°) and bedrock (acidic and calcareous) and were situated in 12 resorts in the Swiss Alps (for details on plot location and ski piste characteristics see Wipf *et al.* 2005). The vegetation on most sites consisted of alpine grassland and dwarf shrub heath. The plots established in the previous study (Wipf *et al.* 2005) had been marked with 25-cm-long nails at two edges and referenced to paint marks on nearby rocks; thus they could be relocated using GPS coordinates, photographs, tape measures and compass.

For each visited ski piste, one plot was randomly chosen on the piste and one control plot next to the piste. The ski pistes were either machine-graded (i.e. removal of rocks and topsoil, performed 5–38 years ago), or ungraded, and had either natural or artificial snow (snow production applied for 2–23 years) resulting in four different types of treatments: natural snow/ungraded (6 pairs of plots in 2008, 11 in 2000); artificial snow/ungraded (13 pairs of plots, 10 in 2000); natural snow/graded (7 pairs of plots, 9 in 2000); and artificial snow/graded (11 pairs of plots, 8 in 2000). The control plots were at most 50 m away from their piste plots and had the same aspect, slope and altitude, but they were not affected by the construction or the snow treatment. Analyses of the 2008 data were carried out on the entire 37 pairs of plots. The comparison between 2000 and 2008, however, could only be done with a reduced data set of 31 pairs of plots

due to treatment changes on six ski pistes. Soil samples were taken at the sites of the vegetation relevés.

VEGETATION DATA

Relevés of vascular plants were made in 74 plots between 1 July and 20 August 2008 following the protocol of Wipf *et al.* (2005). Total vegetation cover was estimated in each plot, and the cover of each plant species was recorded in seven classes according to Braun-Blanquet (1932). For each plot, species richness, plant species diversity (Shannon Index) and weighted indicator values for humidity, light, nutrient availability, reactivity (soil base contents) and humus (Landolt 1977) were calculated. These values define the preferred conditions for the growth of each plant species. The weighted values thereby give indications of ecological condition in each plot. Along with these values, the cover of four different functional groups (graminoids, forbs, legumes and woody species) was calculated. We classified each plant species depending on their flowering period ('early' being before July, 'late' after July and 'other' for other flowering periods; Aeschimann & Burdet 2005; Lauber & Wagner 2007) and on the type of environment where they would be most likely to occur ('snow bed', 'wind edge' or 'neutral'; Aeschimann & Burdet 2005; Lauber & Wagner 2007; Delarze & Gonseth 2008). The cover of each category was compared within pairs of plots. Biomass was harvested 3 cm above ground on two randomly chosen patches (20 × 20 cm) per plot and dried at 60 °C for 48 h. Litter and woody shoots were removed to measure annual productivity. Plant nomenclature follows Lauber & Wagner (2007).

SOIL DATA

In each plot, 10 samples of the topsoil (10 cm, mainly A horizon) were taken with a corer and pooled to obtain one representative soil sample of c. 100 g. The samples were stored at 4 °C in a dark chamber for

c. 4 months and then analysed for total nitrogen (N_{tot}) and total phosphorus (P_{tot}) according to the KJELDAHL method (Baize 2000) and soil acidity (pH_{KCl} , as opposed to reactivity derived from the plant indicator values). Due to the delay of these soil measurements, individual values could not be compared to the literature. Only the differences between piste and off-piste values were analysed according to the pair-wise design of our study. Total organic carbon (TOC) was measured using a Rock-EvalTM pyrolysis analyser (IFP, Paris, France) taking in account eventual soil CaCO_3 contents. One pair of plots had to be omitted from chemical analysis due to a lack of the fine soil fraction.

Additionally, two soil cores were taken in each plot using a 30-cm-long cylindrical corer ($d = 5$ cm) to determine soil bulk density by dividing dry mass by volume. In 10 pairs of plot, that contained only scree and rocks, the soil density cores could not be sampled. Soil characteristics could only be compared between piste and control plots and not over time as no soil analyses were made in 2000.

STATISTICAL ANALYSIS

Linear mixed models with restricted maximum likelihood (REML) were performed on both data sets from 2000 and from 2008 to test whether vegetation and soil characteristics differed between piste and off-piste plots, between machine-graded and ungraded plots, and between artificial and natural snow. To account for the study design with pairs of plots on and next to pistes, we fitted the type of plot pairs, i.e. the type of treatment of the piste plot in the pair. Because of the frequent statistical significance of the interaction between the effects of the ski piste and of machine-grading, the data set was split into graded pairs and ungraded pairs. This allowed us to analyse the impact of machine-grading and of ungraded ski pistes compared to their control plots separately. We fitted the factor piste, which indicated differences between plots on and next to pistes within the pairs, across all types of piste treatment. Then we fitted the interactions of type of pair (duration of artificial snow production) and piste, which

Table 1. REML table presenting *F*-values and their significance in the differences within graded pairs of plots [Graded piste (GP) and off-piste plots (GO)], and interaction with duration of artificial snow production (DA) in the measured values for vegetation in 2008

Source	<i>F</i> -values			
	Altitude (d.f. = 1)	Resort (d.f. = 8)	Diff. GP – GO (d.f. = 1)	Diff. GP × DA – GO × DA (d.f. = 1)
% Vegetation cover	11.07**	0.52	34.72***	0.54
Productivity	8.22*	1.19	13.07**	0.77
Species richness	2.42	0.78	3.17(*)	0.39
Shannon Index	2.30	0.62	3.53(*)	0.26
Humidity	3.03	0.59	1.78	8.47*
Light	30.06***	2.04	7.17*	0.18
Reactivity	4.12(*)	3.69(*)	6.72*	0.69
Nutrient	1.77	1.60	14.27**	0.58
Humus	2.82	1.35	5.72*	0.46
% Cov. grasses	0.02	0.65	16.05**	0.22
% Cov. legumes	0.05	1.47	0.35	1.54
% Cov. woody sp.	3.71(*)	2.00	4.69*	0.73
% Cov. forbs	0.98	1.05	3.27(*)	0.63
% Early flowering	8.08*	0.84	11.97**	0.30
% Late flowering	0.95	0.38	0.93	2.76
% Cov. snow bed sp.	9.11**	0.40	0.04	3.89(*)
% Cov. ridge sp.	7.03*	1.25	0.13	0.08

(*) $P < 0.1$; * $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$.

indicated whether the difference between plots on and next to the piste depended on the type of piste treatment. To test against the correct error terms, the resort was tested as a random factor, and the type of pair was nested within resort. Altitude was considered as a covariate and ski resort as a random factor in all analyses. For all analyses of the vegetation and soil data of 2008, the use of artificial snow was treated as a continuous variable (named 'Duration of artificial snow production') to test for possible cumulative effects over time. The machine-grading was treated as a binary factor, as it was applied only once on a ski piste. Residuals of all variables were checked for normality and homoscedasticity, and transformations were not necessary. The statistical design followed the same approach as the one performed by Wipf *et al.* (2005). However, as some plots had changed treatment meanwhile, which led to an unbalanced data set, we had to perform REML analyses instead of the ANOVA used earlier. We performed the analyses on the data set from 2000 without obtaining any major changes from the result published in Wipf *et al.* (2005). Although the Braun-Blanquet cover classes and Landolt indicator values do not fulfil all assumptions of continuous nor of ordinal variables, we decided to analyse them as continuous variables (mean percentage cover) to keep the design as comparable to Wipf *et al.* (2005) as possible.

To explore changes in the vegetation over time, we compared the effects of ski pistes in 2000 and 2008. For each plot pair and each dependent variable, we calculated the difference between piste and off-piste plot for both years and analysed the change in pair-wise differences in a similar way as above (Tables 4 and 5). Analysing the difference between piste and control plot removed any potential observer bias of the two independent sampling periods in 2000 and 2008. There were no significant vegetation changes observed on control plots. Therefore, a change over time in the difference between piste and control plot would be caused by changes on the ski pistes. We tested whether differences between piste and off-piste plots differed between years and snow types (fitted as a categorical factor) for both graded and ungraded pairs. Because of the low replication and to avoid missing important ecological significances, we analysed *P*-values up to 0.1 and referred to these as being 'marginally significant'.

Principal component analyses (PCAs) were used to evaluate the correlation between soil and vegetation characteristics. Tests of Bartlett and indices of Kaiser–Meyer–Olkin (KMO) showed that the variables could be factorized, and only those axes having eigenvalues > 1 were taken into account (Kaiser's law). REML analyses were performed using R 2.9.2 (R Development Core Team 2008), and SPSS 16.0 (SPSS 2007) was used to calculate the principal coordinate analyses.

Results

VEGETATION ON SKI PISTES

Grading of the ski slopes decreased total vegetation cover and the annual productivity ($P < 0.001$ and $P = 0.003$; Table 1 and Fig. 1). Mean number of species and Shannon diversity were marginally lower on graded ski pistes than on off-piste plots ($P = 0.09$ and $P = 0.08$, respectively; Table 1 and Fig. 1). The species number decreased by approximately three species. Grading significantly affected indicator values by favouring light, higher pH and nutrient demanding species and by impeding humus indicating species ($P = 0.02$, $P = 0.02$, $P = 0.001$ and $P = 0.03$, Table 1 and Fig. 2). The total cover of graminoids and woody species decreased ($P = 0.001$ and

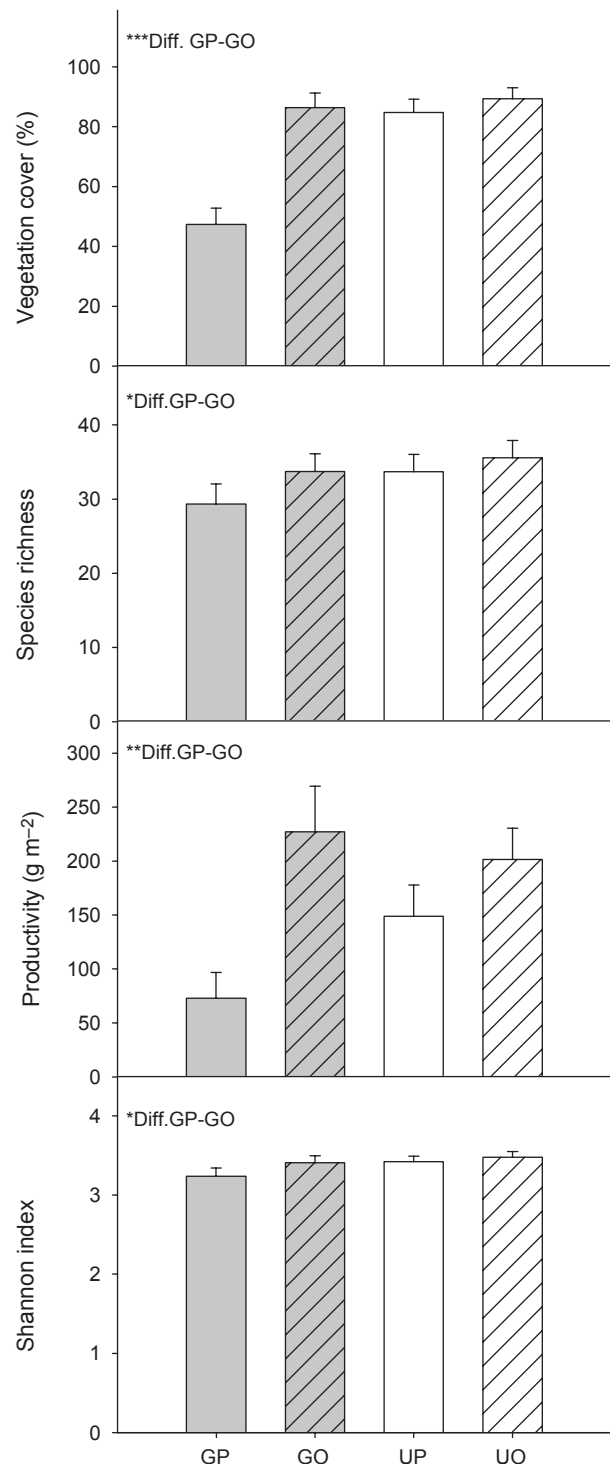


Fig. 1. Mean values of graded piste plots (GP), their control plots (GO) and of ungraded piste plots (UP) and their control plots (UO) for the measured vegetation parameters. The significant differences between piste plots and control plots are indicated [$*P < 0.05$; $**P < 0.01$; $***P < 0.001$].

$P = 0.04$; Table 1 and Fig. 2). Grading was responsible for the decreased cover of early flowering species ($P = 0.004$; Table 1 and Fig. 2).

Ungraded pistes (ski pistes in general) caused higher nutrient availability on ski pistes ($P = 0.04$; Table 2 and Fig. 2).

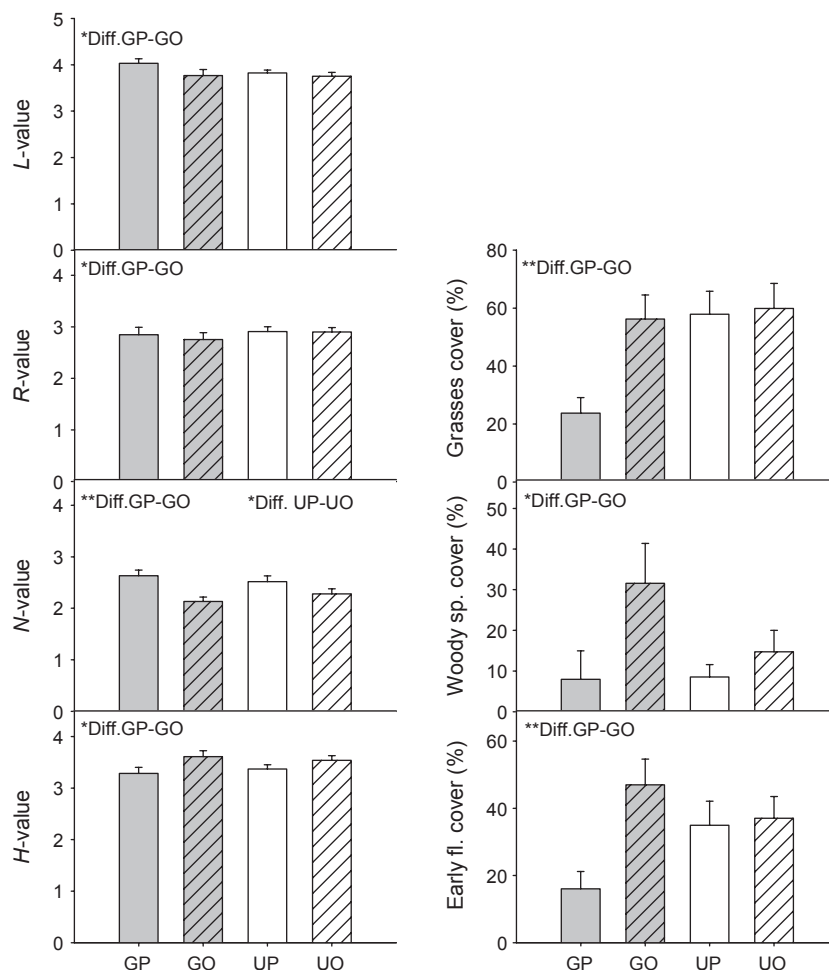


Fig. 2. Mean values of graded piste plots (GP), their control plots (GO) and of ungraded piste plots (UP) and their control plots (UO) for the Landolt indicator values for light (L-), reactivity (R-), nutrients (N-) and humus (H-value), the covers of two functional groups and of early flowering species. The significant differences between piste plots and control plots are indicated [$*P < 0.05$; $**P < 0.01$].

With increasing number of years of artificial snow production on graded ski pistes, plant species that prefer moist conditions were favoured ($P = 0.01$; Table 1). Artificial snow production did not affect vegetation cover, productivity, species richness or diversity. Finally, the interaction of grading and artificial snow indicated a marginally significant decrease in the cover of snow bed species ($P = 0.067$; Table 1).

SOILS ON SKI PISTES

The grading of the slopes increased soil density by 56.6% ($P = 0.002$; Table 3 and Fig. 3) and caused significant changes in soil total nitrogen concentrations, showing lower values on graded pistes than on their control plots ($P = 0.003$; Table 3 and Fig. 3). Soil pH and C/N ratio significantly increased on graded ski pistes ($P = 0.01$ and $P = 0.02$; Table 3 and Fig. 3). Ski pistes in general and artificial snow production did not significantly affect the measured soil parameters. Soil P_{tot} analyses did not show any significant results and are not discussed further.

The PCAs calculated to test the link between impacts of ski pistes on soils and on vegetation showed a positive correlation between annual productivity and total vegetation cover ($r^2 = 0.472$), which were both negatively correlated to soil bulk density ($r^2 = -0.436$ and -0.571 , respectively). Higher soil bulk density on pistes was associated with higher light indicator values ($r^2 = 0.586$). The PCAs further showed that the total N contents of the soils were positively correlated with vegetation cover ($r^2 = 0.432$) and productivity ($r^2 = 0.364$). The soil pH-values were positively correlated with the indicator values for reactivity ($r^2 = 0.608$) and nutrient availability ($r^2 = 0.335$), which in turn showed strong negative correlations with the humus value ($r^2 = -0.551$ and -0.670 , respectively).

VEGETATION CHANGES ON SKI PISTES BETWEEN 2000 AND 2008

Several effects of grading were stronger in 2008 than they appeared in 2000. Although we would expect a recovery of the

Table 2. REML table presenting *F*-values and their significance in the differences within ungraded pairs of plots [Ungraded piste (UP) and off-piste plots (UO)], and interaction with duration of artificial snow production (DA) in the measured values for vegetation in 2008

Source	<i>F</i> -values			
	Altitude (d.f. = 1)	Resort (d.f. = 10)	Diff. UP – UO (d.f. = 1)	Diff. UP × DA – UO × DA (d.f. = 1)
% Vegetation cover	6.27*	4.27(*)	1.25	0.00
Productivity	0.66	1.18	2.99	0.89
Species richness	0.10	0.86	0.99	3.31
Shannon Index	0.31	0.66	0.70	1.57
Humidity	5.62*	0.59	0.02	1.89
Light	12.20**	5.62*	1.46	2.63
Reactivity	0.04	0.98	3.02	0.00
Nutrient	1.79	1.05	4.97*	0.50
Humus	0.53	1.75	2.55	0.05
% Cov. grasses	1.58	3.35(*)	0.07	1.71
% Cov. legumes	4.52*	0.69	0.37	0.10
% Cov. woody sp.	0.60	2.74	1.43	0.07
% Cov. forbs	0.01	1.01	0.12	4.49(*)
% Early flowering	1.34	1.40	0.20	0.45
% Late flowering	0.03	1.19	0.08	0.05
% Cov. snow bed sp.	7.05*	0.48	0.85	0.14
% Cov. ridge sp.	14.58**	1.57	0.19	0.85

(*) $P < 0.1$; * $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$.

Table 3. REML table presenting *F*-values and their significance in the differences within graded pairs of plots [Graded piste (GP) and off-piste plots (GO)], and interaction with duration of artificial snow production (DA) in the measured values for soils in 2008

Source	<i>F</i> -values			
	Altitude (d.f. = 1)	Resort (d.f. = 8)	Diff. GP – GO (d.f. = 1)	Diff. GP × DA – GO × DA (d.f. = 1)
N _{tot} (%)	0.51	2.79	12.94**	0.01
P _{tot} (%)	0.12	1.13	0.95	1.41
pH _{KCl}	0.05	2.93	7.75*	0.02
TOC (%)	1.13	2.62	1.20	0.04
C/N	1.34	1.12	6.36*	0.06
Bulk density (g m ⁻³)	4.11	–	13.93**	0.28

(*) $P < 0.1$; * $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$.

vegetation after time, the vegetation cover on graded ski pistes was even lower in 2008 than in 2000, as indicated by an increased difference between piste and off-piste plots ($P = 0.002$; Table 4 and Fig. 4). The indicator value for reactivity also showed an increased difference in 2008, which points to an increased cover of species preferring high pH-values on piste plots ($P < 0.006$; Table 4 and Fig. 4). Graminoids decreased in cover on the ski piste plots in 2008 compared with 2000 ($P = 0.002$; Table 4).

On ungraded ski pistes, the differences between piste and off-piste plots increased from 2000 to 2008 for the covers of species indicating high base contents in the soil, showing increased pH on ski pistes ($P = 0.01$; Table 5 and Fig. 4). The cover of humus indicator species decreased on the ski piste plots in 2008 compared with 2000 ($P = 0.07$; Table 5 and Fig. 4).

With artificial snow, the difference in the cover of grass and of forb species between piste and off-piste plots decreased from

2000 to 2008 (marginally significant for grass) ($P = 0.09$ and $P = 0.04$; Table 5).

Discussion

This study demonstrates that machine-graded ski pistes, ungraded ski pistes and artificial snow production induced specific perturbations in the alpine vegetation and soils. We show that some impacts of ski runs were more pronounced in 2008 than 8 years earlier and that machine-graded pistes in particular show signs of even greater perturbation today than in the previous survey.

The grading of ski slopes implies the use of heavy machinery, radical soil movement, removal of vegetation and topsoil. Other fundamental factors that exert stress and disturbance on graded and ungraded ski pistes include the mechanical impacts of skiers and snow-grooming vehicles. These types of disturbances are likely to be responsible for changes such as the

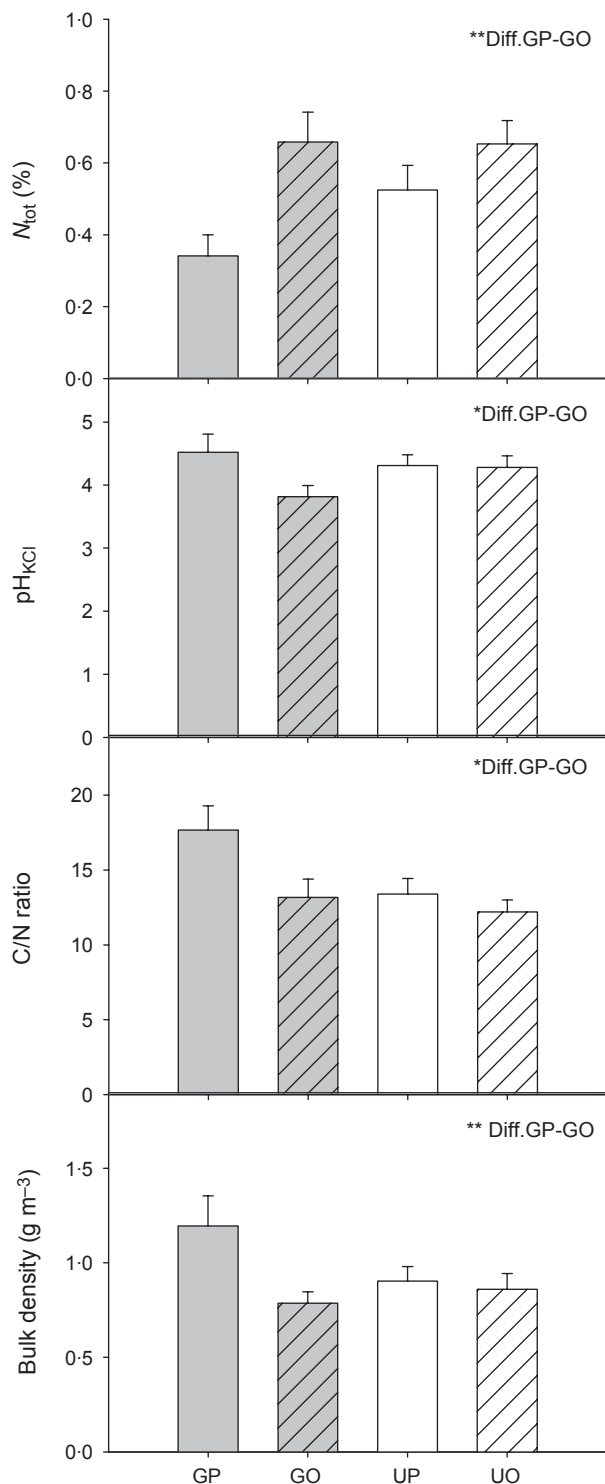


Fig. 3. Mean values of graded piste plots (GP), their control plots (GO) and of ungraded piste plots (UP) and their control plots (UO) for the soil measurements. The significant differences between piste plots and control plots are indicated [$*P < 0.05$; $**P < 0.01$].

greater proportion of un-vegetated ground, lower productivity (which was correlated to decreased concentrations of soil organic nitrogen) and decreased species diversity on graded ski pistes. In alpine environments, plant diversity and richness are

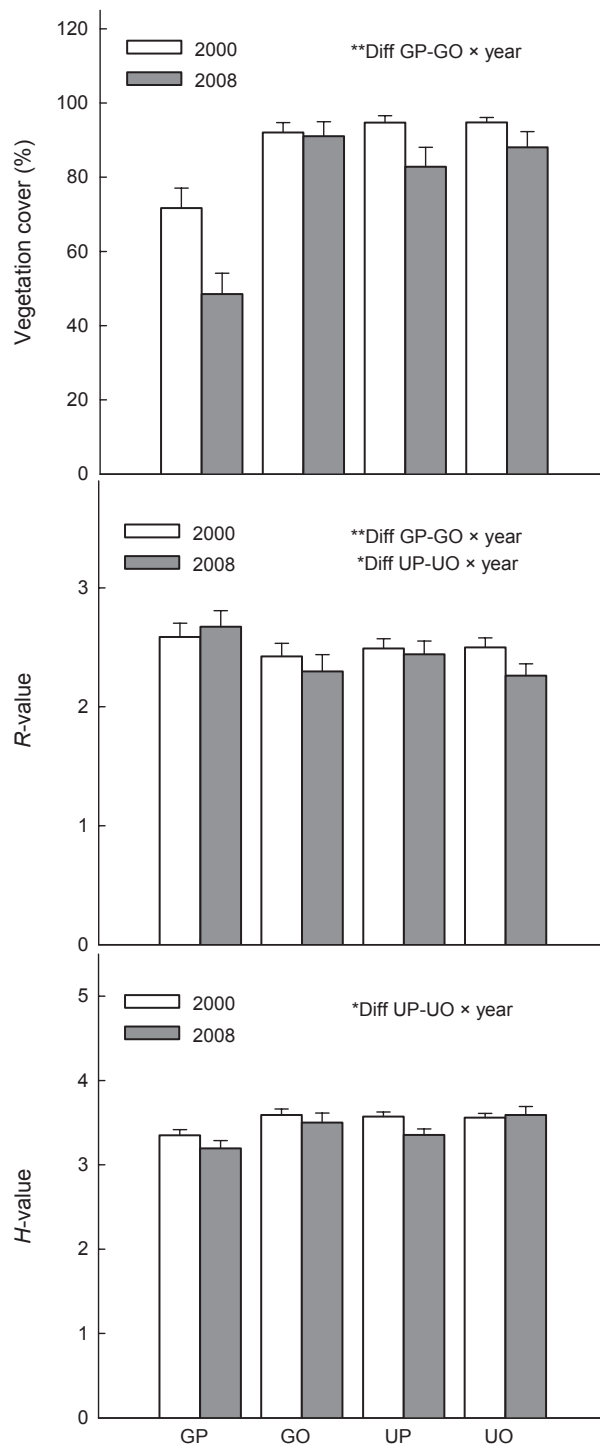


Fig. 4. Mean values of graded piste plots (GP), their control plots (GO) and of ungraded piste plots (UP) and their control plots (UO) in 2000 and in 2008 for vegetation cover and Landolt indicator values for reactivity (R-) and humus (H-value). The significant differences between piste plots and control plots are indicated [$*P < 0.05$; $**P < 0.01$].

rather limited by climatic conditions than by competition (Kammer & Möhl 2002). In our study, the suppression of dominant species due to the disturbance caused by snow compaction may therefore result in decreased vegetation cover and

Table 4. *F*-values and their significance for the changes in the difference between graded piste (GP) and off-piste plots (GO) from 2000 to 2008 (Year) and respective changes on pistes with different snow types (ST)

Source	<i>F</i> -values			
	Altitude (d.f. = 1)	Resort (d.f. = 8)	Diff. GP – GO × Year (d.f. = 1)	Diff. GP – GO × Year × ST (d.f. = 1)
% Vegetation cover	2.79	1.30	15.22**	0.06
Productivity	0.91	0.75	0.25	0.68
Species richness	1.04	1.89	0.30	0.96
Shannon Index	0.70	1.83	0.48	0.01
Humidity	2.67	1.88	0.09	1.21
Light	0.38	0.52	0.43	0.01
Reactivity	0.24	0.28	11.28**	0.05
Nutrient	0.10	0.46	2.91	0.72
Humus	0.64	0.36	0.14	8.14*
% Cov. grasses	8.29*	7.47*	15.57**	0.02
% Cov. legumes	5.84*	0.59	2.56	0.75
% Cov. woody sp.	0.35	1.54	0.33	2.18
% Cov. forbs	0.14	1.14	1.02	0.33
% Cov. early flower	0.85	1.53	0.20	0.64
% Cov. late flower	0.00	1.63	0.02	2.05
% Cov. snow bed sp.	0.21	1.63	0.07	0.15
% Cov. ridge sp.	3.01	0.58	1.58	0.03

(*)*P* < 0.1; **P* < 0.05; ***P* < 0.01; ****P* < 0.001.**Table 5.** *F*-values and their significance for the changes in the difference between ungraded piste (UP) and off-piste plots (UO) from 2000 to 2008 (Year) and respective changes on pistes with different snow types (ST)

Source	<i>F</i> -values			
	Altitude (d.f. = 1)	Resort (d.f. = 8)	Diff. UP – UO × Year (d.f. = 1)	Diff. UP × UO × Year × ST (d.f. = 1)
% Vegetation cover	1.49	1.00	1.00	0.49
Productivity	0.15	0.75	2.19	0.38
Species richness	1.03	0.51	0.02	0.13
Shannon Index	1.32	0.99	0.06	0.89
Humidity	1.36	0.37	1.19	0.36
Light	0.10	2.14	0.79	1.71
Reactivity	0.08	0.53	7.86*	0.55
Nutrient	0.86	0.69	2.74	0.29
Humus	0.46	0.42	3.8(*)	0.67
% Cov. grasses	0.46	0.97	0.43	3.25(*)
% Cov. legumes	3.24(*)	1.52	1.48	0.52
% Cov. woody sp.	0.57	1.46	1.73	0.86
% Cov. forbs	0.48	1.78	0.02	5.04*
% Cov. early flower	2.66	1.40	0.02	2.13
% cov. late flower	0.57	0.82	0.02	0.14
% Cov. snow bed sp.	0.79	0.59	0.06	0.53
% Cov. ridge sp.	1.59	2.64	0.01	0.16

(*)*P* < 0.1; **P* < 0.05; ***P* < 0.01; ****P* < 0.001.

productivity instead of increased biodiversity (Kammer & Möhl 2002; Rixen 2002).

The perturbation due to machine-grading was also reflected in the plant indicator values. The plant species indicated lower soil humus content, higher soil pH (confirmed by soil analysis) and higher light availability on ski slopes, which can all be explained by disturbance. Indicator values also pointed to higher plant nutrient availability on ski pistes than next to

them. Several factors may be responsible for the higher nutrient availability, such as enhanced soil microbial activity in the less acidic soils, high cover of legumes, or altered soil nutrient dynamics that are highly influenced by the soil temperature regime during winter (Grogan *et al.* 2004). In turn, these factors depend on snow pack characteristics (Brooks, Williams & Schmidt 1998; Rixen, Stoeckli & Ammann 2003; Freppaz *et al.* 2007) and are therefore also revealed on ungraded ski pistes.

The soil analysis on graded pistes, on the other hand, showed a low total nitrogen content, which is composed of up to 95% organic nitrogen (Baize 2000), and an increased C/N ratio, which usually indicates low biological activity in the soil (Baize 2000). The combination of negative (disturbance) and beneficial (i.e. higher soil pH) factors on ski pistes may cause the inconsistent nitrogen response. Furthermore, high nutrient and light indicator values are characteristic for pioneer communities, which could be interpreted as an indication for a high degree of stress and disturbance (Grime 1979; Lacoste & Salanon 2005).

The disturbance on ski pistes is probably also responsible for the decrease in woody plants. The size and growth form of many alpine woody species (mostly of the Ericaceae family) with buds and branches above ground level makes them particularly vulnerable to mechanical damage, e.g. by snow-grooming vehicles (Körner 1999; Wipf *et al.* 2005).

The compaction of the snow cover and the subsequently decreased thermal insulation and colder soil temperatures (Rixen 2002) could be responsible for the decrease of early flowering species on ski pistes. Early flowering species usually develop their buds under the snow (Bilbrough, Welker & Bowman 2000), but colder soils under compacted snow and longer snow duration might hamper the development of early flowering species (Galen & Stanton 1995; Wipf *et al.* 2002, 2005; Wipf, Rixen & Mulder 2006). This leads to slower and delayed phenological development and thus, a shorter time period for reproduction.

The dense soil on graded ski runs may be detrimental for plant growth, as a negative relationship between soil density and productivity was revealed in our results and has often been demonstrated (Kozłowski 1999; Wallace 2004; De Paul & Bailly 2005). Moreover, the compacted soils of graded ski pistes can reduce infiltration rates and water-storage capacity, which in turn fosters fine soil erosion (Grismer & Hogan 2005; Martin *et al.* in press). Surface erosion has been shown to be a factor causing seed loss by seed transportation (Urbanska & Fattorini 1997). The slow re-vegetation and the lack of an establishment of a diverse plant cover may cause a positive feed-back enhancing erosion rates (Pohl *et al.* 2009).

On pistes with artificial snow, the significant increase in moisture values of the vegetation is in line with the increased water content of artificial snow (up to five times more than natural snow; Mosimann 1998). This increase of water due to the input of artificial snow could, when applied on graded ski pistes, exert the risk of soil erosion due to lower vegetation cover and increased soil density. To avoid long-lasting damage to vegetation and soil by machine-grading, it is especially crucial to restore a functioning vegetation cover as soon as possible after construction of a ski piste (Krautzer *et al.* 2006; Barni, Freppaz & Siniscalco 2007).

VEGETATION CHANGES FROM 2000 TO 2008

One of the major findings of our study was that the vegetation change on graded and ungraded ski pistes between 2000 and 2008 indicated deterioration rather than improvement, as indi-

cated by the significantly larger difference in vegetation cover between piste and control plots over time. Although most other variables did not significantly change, there was no indication for a succession towards a denser, more productive or more diverse vegetation. The decrease in vegetation cover was especially pronounced on machine-graded pistes, which indicates that the highly disturbed sites are subject to further deterioration.

Conclusion

Our study demonstrates how ski pistes, particularly those that are machine-graded, exert disturbance changes both in vegetation and in soil characteristics. The grading of slopes had particularly long-lasting negative impacts on vegetation cover and soil density. Artificial snow production had minor effects; nevertheless, the addition of water can change the vegetation composition and should therefore be avoided in sensitive habitats such as nutrient-poor and dry grasslands.

The negative impacts of machine-grading on vegetation cover had worsened 8 years after the previous assessment indicating poor recovery ability of these alpine sites after major disturbance. As a consequence, machine-grading in alpine habitats should be avoided or construction sites should be as small as possible and re-vegetated with great care.

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The impact of forest ski-pistes on diversity of ground-dwelling arthropods and small mammals in the Alps

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Abstract Forest clearing for winter sport activities is the major force driving loss and fragmentation of the alpine forests. The establishment of ski-pistes involves impacts on every ecosystem component. To assess the extent of this threat we studied ground-dwelling arthropods (namely ground beetles and spiders) and small mammals (shrews and voles) at two ski resorts in north-western Italian Alps by pitfall trapping. Diversity parameters (mean abundance, species richness and Shannon index) of spiders and macropterous carabids increased from forest interior to open habitats (i.e., ski-piste or pasture), whereas parameters of brachypterous carabids significantly decreased from forest interior to open habitats. Diversity parameters of macropterous ground beetles were higher on pastures than on ski-pistes. Small mammals were virtually absent from ski-pistes. Observed frequencies in the three adjacent habitats were significantly different from expected ones for the bank vole *Myodes glareolus* and the pygmy shrew *Sorex minutus*. Generalized linear models showed that abundance, species richness and diversity of spiders and macropterous carabids of ski-pistes were best modelled by combination of factors, including grass cover and width of the ski-piste. Indicator Species Analysis showed that species that significantly preferred ski-pistes were less than those preferring pastures, and species which were exclusive of ski-pistes were very few. To retain arthropod ground-dwelling fauna of open habitats environmentally friendly ways of constructing pistes should be developed. After tree clearing, only the roughest ground surfaces should be levelled, in order to preserve as much natural vegetation as possible. Where necessary, ski-pistes should be restored through the recovery of local vegetation.

Keywords Alpine forests · Diversity · Ground beetles · Ski-pistes · Spiders · Bank vole · Pygmy shrew

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Introduction

From the beginning of the last century, the expansion of ski districts has severely disturbed the environment in the Alps. The establishment of ski-pistes, in particular, involves impacts on every ecosystem component along a broad altitudinal range that touches the montane and alpine belt (forest and treeless zone, respectively). During ski-piste construction pastures or forest tracts are abruptly clear-cut, bulldozers and power shovels are used for soil removal to provide suitable slopes for skiers (this is often referred as machine grading), and artificial seeding is carried out to control for soil erosion. These interventions affect soil properties (Delgado et al. 2007). Pistes which have been machine graded have lower vegetation cover, species diversity and abundance of early flowering species (Wipf et al. 2005). Vegetation is also damaged by skiing and ski-piste preparation by snow-grooming vehicles (Cernusca et al. 1999; Rixen et al. 2004b). Alpine soils of groomed pistes are also changed by an extensive heat loss (Rixen et al. 2004a). The use of artificial snow induces prolonged snowing which induces a delay in snowmelt and soil warming at the end of the season (Rixen et al. 2004b; Keller et al. 2004b) and may cause a delay in the vegetative re-sprouting (Rixen et al. 2003). The artificial snow can also add pollutants to soils and additives used to promote a rapid and long lasting freezing (Rixen et al. 2003). Furthermore, in summer, cutting of shrubs and machine-grading are carried to level rough or bumpy soil surfaces (ground leveling), producing further damage to vegetation and soil (Bayfield 1996; Titus and Tsuyuzaki 1999; Barni et al. 2007).

Studies on animals were few. Birds of high elevation grasslands tend to avoid ski-pistes and, somehow, to avoid the nearby prairies too (Rolando et al. 2007). Below the tree line impacts of ski development were diverse. In the wooded superior montane belt, the expansion of ski districts caused clear damages to local black grouse populations (*Tetrao tetrix*; Menoni and Magnani 1998; Zeitler and Glanzer 1998) which also suffer mortality induced from collision with cable wires (Observatoire des Galliformes de Montagne 2006). In areas interested by the practice of free-ride ski, the dejections of black grouse contained significant increased quantities of stress metabolites (Arlettaz et al. 2007); ski tourism also affected both habitat use and endocrine status in capercaillie *Tetrao urogallus* (Thiel et al. 2008). Bird communities living in forests crossed by ski-runs undergo a negative margin effect: the biodiversity is lower at the edge of the ski-runs than it is at the edge of pastures or inside the wooded patches (Laiolo and Rolando 2005). A part from researches on birds, there is a substantial lack of studies on other animals and, therefore, to pinpoint the best conservation strategies, new researches on animal assemblages, especially those completely neglected so far (e.g., arthropods and small mammals), are strongly required.

Ground-dwelling arthropods are small, diverse, sensitive to environmental variability and may be therefore used as indication of habitat heterogeneity, ecosystem diversity and environmental stress (McGeoch 1998). Ground beetles (Coleoptera: Carabidae) and spiders (Araneae), in particular, have been widely recommended as bioindicators (Churchill 1997; Rainio and Niemelä 2003). The few researches which focused contemporaneously on both groups showed that both are negatively affected by anthropogenic activities (Alaruikka et al. 2002; Öberg and Ekblom 2006; Pearce and Venier 2006). In the Alps, carabids and spiders have also been used to assess the chronosequence of a glacier foreland (Gobbi et al. 2006a). Spiders and most ground beetles are predators which play a key role in regulating populations of soil invertebrates and serving as prey to salamanders, small mammals and birds (Clarke and Grant 1968; Hance 1990).

Carabids and spiders assemblages in the Alpine region are well known due to notable ecological studies conducted by several authors (Brandmayr et al. 2003a, b; Gobbi et al. 2006b, 2007; Frick et al. 2007; Muff et al. 2009).

Small mammals also play complex and diverse functional roles in ecosystems (Hayward and Phillipson 1979) and may be used as indicators of anthropogenic land use and forest structure (Fitzgibbon 1997; Ecke et al. 2002). A few previous studies investigated short-term effects of ski-runs on the dynamics of small mammal populations in a ski area located in Colorado, USA (Hadley and Wilson 2004a, b). Additional studies on impact of ski-runs are therefore needed to promote management strategies for maintaining populations of these forest-dwelling animals in the Alps.

The zone of transition between two different habitat types may be termed as ecotone and the sharp demarcation between them as edge (Odum and Barrett 2005). Forest/ski-piste zones are therefore typical ecotones, as are the typical forest/pasture zones derived from alpine pastoral activities. The two ecotone types are rather different because ski-pistes are linear, narrow landscape elements, whereas pastures are not. Moreover, forest/pasture edges are usually less abrupt than forest/ski-piste edges.

To assess the impact of forest ski-pistes on assemblages of spiders and carabids, we examined the structure of assemblages (expressed as abundance, species richness and Shannon diversity index) across forest/ski-piste ecotones by sampling at the edge and in each of the adjacent habitats. Forest/pasture ecotones were also considered to test whether assemblage diversity parameters were lower on ski-pistes than on pastures. Relationships between assemblages and environmental characteristics of ski-pistes were analyzed to find out the best predictors of local diversity. In this study, pitfall trapping was not originally intended to catch small mammals. However, individuals found in traps were preserved in alcohol and identified a posteriori.

Materials and methods

Study areas

The study was carried out at two ski resort sites, i.e., Torgnon (45°48'39''N; 7°33'06''E) and Gressoney St. Jean (45°45'31''N; 7°49'50''E), located in Valtournenche and Gressoney Valley, respectively (two parallel valleys located in north-western Italian Alps, Aosta Valley). In Torgnon we surveyed ski-pistes (1,700–2,000 m a.s.l, 30–70 m width) which cut coniferous forests dominated by larch *Larix decidua* and Norway spruce *Picea abies*. The understorey is sparse, mainly composed of juniper *Juniperus communis*, alpenrose *Rhododendron ferrugineum*, bilberry *Vaccinium myrtillus* and bearberry *Vaccinium uliginosum*. In Gressoney St. Jean (hereinafter simply indicated as Gressoney) we surveyed ski-pistes (1,500–1,900 m a.s.l, 40–70 m width) which cut coniferous forests dominated by fir *Abies alba*, larch and Norway spruce, with an under-storey mainly composed of bilberry. In both study-areas, pastures and ski-runs are dominated by Gramineae grasses.

Sampling design

We selected 36 sampling plots at Torgnon (18 in forest/pastures ecotones and 18 in forest/ski-piste ecotones) and 50 at Gressoney St. Jean (25 for each ecotone type). The exact location of plots was established in the field by means of a Global Positioning System (GPS) Garmin eTrex® navigator. Each plot was located at a minimum distance of 100 m

from the next nearest sampling plots. Nine pitfall traps were placed at each sampling plot: three (5 m apart) were placed in the forest, three in the ski-piste (or pasture) and three along the edge between the two habitats. Traps in forest and ski-piste (or pasture) were aligned in parallel with the edge, at a distance of 20 m from it. Pitfall traps were 7.5 cm in mouth diameter and 9 cm deep, filled with 150 ml of a standard mixture of wine vinegar and sodium chloride solution to preserve individuals. Traps were placed at the beginning of July 2006 and emptied after 3 weeks. Trapped arthropods were sorted and identified, whenever possible, to the species level using updated standard keys or specialists' works. Nomenclature follows Platnick (2008) for spiders and Audisio and Vigna Taglianti (2004) for ground beetles. A number of spiders were only present as juveniles, and could not be identified further than to genus level. In keeping with several authors (e.g., Krell 2004; Kapoor 2008), such individuals were included as morpho-species (hereinafter indicated with the name of the genus followed by spp.). Spiders can be collected by means of several sampling techniques: by using pitfall traps, we mainly detected wandering spiders.

Small mammals were identified using field guides (MacDonald and Barrett 1993; Spagnesi et al. 2002) and under the supervision of experts.

Environmental characteristics of ski-pistes were recorded at each plot. In circular areas of 20 m radius (centred on the second pitfall trap) we measured percentages of grass, soil and rubble cover (estimated by eye), mean grass height (ten measurements, in centimetres), aspect, altitude and width of the ski-piste (in metres).

Data analysis

For each sampling plot, samples from the three traps of each habitat type (forest, edge and ski-piste or pasture) were pooled and used in the analyses.

To compare species richness of the two study sites, rarefaction curves were calculated. Thereafter, to ensure valid inter-sites comparisons, these curves were rarefied to the lowest number of individual recorded.

At each study site we calculated three diversity parameters and tested for differences in species richness (S), abundance (N) and diversity (Shannon index: $H' = -\sum p_i \times \ln p_i$ where p_i is the relative frequency of species i) between the three habitats (or between pistes and pastures) by means of One-Way ANOVA. Least-squares deviation (LSD) post hoc tests were used for pair-wise comparisons of habitat type means. To approach normality (checked by using normal probability plots), abundance and richness data were square-root transformed [$y = \sqrt{(x + 0.5)}$], whereas diversity data were log transformed [$y = \log(x + 1)$] (Sokal and Rohlf 1995). Ground beetle assemblages were composed of species with contrasting ecological requirements so that ecological patterns could not be revealed. Hence, carabids were divided into three main ecological groups based on their wing morphology: macropterous (full-sized wings), brachypterous (reduced wings or wingless) and wing-dimorphic (species with both winged and short-winged individuals). ANOVA and data transformation were performed using STATISTICA 6.0 package (StatSoft Inc. 2001).

Environmental characteristics of ski-pistes were analysed to find out the best predictors of local diversity. Since the environmental variables were correlated, much of the information in one or more of these can be redundant and thus the results of analyses based on these raw predictors might be ambiguous. Principal Component Analysis (PCA) was chosen to minimize the effects of multicollinearity. However, PCA generated ambiguous

derived components and we therefore examined all pairwise correlations to identify correlated pairs ($r > 0.71$). Then, following Riitters et al. (1995), one variable was selected to represent each group of highly correlated variables, selection criteria including the degree of normality and interpretability. This procedure identified grass cover, aspect, altitude and width of the ski-piste as independent variables.

To reveal relationships between diversity, abundance and richness of ground-dwelling arthropods and environmental variables of ski-pistes, we used generalized linear models (GLM). Data on species diversity were normally distributed and a normal distribution of error assumption with an identity link was applied. However, abundance and species richness attained a Poisson distribution; therefore a Poisson distribution of errors was assumed and the density of ground-dwelling arthropods was related to explanatory variables via a logarithmic link function (McIntyre and Lavorel 1994).

Akaike's information criterion (AIC, Akaike 1973) was used to select the most appropriate models, i.e., those fitting best the available data set. AIC is based on the principle of parsimony and helps to identify the model that accounts for the most variation and the fewest variables: the model that best explains the data is that with the lowest AIC. This information criterion is one of the most powerful approaches for model selection from a set of alternative plausible models and it solves the problems of stepwise model selection because no sequential statistical test is conducted (Burnham and Anderson 1998). Generalized linear models and AIC were calculated using the R package (Ihaka and Gentleman 1996; R Development Core Team 2005).

High specificity and fidelity of every species within habitats were explored by the IndVal (Indicator Value) procedure (Dufrêne and Legendre 1997). The indicator value is maximum (100) when all individuals of a species are found in a single habitat (high specificity) and when the species occurs in all samples of that habitat (high fidelity). The statistical significance of the maximum indicator value was evaluated by a Monte Carlo randomization test (1,000 runs). IndVal analyses were run using PC-Ord software (McCune and Mefford 1999).

The effect of ski-pistes on small mammals was tested comparing observed frequencies in the three adjacent habitats and expected ones under the assumption of an equal use of the three habitats (Chi-square test for goodness of fit). Individuals collected on forest/pasture ecotones were very few and they were therefore excluded from analyses.

Results

A total of 171 ground-dwelling arthropod species (corresponding to a total of 12,053 individuals) were collected altogether (Table 1, Appendices 1 and 2). Spiders were dominated by wandering species (95.3% of the capture), whereas ground beetles were mostly represented by brachypterous (60%) and macropterous species (24%) and, to a lesser extent, by wing-dimorphic species (16%). Despite the proximity between the two study areas (only 22.3 km in straight line), species composition was rather different: percentages of shared species were 37% for spiders and 25% for ground beetles. Rarefaction procedure suggested that species richness of the two study sites areas was quite similar (Table 1).

Three small mammal species were sampled in both study areas: the bank vole *Myodes glareolus* (Schreber 1780), the common shrew *Sorex araneus* Linnaeus, 1758 and the pygmy shrew *Sorex minutus* Linnaeus, 1766. In this case, given the low number of trapped individuals, data of the two study sites were merged into a single sample for each species.

Table 1 Number of plots (*n*), abundance of individuals (*N*) and species richness (*S*) of ground beetles and spiders at the two study sites

Study site	<i>n</i>	<i>N</i>	<i>S</i>	<i>S</i> (rarefied)
Carabids				
Torgnon	46	1,108	36 (22)	36
Gressoney	32	1,971	35 (21)	34.1 ± 1.4
Spiders				
Torgnon	46	5,790	84 (42)	69.7 ± 2.8
Gressoney	32	3,184	72 (30)	72

Site exclusive species in brackets. Rarefied species richness was obtained by rarefying the most abundant sample down to the less abundant one (±SD)

Ski-piste mean grass cover was lower at Torgnon than at Gressoney (67.5 vs. 85.0%, $F_{1,37} = 3.3$, $P < 0.05$).

Differences between habitat types

Mean abundance, species richness and diversity of spiders were significantly different between the three habitat types, and increased from the forest interior to the open habitats (ski-piste or pasture). A noticeable exception to this pattern regarded the forest/ski-piste ecotone at Torgnon, where species richness and diversity were significantly lower on ski-pistes than at the edge (Table 2; Fig. 1). Mean abundance, species richness and diversity of macropterous ground beetles showed the same general pattern as spiders (Table 3; Fig. 1). In contrast to macropterous, mean values of brachypterous parameters significantly decreased from the forest interior to the open habitat (Table 3).

Individuals of wing-dimorphic species were few (mostly short-winged) and no significant variation between habitat types was evidenced. Hence, this guild was excluded from subsequent statistical analyses.

Small mammals were virtually absent from ski-pistes. Observed frequencies in the three adjacent habitats were significantly different from expected ones for the bank vole and the pygmy shrew (Fig. 2).

Differences between ski-pistes and pastures

Differences between ski-pistes and pastures might depend on differences between plots. Hence, data were standardized by calculating the ratio of the value of each diversity parameter (abundance, species richness and diversity) of the open habitat (ski-piste or pasture) to the average value of the same parameter at each plot (the average among the three habitats). This enabled us to measure the relative contribution of the open habitat to the mean diversity of each plot. Mean ratios of abundance, species richness and diversity of macropterous ground beetles were usually higher on pastures than on ski-pistes (Gressoney H' : $F_{1,29} = 5.3$ $P < 0.05$; Torgnon N : $F_{1,39} = 7.0$ $P < 0.05$, S : $F_{1,39} = 10.0$ $P < 0.01$, H' : $F_{1,39} = 12.2$ $P < 0.01$) and the same pattern was also observed for spiders at Torgnon (S : $F_{1,40} = 4.2$ $P < 0.05$, H' : $F_{1,40} = 4.0$ $P < 0.05$). This indicates that the relative contribution of ski-pistes to the mean diversity of plots was lower than that of pastures. The relative decrease of species richness on ski-pistes in comparison with pastures is apparent in Fig. 1 (black arrows). The only exception to this pattern was the mean ratio of

Table 2 Mean $\pm$ SE spider abundance (N), species richness (S) and diversity (H') in the three habitat types (viz. forest interior, edge and open habitat) at each plot (One-way ANOVA)

Site	Ecotone type	Par.	Forest interior	Edge	Open habitat	F	Significant pair-wise comparisons
Gressoney	Forest/ski-piste	N	8.1 ± 1.6	38.6 ± 10.7	68.5 ± 9.2	$F_{(2,38)} = 22.2^{***}$	(1) vs. (2); (1) vs. (3); (2) vs. (3)
		S	3.5 ± 0.7	7.1 ± 0.7	7.1 ± 0.6	$F_{(2,38)} = 11.7^{***}$	(1) vs. (2); (1) vs. (3)
		H'	0.9 ± 0.2	1.4 ± 0.1	1.2 ± 0.1	$F_{(2,38)} = 4.1^*$	(1) vs. (2)
	Forest/pasture	N	16.5 ± 3.4	32.2 ± 6.7	39.6 ± 6.3	$F_{(2,49)} = 5.4^{**}$	(1) vs. (3)
		S	4.7 ± 0.4	5.8 ± 0.6	6.6 ± 0.6	$F_{(2,49)} = 2.6^*$	(1) vs. (3)
		H'	1.1 ± 0.1	1.2 ± 0.1	1.3 ± 0.1	$F_{(2,49)} = 1.8$	
Torgnon	Forest/ski-piste	N	24.7 ± 4.0	64.9 ± 8.6	52.1 ± 9.8	$F_{(2,71)} = 9.2^{***}$	(1) vs. (2); (1) vs. (3)
		S	5.5 ± 0.6	8.8 ± 0.5	6.7 ± 0.6	$F_{(2,71)} = 9.4^{***}$	(1) vs. (2); (2) vs. (3)
		H'	1.3 ± 0.1	1.6 ± 0.1	1.2 ± 0.1	$F_{(2,71)} = 4.0^*$	(1) vs. (2); (2) vs. (3)
	Forest/pasture	N	22.6 ± 3.3	48.4 ± 8.6	39.6 ± 4.7	$F_{(2,58)} = 6.5^{**}$	(1) vs. (2); (1) vs. (3)
		S	6.3 ± 0.6	8.0 ± 0.5	9.2 ± 0.8	$F_{(2,58)} = 6.0^{**}$	(1) vs. (2); (1) vs. (3)
		H'	1.4 ± 0.1	1.5 ± 0.1	1.7 ± 0.1	$F_{(2,58)} = 3.6^*$	(1) vs. (3)

LSD post hoc tests were used for pairwise comparisons of means

Par. = diversity parameter

* $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$

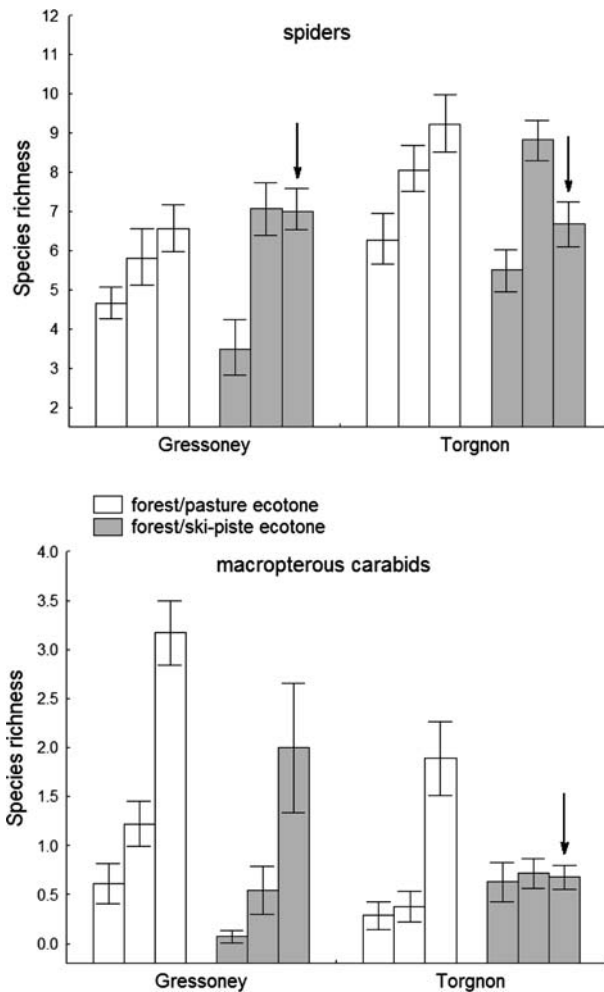


Fig. 1 Differences in species richness of spiders and macropterous carabids between habitats (viz. forest interior, edge and open habitat, from the left to the right for each three-bars histogram). Error bars are $\pm$ SE. Black arrows indicate cases of apparent decrease of species richness in ski-pistes

abundance of spiders, which was significantly higher on ski-pistes than on pastures at Gressoney ($F_{1,27} = 5.3$ $P < 0.05$).

Relationship between arthropod assemblages and ski-pistes

Results of GLM of spider and macropterous carabid abundance, species richness and diversity on environmental predictors are shown in Table 4. Ecological parameters were positively associated with grass cover in six selected models out of nine (diversity of spiders at both sites, abundance and species richness of spiders at Torgnon, abundance of macropterous at Gressoney) and with width of ski-pistes in three out of nine (abundance of spiders at Torgnon, abundance and species richness of ground beetles at Gressoney).

Table 3 Mean $\pm$ SE ground beetle abundance (N), species richness (S) and diversity (H') in the three habitat types (viz. forest interior, edge and open habitat) at each plot (One-way ANOVA)

Site	Ecotone type	Par.	Forest interior	Edge	Open habitat	F	Significant pair-wise comparisons
<i>Macropterous</i>							
Gressoney	Forest/ski-piste	N	0.1 ± 0.1	1.3 ± 0.7	11.4 ± 6.0	$F_{(2,39)} = 6.3^{**}$	(1) vs. (3); (2) vs. (3)
		S	0.1 ± 0.1	0.5 ± 0.3	2.0 ± 0.7	$F_{(2,39)} = 8.1^{**}$	(1) vs. (3); (2) vs. (3)
		H'	0.0 ± 0.0	0.1 ± 0.1	0.4 ± 0.1	$F_{(2,39)} = 4.3^*$	(1) vs. (3)
	Forest/pasture	N	1.1 ± 0.4	3.3 ± 1.1	16.5 ± 2.9	$F_{(2,51)} = 31.5^{***}$	(1) vs. (3); (2) vs. (3)
		S	0.6 ± 0.2	1.2 ± 0.2	3.2 ± 0.3	$F_{(2,51)} = 24.2^{***}$	(1) vs. (2); (1) vs. (3); (2) vs. (3)
		H'	0.1 ± 0.1	0.3 ± 0.1	0.8 ± 0.1	$F_{(2,51)} = 14.8^{***}$	(1) vs. (3); (2) vs. (3)
Torgnon	Forest/ski-piste	N	1.1 ± 0.4	1.2 ± 0.3	1.4 ± 0.4	$F_{(2,71)} = 0.4$	
		S	0.6 ± 0.2	0.7 ± 0.2	0.7 ± 0.1	$F_{(2,71)} = 0.3$	
		H'	0.2 ± 0.1	0.1 ± 0.1	0.1 ± 0.0	$F_{(2,71)} = 0.7$	
	Forest/pasture	N	0.5 ± 0.3	0.5 ± 0.2	3.6 ± 1.5	$F_{(2,57)} = 8.5^{***}$	(1) vs. (3); (2) vs. (3)
		S	0.3 ± 0.2	0.4 ± 0.2	1.9 ± 0.4	$F_{(2,57)} = 13.2^{***}$	(1) vs. (3); (2) vs. (3)
		H'	0.1 ± 0.1	0.1 ± 0.1	0.5 ± 0.1	$F_{(2,57)} = 12.3^{***}$	(1) vs. (3); (2) vs. (3)
<i>Brachypterous</i>							
Gressoney	Forest/ski-piste	N	17.0 ± 3.4	20.7 ± 5.1	6.2 ± 2.0	$F_{(2,39)} = 3.7^*$	(1) vs. (3); (2) vs. (3)
		S	3.0 ± 0.3	3.5 ± 0.5	2.1 ± 0.3	$F_{(2,39)} = 1.5$	
		H'	0.8 ± 0.1	0.8 ± 0.1	0.5 ± 0.1	$F_{(2,39)} = 1.1$	
	Forest/pasture	N	20.8 ± 3.8	13.1 ± 2.1	6.8 ± 1.5	$F_{(2,51)} = 6.9^{**}$	(1) vs. (3); (2) vs. (3)
		S	3.1 ± 0.3	2.4 ± 0.3	1.4 ± 0.2	$F_{(2,51)} = 9.1^{***}$	(1) vs. (3); (2) vs. (3)
		H'	0.7 ± 0.1	0.5 ± 0.1	0.2 ± 0.1	$F_{(2,51)} = 8.6^{***}$	(1) vs. (3); (2) vs. (3)

Table 3 continued

Site	Ecotone type	Par.	Forest interior	Edge	Open habitat	F	Significant pair-wise comparisons
Torgnon	Forest/ski-piste	N	9.7 ± 2.4	7.5 ± 4.0	1.2 ± 0.6	$F_{(2,71)} = 8.1^{***}$	(1) vs. (3); (2) vs. (3)
		S	1.4 ± 0.2	1.2 ± 0.2	0.4 ± 0.1	$F_{(2,71)} = 12.9^{***}$	(1) vs. (3); (2) vs. (3)
		H'	0.3 ± 0.1	0.2 ± 0.1	0.0 ± 0.0	$F_{(2,71)} = 7.0^{**}$	(1) vs. (3); (2) vs. (3)
	Forest/pasture	N	7.6 ± 2.4	1.6 ± 0.7	1.0 ± 0.4	$F_{(2,57)} = 9.4^{***}$	(1) vs. (2); (1) vs. (3)
		S	1.2 ± 0.2	0.5 ± 0.1	0.4 ± 0.1	$F_{(2,57)} = 6.1^{**}$	(1) vs. (2); (1) vs. (3)
		H'	0.2 ± 0.1	0.1 ± 0.0	0.0 ± 0.0	$F_{(2,57)} = 3.5^*$	(1) vs. (2); (1) vs. (3)

LSD post hoc tests were used for pairwise comparisons of means

Par. = diversity parameter

* $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$

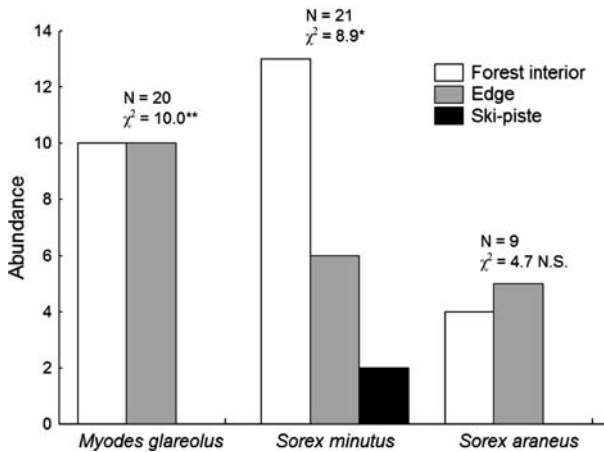


Fig. 2 Habitat use of small mammals (bank vole *Myodes glareolus*, pygmy *Sorex minutus* and common shrew *S. araneus*) in the forest/ski-piste ecotone. No bank vole and no common shrew were trapped in ski-piste. χ^2 test for goodness of fit. Single classification, expected frequencies based on hypothesis extrinsic to the sampled data, i.e., assuming an equal use of the three habitats. * $P < 0.05$; ** $P < 0.01$; NS not significant

Species identity

Spiders and ground beetles which were indicators of open habitats are shown in Appendix 3. In general, species that significantly preferred ski-pistes were less numerous than those preferring pastures, especially at Torgnon. Only three species were exclusive indicators of ski-pistes (i.e., they were never classed as indicator of any other habitat): *Pardosa blanda*, *Drassodes* spp. (spiders) and *Agonum sexpunctatum* (ground beetle). IndVal analysis also detected species which positively selected coniferous forests: five spider species (*Pardosa ferruginea*, *Malthonica silvestris*., *Coelotes* spp. at Gressoney; *Micaria* spp. and *Alopecosa aculeata* at Torgnon) and six ground beetle species (*Pterostichus flavofemoratus*, *Pterostichus apenninus*, *Carabus depressus* at Gressoney; *Calathus micropterus*, *Pterostichus multipunctatus*, *Notiophilus biguttatus* at Torgnon).

Discussion

All studies regarding the impact of ski on mountainous areas agree on defining the establishment of ski districts as a general threat to the environment. This is rather worrying in the Alps because the area affected by ski-pistes is still increasing (Abegg et al. 1997; Elsasser and Messerli 2001; Wipf et al. 2005). Below the tree line, grass colonization of ski-runs is faster than above the tree line because the success of revegetation declines with altitude (Urbanska 1997a). Nevertheless, the impact is severe because in most cases the construction of ski-pistes requires the permanent elimination of the forest from the track. The construction of ski-pistes in the montane belt induces forest loss and fragmentation, potentially inducing severe impacts on animal communities. However, a part from a study on bird communities living in forests crossed by ski-runs (Laiolo and Rolando 2005), no other research on the effects of ski-pistes below the tree line has been carried out. Further studies on other animal taxa are thus particularly needed.

Table 4 Generalized linear models of abundance, species richness and diversity of spiders and macropterous ground beetles in relation to environmental predictors of ski-pistes [grass cover, width of ski-pistes, altitude and geographical aspect (North, North-East, North-West at Gressoney and North, South, East, South-East at Torgnon)]

Predictor	β	SE	P
<i>Spiders—Gressoney</i>			
Diversity			
Grass cover	0.02	0.00	<0.05
AIC = 20.57			
Abundance			
North-East	0.31	0.10	<0.001
AIC = 286.92			
Richness			
North-Ovest	0.50	0.20	<0.05
AIC = 66.92			
<i>Spiders—Torgnon</i>			
Diversity			
Grass cover	0.01	0.00	<0.05
AIC = 42.15			
Abundance			
Grass cover	0.01	0.00	<0.001
North	−0.82	0.10	<0.001
South	−0.80	0.11	<0.001
East	0.81	0.11	<0.001
Width of ski-piste	0.01	0.01	<0.05
AIC = 657.15			
Richness			
Grass cover	0.01	0.00	<0.001
AIC = 120.78			
<i>Macropterous carabids—Gressoney</i>			
Diversity			
Altitude	−0.01	0.00	<0.05
AIC = 14.88			
Abundance			
Grass cover	0.11	0.02	<0.001
Width of ski-piste	0.10	0.02	<0.001
North	−2.02	0.43	<0.001
Altitude	0.01	0.00	<0.05
AIC = 136.80			
Richness			
Grass cover	0.05	0.03	<0.05
Width of ski-piste	0.08	0.02	<0.01
AIC = 43.93			

Only significant variables included in the best model (i.e., those minimizing AIC) are shown. Variables added sequentially. No model significantly predicted the diversity of macropterous ground beetles at Torgnon

This study focused for the first time on ground dwelling arthropods and small mammals. The two areas, despite their relative proximity, greatly differed in arthropod species composition, due to environmental and historical events (Casale and Vigna Taglianti 1993). Nevertheless, the results were similar at two sites and showed that mean abundance,

species richness and diversity of spiders and macropterous carabids increased from the forest interior to the open habitat (ski-piste or pasture). Both assemblages were characterized by open habitat species capable of colonizing new habitats (wandering spiders, small body size, winged carabids). Contrarily to macropterous, diversity of brachypterous carabids significantly decreased from forest interior to open habitat. These ground beetles are medium-large body size species, wingless or with reduced wings, hence incapable of long movements or dispersal by flight (den Boer 1970; Negro et al. 2007, 2008). The relationship between brachyptery and endemic status of montane forest dwelling carabids in the Alps has been examined closely in Brandmayr (1991).

Our results also showed that bank voles and pygmy shrews virtually avoided ski-pistes. Both are typical forest species (MacDonald and Barrett 1993; Alibhai and Gipps 1991), which may be affected by the construction of ski-pistes because movements and abundance of small mammals are influenced by habitat loss and fragmentation (Diffendorfer et al. 1995; Bentley et al. 2000; Laakkonen et al. 2001).

Although both open habitats (pastures and ski-pistes) were positively selected by spiders and macropterous carabids, comparisons between the two habitats suggested that ski-pistes were less attractive than pastures, in particular for carabids. IndVal analyses strengthen these conclusions because the number of typical pasture species were usually higher than that of ski-piste species. GLM analyses suggested that the local degree of grass cover of ski-pistes can significantly affect spider and macropterous ground beetle diversity, which increased with increasing of the grass cover. This explains why at Torgnon, where the desolation of ski-pistes (in terms of scarce grass cover) was great, species richness and diversity were significantly lower on ski-pistes than on the edge. Ski-piste width was another predictor of ground-dwelling arthropod diversity, which increased with increasing width. We believe both predictors concur to explain why ski-pistes are less attractive to macropterous carabids and spiders than pastures. On one hand, migration to ski-pistes is more difficult because they are perceived as narrow pastures enclosed in the forest matrix, on the other colonization is more difficult because of the lower grass availability.

Despite the general low attractiveness of ski-pistes, a few species in the study areas were significantly associated with this habitat. This was the case of the spider *Pardosa blanda* and the ground beetle *Agonum sexpunctatum*. *P. blanda*, in particular, was much more abundant in ski-pistes than in pastures, especially at Gressoney (where the local mean abundance was higher on ski-pistes than on pastures just because of its prevalence). This species might have found better environmental conditions on ski-pistes than on pastures (micro-habitat and/or competitive conditions).

Carabids and spiders may show fairly similar responses to environmental disturbances (Rushton et al. 1989; Alarukka et al. 2002; Öberg and Ekbom 2006; Pearce and Venier 2006). Our study confirmed that spiders and ground beetles may be usefully simultaneously considered to monitor environmental man-induced changes. However, it also emphasized that when/where assemblages are heterogeneous (ground beetles, in this study), distinct ecological guilds and species identities should be considered.

Open habitat arthropods were usually common. However, some spider species, caught occasionally on ski-pistes, were of conservation interest because rare and endemic to the Alps (*Coelotes rudolfi*, *Cybaeus intermedius*, *Berlandina nubivaga*, *Metopobactrus schenkeli*). Our results suggested that the poor grass cover of ski-pistes is a serious hindrance to optimal colonization of macropterous ground beetles and spiders. From this point of view, retaining the ground-dwelling fauna of these anthropogenic open habitats is likely to involve developing environmentally friendly ways of constructing pistes. After tree clearing, only the roughest ground surfaces should be levelled, in order to preserve as much

soil and natural vegetation as possible. Where necessary, ski-pistes should be restored through management to promote the recovery of local vegetation. Transplants of wild species (Urbanska 1997b; Conlin and Ebersole 2001; Ebersole et al. 2002) are particularly promising methods. Once natural revegetation is achieved, vegetation cover should be preserved without compromising the safety of the ski-runs. Grassy and shrubby vegetation, for instance, can be kept low through cattle-grazing and direct pruning without applying ground levelling.

Our results also suggested that typical forest species (both brachypterous carabids and small mammals) may be heavily damaged from ski-piste construction because they are unable to colonize these open habitats. For these species, forest removal along narrow strips can cause habitat loss and habitat fragmentation, both potentially exerting negative effects on animal diversity (Hanski 1999; Odum and Barrett 2005). Ski-pistes might potentially prevent or reduce movements between adjacent forest patches. This is of particular concern in the case of carabid endemic species, such as *Pterostichus flavo-femoratus*, *P. muntipunctatus*, *Carabus depressus* (all identified by IndVal as typical forest species), which were precinctive to more or less restricted alpine areas (Negro et al. 2007). Certain carabids and spiders rarely cross large roads (Mader 1984; Koivula and Vermeulen 2005), which are known to lead to significant intraspecific genetic differentiation in flightless carabids (Keller et al. 2004a). Movements of forest small mammals are also known to be constrained by the presence of open habitats as fields (Wegner and Merriam 1979) or roads (Oxley et al. 1974; McGregor et al. 2008). Home ranges of the bank vole are usually between 0.1 and 0.2 ha in deciduous woods (Alibhai and Gipps 1991) and those of the pygmy shrew between 0.05 and 0.2 ha (Churchfield 1991). Hence, in theory, for these species most ski-pistes might be too large to be crossed.

All in all, specific studies on animal movements across ski-pistes should be carried out to ascertain whether they operate as true barriers to movements between forest patches.

To make movements between forest patches easier, a possible management intervention could be that of restoring the gradual transition from forest to open habitat by enhancing a partial shrub colonization of ski-pistes. It has been demonstrated that the presence of shrubs facilitate the movements of the ground beetle *Carabus olympiae*, which likely uses shrubs as shelter and protection from predators (Negro et al. 2007, 2008). Moreover, shrub cover may increase the amount of prey available to carabids and may provide a more uniform resource distribution in time (Niemelä and Spence 1994; Magura 2002). Shrubs and fencerows are also known to be used by small mammals (Wegner and Merriam 1979). The bank vole, in particular, favours dense shrubby cover (Alibhai and Gipps 1991; Tattersall et al. 2002).

Finally, it is worth mentioning that all the managing measures here proposed have a broader ecological significance because they may simultaneously be useful to preserve forest bird diversity (Laiolo and Rolando 2005).

Acknowledgments We are sincerely grateful to Achille Casale and Gianni Allegro, who checked ground beetle identification and to Sandro Bertolino, who supervised small mammal identification. Matteo Negro was funded by a Turin University fellowship.

Appendix 1

See Table 5.

Table 5 List of spider species collected at Torgnon (T) and Gressoney (G)

Agelenidae		
<i>Histopona italica</i> Brignoli, 1977		G
<i>Malthonica silvestris</i> (L. Koch, 1872)		G, T
Amaurobiidae		
<i>Coelotes mediocris</i> Kulczyn'ski, 1887		G
<i>Coelotes rudolfi</i> (Schenkel, 1925)		G
Araneidae		
<i>Parazygiella montana</i> (C. L. Koch, 1834)		T
Clubionidae		
<i>Clubiona alpicola</i> Kulczyn'ski, 1882		G
<i>Clubiona diversa</i> O. P.-Cambridge, 1862		T
<i>Clubiona neglecta</i> O. P.-Cambridge, 1862		T
<i>Clubiona reclusa</i> O. P.-Cambridge, 1863		G
Cybaeidae		
<i>Cybaeus intermedius</i> Maurer, 1992		G
Dysderidae		
<i>Dysdera crocata</i> C. L. Koch, 1838		T
Gnaphosidae		
<i>Aphantaulex trifasciata</i> (O. P.-Cambridge, 1872)		T
<i>Berlandina nubivaga</i> (Simon, 1878)		T
<i>Callilepis nocturna</i> (Linnaeus, 1758)		G, T
<i>Drassodes cupreus</i> (Blackwall, 1834)		G, T
<i>Drassodes lapidosus</i> (Walckenaer, 1802)		G
<i>Drassodes pubescens</i> (Thorell, 1856)		G, T
<i>Drassyllus praeficus</i> (L. Koch, 1866)		G
<i>Drassyllus pusillus</i> (C. L. Koch, 1833)		G, T
<i>Gnaphosa badia</i> (L. Koch, 1866)		G, T
<i>Haplodrassus aenus</i> Thaler, 1984		T
<i>Haplodrassus signifer</i> (C. L. Koch, 1839)		G, T
<i>Haplodrassus umbratilis</i> (L. Koch, 1866)		G, T
<i>Micaria aenea</i> Thorell, 1871		G, T
<i>Micaria alpina</i> L. Koch, 1872		G
<i>Micaria fulgens</i> (Walckenaer, 1802)		G, T
<i>Micaria pulicaria</i> (Sundevall, 1831)		G, T
<i>Zelotes electus</i> (C. L. Koch, 1839)		T
<i>Zelotes latreillei</i> (Simon, 1878)		T
<i>Zelotes apricorum</i> (L. Koch, 1876)		G
<i>Zelotes subterraneus</i> (C. L. Koch, 1833)		G, T
<i>Zelotes talpinus</i> (L. Koch, 1872)		G, T
Hahniidae		
<i>Cryphoea silvicola</i> (C. L. Koch, 1834)		G, T
<i>Hahnina nava</i> (Blackwall, 1841)		T
Linyphiidae		
<i>Agyneta conigera</i> (O. P.-Cambridge, 1863)		T
<i>Asthenargus paganus</i> (Simon, 1884)		G

Table 5 continued

<i>Centromerita bicolor</i> (Blackwall, 1833)	G
<i>Centromerus brevivulvatus</i> Dahl, 1912	T
<i>Centromerus subalpinus</i> Lessert, 1907	T
<i>Ceratinella scabrosa</i> (O. P.-Cambridge, 1871)	G, T
<i>Collinsia inerrans</i> (O. P.-Cambridge, 1885)	G, T
<i>Diplocentria bidentata</i> (Emerton, 1882)	T
<i>Diplocephalus latifrons</i> (O. P.-Cambridge, 1863)	G
<i>Diplostyla concolor</i> (Wider, 1834)	G, T
<i>Erigone dentipalpis</i> (Wider, 1834)	G
<i>Gonatium rubens</i> (Blackwall, 1833)	T
<i>Incestophantes frigidus</i> (Simon, 1884)	G
<i>Mansuphantes prope pseudoarciger</i> Wunderlich, 1985	G, T
<i>Meioneta prope orites</i> (Thorell, 1875)	G, T
<i>Metopobactrus schenkeli</i> Thaler, 1976	T
<i>Micrargus apertus</i> (O. P.-Cambridge, 1871)	G, T
<i>Minyriolus pusillus</i> (Wider, 1834)	G
<i>Nerienne peltata</i> (Wider, 1834)	G
<i>Palliduphantes pallidus</i> (O. P.-Cambridge, 1871)	T
<i>Pelecopsis elongata</i> (Wider, 1834)	G, T
<i>Pelecopsis radicolica</i> (L. Koch, 1872)	T
<i>Peponocranium orbiculatum</i> (O. P.-Cambridge, 1882)	G, T
<i>Pityohyphantes phrygianus</i> (C. L. Koch, 1836)	T
<i>Porrhomma microphthalmum</i> (O. P.-Cambridge, 1871)	G
<i>Tapinocyba pallens</i> (O. P.-Cambridge, 1872)	T
<i>Tenuiphantes flavipes</i> (Blackwall, 1854)	G
<i>Tenuiphantes tenuis</i> (Blackwall, 1852)	G
<i>Tiso vagans</i> (Blackwall, 1834)	G
<i>Trichopterna cito</i> (O. P.-Cambridge, 1872)	T
<i>Walckenaeria alticeps</i> (Denis, 1952)	G, T
<i>Walckenaeria atrotibialis</i> (O. P.-Cambridge, 1878)	G
<i>Walckenaeria furcillata</i> (Menge, 1869)	G
<i>Walckenaeria nodosa</i> O. P.-Cambridge, 1873	T
<i>Walckenaeria obtusa</i> Blackwall, 1836	T
Liocranidae	
<i>Agroeca cuprea</i> Menge, 1873	T
<i>Scotina celans</i> (Blackwall, 1841)	T
Lycosidae	
<i>Alopecosa aculeata</i> (Clerck, 1757)	G, T
<i>Alopecosa cuneata</i> (Clerck, 1757)	G, T
<i>Alopecosa accentuata</i> (Latreille, 1817)	T
<i>Arctosa figurata</i> (Simon, 1876)	T
<i>Arctosa renidescens</i> Buchar and Thaler, 1995	G, T
<i>Pardosa amentata</i> (Clerck, 1757)	G
<i>Pardosa bifasciata</i> (C. L. Koch, 1834)	T
<i>Pardosa blanda</i> (C. L. Koch, 1833)	G, T

Table 5 continued

<i>Pardosa ferruginea</i> (L. Koch, 1870)	G, T
<i>Pardosa lugubris</i> (Walckenaer, 1802)	G, T
<i>Pardosa mixta</i> (Kulczyn'ski, 1887)	T
<i>Pardosa palustris</i> (Linnaeus, 1758)	G, T
<i>Pardosa riparia</i> (C. L. Koch, 1833)	G, T
<i>Trochosa ruricola</i> (De Geer, 1778)	G
<i>Xerolycosa nemoralis</i> (Westring, 1861)	G, T
Philodromidae	
<i>Philodromus cespitum</i> (Walckenaer, 1802)	G, T
<i>Philodromus collinus</i> C. L. Koch, 1835	T
<i>Philodromus vagulus</i> Simon, 1875	G, T
<i>Thanatus formicinus</i> (Clerck, 1757)	T
<i>Tibellus oblongus</i> (Walckenaer, 1802)	T
Pisauridae	
<i>Pisaura mirabilis</i> (Clerck, 1757)	T
Salticidae	
<i>Aelurillus v-insignitus</i> (Clerck, 1757)	G, T
<i>Heliophanus cupreus</i> (Walckenaer, 1802)	G, T
<i>Pellenes tripunctatus</i> (Walckenaer, 1802)	T
<i>Phlegra fasciata</i> (Hahn, 1826)	G, T
<i>Sitticus saxicola</i> (C. L. Koch, 1846)	T
Segestriidae	
<i>Segestria senoculata</i> (Linnaeus, 1758)	T
Tetragnathidae	
<i>Pachygnatha listeri</i> Sundevall, 1830	G
<i>Pachygnatha degeeri</i> Sundevall, 1830	T
Theridiidae	
<i>Enoplognatha thoracica</i> (Hahn, 1833)	T
<i>Euryopsis flavomaculata</i> (Keyserling, 1891)	T
<i>Robertus lividus</i> (Blackwall, 1836)	G
<i>Robertus negelctus</i> (O. P.-Cambridge, 1871)	G
<i>Robertus truncorum</i> (L. Koch, 1872)	T
<i>Steatoda phalerata</i> (Panzer, 1801)	G, T
<i>Ozyptila trux</i> (Blackwall, 1846)	G
<i>Xysticus audax</i> (Schrank, 1803)	G, T
<i>Xysticus bifasciatus</i> C. L. Koch, 1837	G
<i>Xysticus erraticus</i> (Blackwall, 1834)	G, T
<i>Xysticus gallicus</i> Simon, 1875	G, T
<i>Xysticus kochi</i> Thorell, 1872	T
<i>Xysticus ninnii</i> Thorell, 1872	T
Zoridae	
<i>Zora spinimana</i> (Sundevall, 1833)	G, T

Appendix 2

See Table 6.

Table 6 List of ground beetle species collected at Torgnon (T) and Gressoney (G) grouped by wing morphology

Carabidae

Brachypterous

<i>Abax exaratus</i> (Dejean, 1828)	G
<i>Calathus fuscipes</i> (Goeze, 1777)	T
<i>Calathus micropterus</i> (Duftschmid, 1812)	G, T
<i>Carabus depressus</i> Bonelli, 1810	G, T
<i>Carabus nemoralis</i> O.F. Müller, 1764	G, T
<i>Carabus problematicus</i> Herbst, 1786	T
<i>Laemostenus janthinus</i> (Duftschmid, 1812)	G
<i>Licinus hoffmanseggii</i> (Panzer, 1803)	G
<i>Pterostichus apenninus</i> (Dejean, 1831)	G
<i>Pterostichus cribratus</i> (Dejean, 1828)	G
<i>Pterostichus flavofemoratus</i> (Dejean, 1828)	G
<i>Pterostichus multipunctatus</i> (Dejean, 1828)	T
<i>Pterostichus spinolae</i> (Dejean, 1828)	G

Macropterous

<i>Agonum sexpunctatum</i> (Linné, 1758)	G
<i>Amara aenea</i> (De Geer, 1774)	T
<i>Amara aulica</i> (Panzer, 1796)	T
<i>Amara bifrons</i> (Gyllenhal, 1810)	T
<i>Amara convexior</i> Stephens, 1828	G
<i>Amara curta</i> Dejean, 1828	T
<i>Amara equestris</i> (Duftschmid, 1812)	G, T
<i>Amara erratica</i> (Duftschmid, 1812)	G, T
<i>Amara lunicollis</i> Schiödte, 1837	G, T
<i>Amara nitida</i> Sturm, 1825	G
<i>Amara ovata</i> (Fabricius, 1792)	T
<i>Amara praetermissa</i> (C.R. Sahlberg, 1827)	T
<i>Amara similata</i> (Gyllenhal, 1810)	T
<i>Bembidion quadrimaculatum</i> (Linné, 1761)	G
<i>Cymindis cingulata</i> Dejean, 1825	G, T
<i>Cymindis humeralis</i> (Geoffroy in Fourcroy, 1785)	T
<i>Cymindis scapularis</i> Schaum, 1857	T
<i>Cymindis vaporariorum</i> (Linné, 1758)	T
<i>Harpalus affinis</i> (Schränk, 1781)	T
<i>Harpalus honestus</i> (Duftschmid, 1812)	T
<i>Harpalus rubripes</i> (Duftschmid, 1812)	T
<i>Harpalus rufipalpis</i> Sturm, 1818	T
<i>Harpalus solitarius</i> Dejean, 1829	T
<i>Limodromus assimilis</i> (Paykull, 1790)	G

Table 6 continued

<i>Ocydromus bualei</i> (Jacquelin du Val, 1852)	T
<i>Ocydromus incognitus</i> (G. Müller, 1931)	G, T
<i>Ocydromus tetracolos</i> (Say, 1823)	G
<i>Ophonus laticollis</i> Mannerheim, 1825	G
<i>Ophonus puncticollis</i> (Paykull, 1798)	T
<i>Panagaeus bipustulatus</i> (Fabricius, 1775)	G
<i>Poecilus versicolor</i> (Sturm, 1824)	G, T
<i>Pseudoophonus rufipes</i> (De Geer, 1774)	G
<i>Pterostichus oblongopunctatus</i> (Fabricius, 1787)	G
<i>Pterostichus strenuus</i> (Panzer, 1796)	G
<i>Pterostichus strenuus</i> (Panzer, 1796)	G
Wing-dimorphic	
<i>Calathus erratus</i> (C.R. Sahlberg, 1827)	T
<i>Calathus melanocephalus</i> (Linné, 1758)	G, T
<i>Leistus nitidus</i> (Duftschmid, 1812)	T
<i>Metallina lampros</i> (Herbst, 1784)	G, T
<i>Notiophilus biguttatus</i> (Fabricius, 1779)	G, T
<i>Notiophilus palustris</i> (Duftschmid, 1812)	G
<i>Poecilus lepidus</i> (Leske, 1785)	G
<i>Synuchus vivalis</i> (Illiger, 1798)	G, T
<i>Trichotichnus laevicollis</i> (Duftschmid, 1812)	G, T
<i>Trichotichnus nitens</i> (Heer, 1838)	G

Appendix 3

See Table 7.

Table 7 Indicator species analysis (IndVal)

Site	Open habitat type	Species	IndVal		<i>P</i>	Species	IndVal		<i>P</i>
		Ground beetles	Max. obs.	Mean exp.		Spiders	Max. obs.	Mean exp.	
Gressoney	Ski-piste	<i>Amara erratica</i>	53.8	17.6	***	<i>Pardosa blanda</i>	79.0	28.5	***
		<i>Metallina lampros</i>	38.5	18.9	*	<i>Drassodes</i> spp.	59.3	35.6	***
		<i>Agonum sexpunctatum</i>	28.6	10.7	*	<i>Xysticus gallicus</i>	35.7	13.3	***
	Pasture					<i>Pardosa palustris</i>	28.6	11.1	*
		<i>Poecilus versicolor</i>	64.7	19.2	***	<i>Pardosa riparia</i>	74.9	28.2	***
		<i>Ophonus laticollis</i>	49.7	25.9	***	<i>Pardosa palustris</i>	48.9	15.6	***
		<i>Amara lunicollis</i>	38.9	11.5	***	<i>Drassylus</i> spp.	26.0	11.9	*
		<i>Amara erratica</i>	20.4	9.4	*				
		<i>Pseudophonus rufipes</i>	19.4	10.3	*				

Table 7 continued

Site	Open habitat type	Species	IndVal		<i>P</i>	Species	IndVal		<i>P</i>
			Max. obs.	Mean exp.			Max. obs.	Mean exp.	
Torgnon	Ski-piste	<i>Metallina lampros</i>	44.9	12.7	***	<i>Pardosa blanda</i>	52.9	35.6	***
		<i>Amara erratica</i>	18.5	7.5	*	<i>Pardosa palustris</i>	30.4	10.0	***
	Pasture	<i>Amara equestris</i>	29.2	9.8	***	<i>Pardosa mixta</i>	75.4	17.9	***
		<i>Calathus fuscipes</i>	27.7	13.4	*	<i>Steatoda phalerata</i>	61.1	13.0	***
		<i>Amara lunicollis</i>	22.1	10.5	*	<i>Alopecosa cuneata</i>	50.6	17.1	***
		<i>Poecilus versicolor</i>	20.1	10.0	*	<i>Pardosa palustris</i>	40.9	15.4	***
		<i>Metallina lampros</i>	17.9	8.4	*	<i>Xysticus gallicus</i>	30.2	9.9	***
		<i>Amara curta</i>	16.7	6.5	*	<i>Xysticus ninni</i>	30.1	14.3	*
		<i>Harpalus rubripes</i>	15.6	8.1	*	<i>Zelotes</i> spp.	30.1	16.4	*
						<i>Pardosa bifasciata</i>	21.8	12.5	*
						<i>Philodromus</i> spp.	20.1	8.3	***
						<i>Caccilepis nocturna</i>	19.2	8.1	*
						<i>Arctosa figurata</i>	17.70	8.80	*

Species which significantly indicate open habitat (i.e., ski-piste or pasture) are shown. Maximum indicator value (Max. obs.) and mean expected indicator value (mean exp.) are given

Statistical significance obtained by Monte Carlo randomization test (1,000 runs). * $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$

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Not all ski slopes are created equal: Disturbance intensity affects ecosystem properties

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Abstract. In mountain regions around the world, downhill ski areas represent a significant source of anthropogenic disturbance while also providing recreation and revenue. Ski-run creation always results in some level of disturbance, but disturbance intensity varies greatly with construction method. Ski runs may be established either by clearing (cutting and removing tall vegetation) or by clearing and then machine-grading (leveling the soil surface with heavy equipment). To quantify how these different intensities of initial disturbance affect ecosystem properties, we extensively surveyed vegetation, soils, and environmental characteristics on cleared ski runs, graded ski runs, and adjacent reference forests across seven large downhill ski resorts in the northern Sierra Nevada, USA. We found that the greater disturbance intensity associated with grading resulted in greater impacts on all ecosystem properties considered, including plant community composition and diversity, soil characteristics relating to processes of nutrient cycling and retention, and measures of erosion potential. We also found that cleared ski runs retained many ecological similarities to reference forests and might even offer some added benefits by possessing greater plant species and functional diversity than either forests or graded runs. Because grading is more damaging to multiple indicators of ecosystem function, clearing rather than grading should be used to create ski slopes wherever practical.

Key words: ecological restoration; ecosystem services; erosion control; gradient; high-elevation ecosystems; hydrology; intermediate disturbance; Sierra Nevada, California, USA; ski piste; soil function; species diversity; vegetation management.

INTRODUCTION

Downhill ski areas dramatically alter the ecology and aesthetics of the landscapes they occupy. Most large downhill ski areas in the United States are on lands managed by the USDA Forest Service, a federal agency charged with encouraging multiple uses while attempting to protect and maximize ecosystem services (Kessler et al. 1992, Briggs 2000, Rivera and de Leon 2004, Zhang 2005). Certainly not all ecosystem uses and services can be maximized simultaneously in one location. However, ski areas are managed almost exclusively for recreation, when they might also be managed to minimize negative impacts on compatible ecological services, such as water storage, nutrient cycling, and maintenance of biodiversity. Ski slopes are of great conservation concern and restoration interest because they extensively and significantly alter fragile high-elevation ecosystems (Tsuyuzaki 1994, Tenenbaum 2001, Clifford 2002, Rivera and de Leon 2004). Ski areas also provide unique opportunities as large-scale natural experiments in that downhill ski runs are large, replicated disturbances amid relatively undisturbed landscapes. Ski areas thus facilitate exper-

imental examination of the effects of large-scale disturbances of different intensities on multiple aspects of plant community structure and ecosystem properties.

Ski slopes are “not all created equal” principally because there are two basic approaches to ski-run construction that correspond to distinctly different initial disturbance intensities. “Cleared” ski runs are created by cutting and removing tall woody vegetation as needed to create open skiing pathways, but leaving the soil and seedbank largely intact. “Graded” ski runs, in contrast, are cleared and then machine-graded or leveled to remove tree stumps, boulders, and slope irregularities. This grading process disturbs and/or removes much of the topsoil and most of the vegetation. These differences in the severity of initial disturbance are likely to differentially alter environmental capacities for ecosystem recovery after ski-run construction.

Although there is much scientific interest in ski-slope ecology and impacts, the preponderance of research on this topic focuses on alpine (above timberline) grasslands and heathlands in Europe (e.g., Mosimann 1985, Bayfield 1996, Urbanska 1997, Urbanska et al. 1998, Urbanska and Fattorini 1998, 2000, Rixen et al. 2003, Gros et al. 2004, Wipf et al. 2005, Barni et al. 2007, Delgado et al. 2007), and with only one exception (Wipf et al. 2005), on machine-graded ski runs. As a result, there is paucity of studies describing ecological impacts of ski slopes in montane or subalpine (below tree line)

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ecosystems. Despite this lack of studies, ski runs are predominately located below tree line in western North America (Price 1985) and are common in upper montane and subalpine zones elsewhere (Ruth-Balaganskaya and Myllynen-Malinen 2000, Tsuyuzaki 2002, Laiolo and Rolando 2005). In Finland, Ruth-Balaganskaya and Myllynen-Malinen (2000) conducted one of the few studies below tree line that explicitly compared conditions on graded ski runs to reference forests; they found that soils on graded ski runs were nutrient depleted relative to undisturbed boreal forests to such an extent that recovery would not occur without active restoration.

Furthermore, of all the studies we reviewed that describe the ecology and impacts of ski slopes, only one considered ungraded ski runs. That study, conducted in alpine grasslands and dwarf heathlands in the Swiss Alps, demonstrated that graded and ungraded ski runs differed greatly in many respects, including vegetation cover and productivity, plant indicator values, and species diversity (Wipf et al. 2005: Table 1). These alpine ecosystems are very different from the conifer forest ecosystems that characterize many ski areas, and we know of no studies comparing cleared ski runs and graded ski runs below timberline.

In the context of vegetation succession, which is initiated or reset by disturbance, the intensity of disturbance influences recovery time (Coffin et al. 1998, Whisenant 1999, Hirst et al. 2003, Nishimura 2006). Disturbance severity fundamentally determines whether a system will undergo primary or secondary succession or follow some intermediate model (Whisenant 1999, Pickett and Cadenasso 2005). Cleared ski runs likely retain a greater biotic legacy (residual soil function and plant propagules) than graded ski runs, because grading can severely disturb or remove the topsoil and seed bank. We might, therefore, expect cleared ski runs to follow a model of secondary succession, and graded ski runs, primary succession (Whisenant 1999). Greater disturbance severity has also been found to lead to less predictable successional trajectories (Turner et al. 1998, Urbanska and Chambers 2002, Hirst et al. 2003).

Disturbance intensity may produce varying effects on patterns of plant community diversity as well as on underlying soil properties. The intermediate-disturbance hypothesis predicts that plant community diversity should be highest at intermediate disturbance levels (Grime 1973, Connell 1978, Huston 1979). This hypothesis has been supported by many studies, but an even greater number have failed to support it (reviewed in Mackey and Currie 2001). Beyond affecting plant community composition, increased disturbance intensity can also influence soil nutrient availability, organic matter, microbial biomass, and soil respiration (McNabb et al. 1997, Whisenant 1999, Claassen and Hogan 2002, DeBusk et al. 2005). Soil structure and hydrological parameters, including depth, compaction, soil aggregation, and water-holding capacity, may also

be influenced by soil disturbance (Grismer and Hogan 2005b). Impacts to soil physical structure resulting from ski-run creation can result in some of the most problematic and pervasive consequences of anthropogenic disturbance: erosion, nutrient leaching, and sediment runoff. Intensified erosion, leaching, and runoff increase nutrient and sediment loads in nearby waterways, thus reducing water quality (Claassen and Hogan 2002, Grismer and Hogan 2004, Houser et al. 2006). Because water-quality protection in the United States is mandated federally by the Clean Water Act, and because ski areas present potentially large sediment sources (Maholland 2002, Grismer and Hogan 2004), impacts to soil and hydrologic properties on ski slopes often receive most attention from agencies and ski-area managers.

Our study goals were to examine the effects of high- and low-intensity disturbance on multiple ecosystem properties using ski areas as large, replicated, anthropogenic disturbance experiments. In particular, we hoped to provide valuable missing information on the relative impacts of clearing and grading in understudied forested upper montane and subalpine habitats. We hypothesized that greater disturbance intensity would result in greater divergence from reference conditions for four categories of ecosystem properties: (1) plant community composition; (2) patterns of plant community diversity; (3) soil physical characteristics related to hydrologic function and erosion potential; and (4) soil chemical measurements related to soil quality and potential productivity. Within each category we measured several indicators in order to assess the multivariate impact of disturbance intensity on ecosystem properties.

METHODS

Study region

We extensively surveyed vegetation, soils, and environmental characteristics in large (100-m²) plots on matched sets of graded ski runs, cleared ski runs, and adjoining reference forests in seven large downhill ski resorts located in and around the Lake Tahoe Basin, in the northern Sierra Nevada of California and Nevada, USA (Fig. 1; 38°30'00" N, 119°51'00" W to 39°30'00" N, 120°6'00" W). These ski resorts collectively represent broad abiotic gradients and likely capture much of the potential variation among ski areas in the northern Sierra Nevada (Appendix A).

Surveyed ski areas include: Sugarbowl, Northstar-at-Tahoe, Diamond Peak, Mount Rose, Heavenly, Sierra-at-Tahoe, and Kirkwood. Most of these ski areas are fairly large; the largest ski area included in this study boasts 1943 skiable hectares and 95 ski runs, and the average ski-area size is 864 skiable hectares and 66 ski runs. We sampled all ski areas in our study region that met two basic criteria: (1) they had sufficient interspersed cleared runs with graded runs below the tree line to satisfy the blocked sampling design, and (2) we could

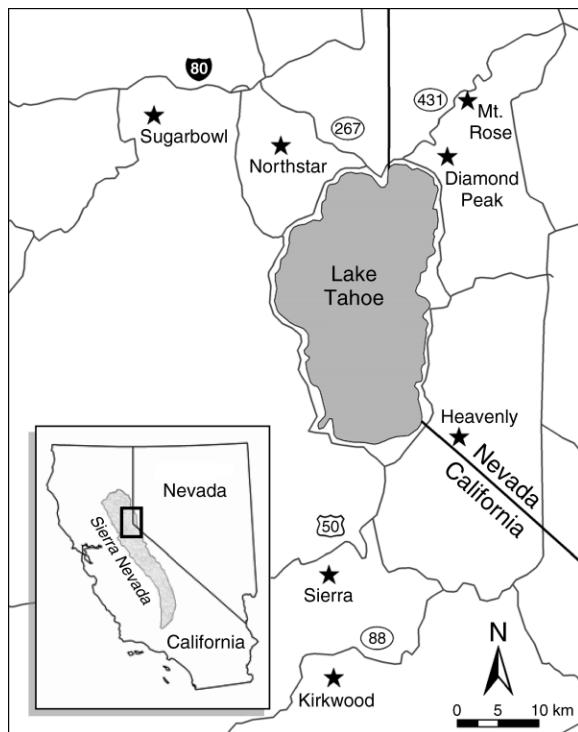


FIG. 1. Study region and locations of the seven ski areas included in this study within the northern Sierra Nevada, California and Nevada, USA.

gain access (either on public lands or private landowner granted access).

Sampled ski slopes were located within mixed-conifer forest ecosystems in the upper montane and subalpine climate zones, between 2100 and 2800 m above sea level. Within these zones, patterns of conifer forest community composition depend on complex climatic gradients, including snowpack depth and duration, elevation, aspect, soil depth and precipitation (Urban et al. 2000, Royce and Barbour 2001, Fites-Kaufman et al. 2007). Forests sampled in this study varied in composition and were dominated or codominated by any of the following species: red fir (*Abies magnifica*), western white pine (*Pinus monticola*), lodgepole pine (*Pinus contorta* ssp. *murrayana*), Jeffrey pine (*Pinus jeffreyi*), white fir (*Abies concolor*), and (at higher elevations) western hemlock (*Tsuga mertensiana*) and white-bark pine (*Pinus albicaulis*).

Total annual precipitation varies with elevation and location on the precipitation gradient across the Sierra Nevada range. Mean annual precipitation among the ski areas included in this study ranges from 74 cm (at Heavenly) to 164 cm (at Sugarbowl; 1961–1990 averages; Daly and Taylor 1998). Most (70–90%) annual precipitation falls as snow in the winter (November–April), while summers are characterized by very low rainfall, mild temperatures, and low humidity (Barbour et al. 2002, Taylor 2004, Fites-Kaufman et al. 2007).

Soils of the upper montane and subalpine regions of the Sierra Nevada are generally weakly developed (Entisols and Inceptisols) from granitic, volcanic and mixed glacial outwash parent materials; all of these types are represented among our study sites (Schruben et al. 1997, O'Geen et al. 2007, USDA-NRCS 2007). High-elevation soils of the Sierra Nevada tend to be shallow (<1 m depth), sandy, and characterized by high coarse-fragment composition; thus rooting depth is an important limiting factor for vegetation in this region (O'Geen et al. 2007). Because these zones experience xeric summers and cold winter temperatures, rates of organic-matter decomposition are slow. This results in a well-developed litter layer and high organic matter in the upper soil horizon. Disturbance of the litter and upper soil layers can cause subsequent soil erosion (Grismer and Hogan 2004, Fites-Kaufman et al. 2007).

Field methods

We conducted field measurements between 18 July and 6 September 2006, during peak blooming periods and before onset of plant senescence. We used a blocked sampling design within each ski area to account for site variation (e.g., topography and soil type) and to spatially intersperse treatments. In each ski area, four or five replicate blocks were established. Each block consisted of three 5×20 m (100-m^2) sampling plots corresponding to three treatment or disturbance levels: (1) a graded ski run, (2) an adjacent cleared ski run, and (3) reference forest between the two ski runs, for a total of 31 replicate blocks (93 plots total) across the study region. To increase sample dispersion and independence of blocks at a site, blocks were always located >150 m apart. The ski-run types were easily distinguishable based on the presence of tree stumps and boulders on cleared runs and the absence of these same features on graded ski runs (as well as the frequent presence of cut-and-fill slopes and manufactured water bars or berms). Our field assessments were all confirmed by communications with ski-area managers and/or Forest Service personnel. We also interviewed ski-area managers to determine approximate ski run ages and dates of ski-run grading to determine whether ski runs within sampling blocks had similar post-disturbance ages.

Each 5×20 m sampling plot was oriented upslope. Ski run plots were located in the centers of the ski runs, and reference forest plots in forest patches midway between each pair of sampled ski runs. We subdivided each sampling plot into four 5×5 m quadrats for more precise vegetation cover estimates. We visually estimated percent cover of each plant species present, as well as cover of bare ground, litter, rock, and total vegetative cover. Most plants were identified to species in the field. Unknowns were collected, pressed, and brought back for identification and verification in the University of California Davis Herbarium. We characterized plants for analyses into life-form groups (trees, shrubs, subshrubs, perennial herbs, annual herbs, herbaceous

legumes, and graminoids) based on descriptions contained in Hickman (1993). Plants listed as biennial/annual were classified as annual. All but one species of graminoids encountered was perennial, so we assigned all graminoids to a single category, and we based assignment to the subshrub category on written descriptions and personal observations. Plant nomenclature presented also follows Hickman (1993). For diversity analyses, we calculated the Shannon-Weiner H' total species diversity index for each plot (which incorporates both richness and evenness, hereinafter referred to as "species diversity"). We also calculated functional richness (defined as the number of the seven life-form groups present in a plot).

We measured relative soil depth (i.e., depth to refusal) by pushing a tile probe into the soil to the maximum depth at 10 locations along each plot perimeter. We assessed soil compaction using a cone penetrometer at 10 locations along each plot perimeter, and the depth at which a compacted soil layer was encountered (requiring >1700 kPa force to penetrate) was recorded. Plot averages of relative soil depth and depth to compaction were used in subsequent analyses. We quantified visible soil erosion for each of the four plot quadrats based on the maximum level of visible erosion, using ordinal erosion classes we defined as follows: (1) no visible erosion, (2) only minimal sheet erosion visible (evidence of downslope soil movement and pedestalling, but no flow patterns), (3) advanced sheet erosion (some small intermittent flow patterns visible), and (4) rill erosion (visible interconnected and well-defined flow patterns). We averaged the erosion scores made for each subplot to provide an average plot-erosion score for data analysis. We also recorded aspect, slope, elevation, run width, and evidence of snowmaking and erosion-control seeding.

We collected a soil sample at each plot from the top 0–20 cm of soil after removing the litter layer. The soils were dried, sieved to 2 mm, and analyzed for texture, cation-exchange capacity (CEC), and soil water-holding capacity (WHC at 30.4 kPa) by the University of California Agriculture and Natural Resources Analytical Lab (for methods, see UCANR [2008]). Analyses of total N and total C were conducted by the UC–Davis Stable Isotope Facility, using an elemental analyzer and continuous-flow isotope-ratio mass spectrometer (UCD-SIF 2008).

Statistical analyses

We analyzed the resulting data set using multivariate analysis of variance (MANOVA). We conducted four separate MANOVAs corresponding to variable sets representing four major categories of ecosystem properties: (1) plant community composition by life forms; (2) patterns of plant community diversity; (3) soil physical characteristics; and (4) soil chemical characteristics (see Appendix B for MANOVA details).

The first MANOVA compared patterns of plant community composition by seven basic functional groups or life forms. The dependent variables in this analysis were thus the total cover by trees, shrubs, subshrubs, perennial herbs, herbaceous legumes, annual herbs, and graminoids. The second MANOVA on patterns of plant diversity analyzed total species diversity, total vegetation cover, introduced (nonnative) species richness, introduced species cover, and functional richness (defined as the number of the functional groups present in a plot). The third MANOVA analyzed soil physical properties relating to erosion potential. Dependent variables were soil depth, depth to compaction, cover of litter and bare ground, and average erosion class. The fourth MANOVA analyzed soil chemical characteristics, including total soil N, C:N ratio, CEC, and WHC. Total C was measured (presented in Table 1) but was not included in the MANOVA analysis because it was highly correlated with total N ($r = 0.96$, $P < 0.0001$).

All MANOVAs and protected ANOVAs were hierarchical models with ski area as a fixed factor, block (nested within ski area) as a random factor, and disturbance treatment as a three-level fixed factor comparing graded ski runs, cleared ski runs, and reference forests. Where needed, data were natural log-transformed to meet assumptions of normality and reduce heteroscedasticity. For each MANOVA, we also conducted a priori multivariate contrast tests (JMP 5.0.1a; SAS Institute 2002), and calculated Mahalanobis distances between treatment centroids (SAS 9.1, SAS Institute 2003). The contrast tests indicate significant differences among disturbance levels, while the Mahalanobis distances demonstrate multivariate effect sizes because they represent the degree of separation between disturbance levels.

Pairwise differences between disturbance levels for individual response variables were also of specific interest. We thus conducted follow-up ANOVAs and Tukey hsd tests for each response variable. These univariate analyses also allowed us to investigate the nature of significant interactions between ski area and disturbance level detected in the MANOVAs.

We investigated correlated and potentially confounding factors within our data set to ensure that we could attribute differences between treatments to initial disturbance intensity. We also analyzed environmental variables across treatments and confirmed that the blocked sampling design controlled for most underlying environmental differences except for slope (degrees of incline), which we found to be lower on graded ski runs than on cleared ski runs or reference forests. Aspect, run width, and elevation were not significantly correlated with treatment ($P > 0.10$). The slight difference in slope between treatments appears to be a consequence and not a cause of ski run grading, because even adjacent reference forests had significantly steeper slopes. Moreover, when we included slope as a covariate in each of

the MANOVA models, we found it to be nonsignificant in all analyses ($P < 0.50$). As a result, we did not include slope in the final models.

Because approximately half of the graded ski runs sampled had artificial snowmaking (but only one cleared ski run did), it was possible that snowmaking and disturbance intensity effects were potentially confounded. To determine whether the presence of snowmaking might influence our interpretation of disturbance effects, we split our data set in two and reran our MANOVA analyses on the two data subsets: those blocks where graded ski runs experienced snowmaking ($N = 15$ blocks; in one of these the cleared run also had snowmaking), and those blocks without snowmaking ($N = 16$ blocks).

RESULTS

Disturbance intensity (graded vs. cleared vs. reference forest) significantly affected all ecosystem properties examined in this study, including plant community composition, patterns of diversity, soil physical characteristics and erosion potential, and soil chemical characteristics. Multivariate contrast tests indicate that all three disturbance levels significantly differed from one another for all MANOVAs. Effects of disturbance intensity on the four categories of ecosystem properties are discussed in detail, below.

Ski area was also a significant factor in all MANOVAs. The seven ski areas sampled collectively represent a wide range of abiotic conditions and management approaches. The ski area $\times$ disturbance treatment interaction term was significant ($P < 0.02$) for three of the four MANOVAs ($P = 0.23$ for soil chemical characteristics). Univariate analyses of these ski area $\times$ disturbance treatment interactions reveal that, except for species diversity, significant interactions were generally due to absolute differences in treatment effect size among ski areas, rather than qualitative differences in the effects of disturbance treatment. Thus, except where noted, the significant ski area $\times$ disturbance treatment interaction term did not alter our interpretation of overall effects of disturbance intensity.

Plant community composition

Disturbance intensity significantly affected plant life-form composition (Wilks' $\lambda = 0.015$, $P < 0.0001$), and the MANOVA canonical centroid plot of treatment effects on plant community composition indicates that graded ski runs, cleared ski runs, and reference forests separate clearly from one another in multivariate space (Fig. 2a). Observed patterns of community composition are suggestive of successional seres following disturbance in that graded ski runs (greatest disturbance intensity) supported greater cover of graminoids and annual herbs, a composition consistent with early successional plant communities (Fig. 2a, Table 1). In contrast, cleared ski runs (intermediate disturbance) were characterized by greater cover by perennial herbs, subshrubs, and shrubs, a

composition more typical of mid-successional communities. Reference forests were characterized by greater tree cover, a compositional trait indicative of late successional or climax communities. The tight clustering of graded ski-run plots shows that there was less variance in plant community composition among graded ski runs than among either cleared runs or reference forests (Fig. 2a).

Cleared ski runs are intermediate between and overlap with graded runs and reference forests in the centroid plot. In contrast, graded ski runs and reference forests do not intersect at all, especially along the first canonical axis, which accounted for the most explainable variation between treatments (Fig. 2a). Contrast tests and Mahalanobis distances between disturbance levels support this pattern. Although all disturbance levels were significantly different at the multivariate level, graded ski runs and reference forests were most different from one another, while cleared ski runs and reference forests were the most similar of the three pairings (Table 2).

Patterns of diversity

Patterns of plant community diversity were also significantly affected by disturbance treatment (Wilks' $\lambda = 0.072$, $P < 0.0001$). Graded ski runs differed greatly from both cleared ski runs and reference forests based primarily on increased cover and richness of introduced plant species (Fig. 2b, Table 1). While all disturbance levels significantly differed from one another at the multivariate level, Mahalanobis distances emphasize that graded ski runs separate greatly from cleared runs and forests (Table 2). Cleared ski runs and reference forests overlap almost entirely on the canonical centroid plot (Fig. 2b), based on their similarly high total vegetative cover and very low abundance and richness of introduced plants (Table 1). We did not encounter introduced plants in any reference forest plots and only observed introduced plants in three cleared ski-run plots; these each had $<4\%$ introduced cover. In contrast, graded ski runs had an average introduced plant cover of 19.6% and an average of 2.5 introduced species per plot (Table 1).

Most of the introduced plant species detected in this study were seeded for erosion control. Nearly all graded ski runs sampled had been seeded for erosion control while there was no evidence that any cleared ski runs had been seeded. Previous seeding efforts were evidenced both by the presence of typical erosion-control species and confirmed by personal communications (J. Burt) with ski-area managers. Typical seeding indicators on our sites included intermediate wheatgrass (*Elytrigia intermedia* ssp. *intermedia*), orchardgrass (*Dactylis glomerata*), smooth brome (*Bromus inermis* ssp. *inermis*), hard fescue (*Festuca trachyphylla*), and birdsfoot trefoil (*Lotus corniculatus*). Because almost all nonnative plants observed during this study are used for erosion control, the higher introduced species cover and richness on graded ski runs can be attributed almost entirely to this active management practice.

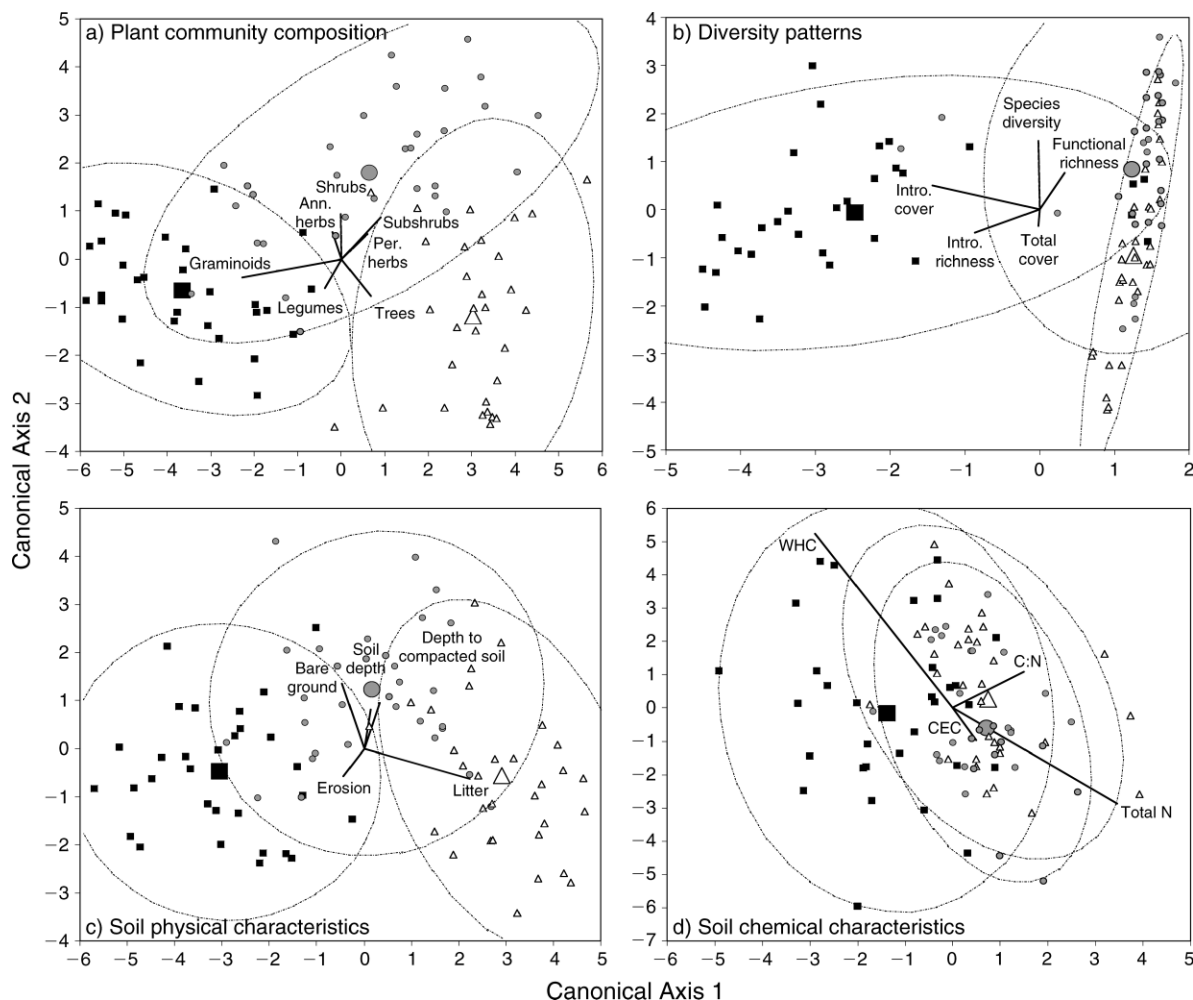


FIG. 2. MANOVA canonical centroid plots illustrate multivariate effects of disturbance treatment on ecosystem properties. Small symbols represent individual sample units: graded ski runs (solid squares), cleared ski runs (gray circles), and reference forests (open triangles). Treatment centroids are indicated with enlarged symbols, and dotted-line ellipses represent 95% confidence intervals for each disturbance level. Canonical Axis 1 accounts for most of the explainable variation in all plots: the proportion of variation accounted for ranged from 82% to 90% for panels (a)–(d). Key to abbreviations: CEC, cation-exchange capacity; Intro richness, richness of introduced plants; WHC, water-holding capacity.

Cleared ski runs did separate somewhat from reference forests because of their increased species diversity (Shannon's H') and functional richness. This apparent difference in the centroid plot was supported by results of univariate analyses that indicated that cleared ski runs possess significantly greater species diversity on average than either graded runs or reference forests, and significantly greater functional richness than forests (Fig. 2b, Table 1). However, the effects of disturbance intensity on species diversity were not entirely consistent across ski areas; although five of the seven ski areas had a hump-shaped effect of disturbance intensity on diversity, two ski areas exhibited different patterns. At the Sugarbowl site, cleared runs and reference forests both had high levels of species diversity, and at the Heavenly site, cleared ski runs had lower diversity than either graded runs or reference forests.

Soil physical characteristics and erosion potential

Disturbance intensity greatly affected soil physical characteristics and erosion potential (Wilks' $\lambda = 0.035$, $P < 0.0001$); the centroid plot indicates that cover by litter was a primary differentiating factor between disturbance levels, with bare ground and visible erosion also contributing to the separation of treatments (Fig. 2c). Univariate pairwise analyses indicated that graded ski runs significantly differed from cleared ski runs and from reference forests for all soil physical characteristics (Table 1). In contrast, cleared ski runs and reference forests had statistically indistinguishable average soil depths and compaction levels, and more similar values for bare ground, litter, and visible erosion class (Table 1). Similarly, comparing Mahalanobis distances between treatment centroids reveals that the multivariate difference between graded ski runs and reference forests was

TABLE 1. Response variable means and pairwise comparisons among disturbance levels associated with ski-run creation, grouped by ecosystem property.

Response variable	Disturbance level		
	Graded ski runs	Cleared ski runs	Reference forests
Plant community composition			
Cover graminoids (%)	26.4 ^a	4.5 ^b	0.8 ^c
Cover annual herbs (%)	2.7 ^a	1.0 ^b	0.3 ^c
Cover leguminous herbs (%)	2.2 ^a	0.8 ^a	0.7 ^a
Cover perennial herbs (%)	7.1 ^a	13.9 ^b	6.8 ^a
Cover shrubs (%)	3.4 ^a	26.6 ^c	10.0 ^b
Cover subshrubs (%)	0.1 ^a	2.6 ^c	1.2 ^b
Cover trees (%)	3.7 ^a	5.5 ^a	51.6 ^b
Diversity patterns			
Shannon-Weiner species diversity, H'	1.4 ^b	1.7 ^a	1.1 ^c
Species richness†	13.0 ^{ab}	15.3 ^b	10.8 ^a
Introduced richness	2.5 ^a	0.1 ^b	0.0 ^b
Functional richness	4.5 ^{ab}	5.1 ^b	4.0 ^a
Cover introduced plants (%)	19.7 ^a	0.2 ^b	0.0 ^b
Total vegetative cover (%)	43.5 ^a	51.8 ^{ab}	62.1 ^b
Soil physical characteristics			
Visible-erosion class	2.6 ^a	1.8 ^b	1.2 ^c
Cover bare ground (%)	48.4 ^a	23.2 ^b	6.3 ^c
Cover litter (%)	4.3 ^a	16.3 ^b	57.7 ^c
Depth to compaction (cm)	8.4 ^a	18.8 ^b	17.1 ^b
Soil depth (cm)	13.8 ^a	31.3 ^b	30.2 ^b
Soil chemical characteristics			
Total nitrogen (mg/g soil)	1.4 ^a	2.5 ^b	2.2 ^b
Total carbon (mg/g soil)†	32.8 ^a	63.9 ^b	64.3 ^b
C:N ratio	23.6 ^a	28.2 ^b	31.7 ^b
Soil water-holding capacity (% at 0.3 ATM)	19.0 ^a	20.9 ^b	22.3 ^b
Cation-exchange capacity (meq/100 g)	12.4 ^a	17.0 ^b	17.5 ^b

Notes: Disturbance levels with the same superscript lowercase letter are not significantly different (Tukey hsd pairwise comparisons on transformed data; $\alpha = 0.05$). All response variables (except cover by leguminous herbs) were significantly affected by disturbance treatment (separate ANOVAs), even after a Bonferroni correction for multiple tests ($P < 0.001$).

† Not included in MANOVA analyses because highly redundant with variables already included in the models.

>3 times greater than the difference between cleared runs and forests (Table 2).

Soil chemical characteristics

Ski-run grading resulted in greater changes to soil chemical characteristics and nutrient status (Wilks' $\lambda = 0.278$, $P < 0.0001$). The centroid plot indicates a much greater degree of overlap between treatments than was observed for other ecosystem properties (Fig.

2d). Multivariate contrast tests and Mahalanobis distances between disturbance-level centroids indicate similar patterns as found for other ecosystem properties, however; cleared ski runs and reference forests were much more similar to one another than graded ski runs were to either one (by fivefold; Table 2). Graded ski runs significantly differed from cleared ski runs and from reference forests for all soil chemical response variables at the univariate level, including N, C, C:N ratio, CEC

TABLE 2. Comparison of multivariate effect sizes between disturbance levels for each set of ecosystem properties.

Ecosystem properties	Graded ski runs vs. reference forests		Graded ski runs vs. cleared ski runs		Cleared ski runs vs. reference forests	
	Mahalanobis distance	Contrast F	Mahalanobis distance	Contrast F	Mahalanobis distance	Contrast F
Plant community composition	30.8	85.8***	18.1	46.9***	16.1	27.7***
Diversity patterns	20.2	41.0***	17.7	40.8***	3.0	9.0***
Soil physical characteristics	43.5	99.9***	17.5	37.2***	12.9	30.1***
Soil chemical characteristics	5.6	16.8***	5.8	16.6***	1.1	2.7*

Note: All multivariate contrasts are statistically significant, but greater Mahalanobis distances between treatment centroids and contrast test F statistics indicate greater degree of separation between treatment levels.

* $P < 0.05$; ** $P < 0.001$; *** $P < 0.0001$.

(cation-exchange ratio) and WHC (water-holding capacity). Cleared ski runs and forests, in contrast, had statistically indistinguishable values for all response parameters (Table 1).

Soil texture (represented by percentage sand) was strongly negatively correlated with both CEC ($r = -0.72$; $P < 0.0001$) and WHC ($r = -0.85$; $P < 0.0001$) across sites. Although soil texture was statistically unaffected by disturbance level (ANOVA $P > 0.07$ for all soil-texture classes), CEC and WHC were still highly significantly affected by disturbance treatment (Table 1). Disturbance may alter some biotically mediated soil characteristics that we did not measure that affect both CEC and WHC.

Other factors

The follow-up analyses we conducted to detect potential confounding effects of snowmaking indicated that the effects of disturbance intensity were consistent across ski runs with and without snowmaking. Results from MANOVAs on the two separate subsets of data (blocks where graded ski runs had snowmaking and blocks without snowmaking) were similar to results from MANOVAs on the overall data set; differences among disturbance treatments were still significant despite reduced statistical power of the data subsets. Canonical centroid plots revealed similar patterns across treatments to those observed in the complete data set. Snowmaking may indeed have impacts not addressed in this study, but it appears that the effects of disturbance intensity on measured ecosystem properties are consistent, whether or not the graded ski runs had artificial snowmaking.

Based on information provided by ski-area managers, we found that clearing and grading of adjacent ski runs occurred simultaneously for most ski areas, and thus the blocked sampling design accounted reasonably well for post-disturbance age. However, for three of the seven ski areas, we were either unable to determine when runs were graded (Heavenly) or determined that some runs were graded later, anywhere from 8 to 46 years after creation (Mt. Rose and Sierra), potentially confounding initial disturbance intensity and time since disturbance at these ski areas. We reran our analyses with these three ski areas excluded and found the results were robust and remained highly significant for all four groups of ecosystem properties, despite greatly reduced statistical power. We also found responses at these ski areas to be qualitatively similar to the other ski areas. These results suggest that time since disturbance may be less important than the severity of disturbance to the response variables we measured; as a result, we retained all ski areas in the final models.

DISCUSSION

Our results offer compelling evidence that impacts on ecosystem properties increase with the increased severity of disturbance associated with ski-run grading. Graded

ski runs (which are machine-leveled to remove slope irregularities) are clearly distinct from both cleared ski runs and reference forests in plant community composition and diversity, soil physical characteristics and erosion potential, and soil fertility and potential productivity. In contrast, cleared ski runs (which are cut over but not machine-graded) retain many similarities with reference forests, including indicators of soil structure, nutrient status, and overlap in plant community composition. We found, unexpectedly, that cleared ski runs are often more similar to reference forests than they are to graded ski runs, as indicated by multivariate Mahalanobis distances, centroid plots, and univariate comparisons (Tables 1 and 2, Fig. 2). The magnitude of differences between disturbance levels on ecosystem properties varies slightly across ski areas and abiotic conditions, but these basic results are consistent and robust with respect to site and management differences.

The measured ecosystem properties were chosen because they are indicators of important aspects of ecosystem function. For example, plant community composition and diversity have been shown to influence productivity, wildlife habitat quality, ecosystem resilience to disturbance, and nutrient cycling, as well as aesthetics (Hooper and Vitousek 1998, Tilman 1999, Diaz and Cabido 2001, Loreau et al. 2001). Greater functional diversity of vegetation has also been shown to benefit water and sediment conservation (Bautista et al. 2007). Similarly, physical soil indicators measured (including depth, compaction, visible erosion, bare ground and litter cover) relate directly to hydrologic function and erosion prevention, via their effects on water-storage capacity and processes affecting sediment retention (Kozlowski 1999, Grismer and Hogan 2004, Bautista et al. 2007). Soil depth and compaction also relate to soil rooting depth and rooting volume, and thus potential vegetation productivity (Kozlowski 1999, Meyer et al. 2007). Finally, soil chemistry and fertility indicators measured also influence multiple ecosystem functions, including capacity to support productive soil biota and vegetation growth, processes of nutrient cycling and retention, buffering capacity, and smaller-scale aspects of water and sediment retention (Whisenant 1999, Claassen and Hogan 2002, Clark et al. 2007, Watt et al. 2008). We think that the impacts we observed to ecosystem properties result in alterations to important ecosystem functions and services, all of which could be managed for in ski areas.

As predicted, graded ski runs appear to be "set back" in succession relative to cleared ski runs. The more severe disturbance associated with grading reduced soil quality and may have removed or destroyed much of the existing seed bank and any underground plant storage organs. Graded ski runs in this study were characterized by plant communities more typical of early-successional seres, including annual herbs (which are nearly absent in cleared runs or forests), graminoid species, and herbaceous legumes. In part, this early-successional structure

may reflect the seeding of exotic grasses and legumes on graded runs. Notably, these results are consistent despite differences in post-disturbance ski run “ages” across ski areas. Ongoing vegetation maintenance on both types of ski runs may contribute to this lack of recovery. For example, brush cutting (of shrubs and sapling trees) is generally conducted every 3–5 years on both types of ski runs (J. Burt, *unpublished data*).

Although greater disturbance intensity negatively affected certain ecosystem properties, we found intermediate disturbance on average resulted in greater species and functional-group diversity. In contrast to many observational studies on the effects of intermediate disturbance, replication of ski-run types within sites allowed us to experimentally tease out categorical effects of disturbance intensity (although seeding of nonnative species in graded runs may also have had an influence on diversity). In our study, plots within moderately disturbed, cleared ski runs exhibited the greatest species diversity and functional richness. While graded ski runs were more likely to be dominated by early successional species, and reference forests often had nearly closed canopies with reduced understory, cleared ski runs were more representative of an intermediate successional state, with all functional groups well represented and a greater diversity of perennial herbs, subshrubs, and shrubs. Cleared ski runs also exhibited greater variation among plots in terms of composition by functional groups than did graded ski runs or forests (Fig. 2a). These results support the long-standing hypothesis in community ecology that an intermediate-disturbance regime (in terms of either frequency or intensity) will have the highest species diversity (Grime 1973, Connell 1978, Huston 1979).

Evidence for higher diversity on intermediately disturbed cleared ski runs was consistent across five of the seven ski areas, but two ski areas did not fit this pattern. At the Sugarbowl site, reference forests exhibited the highest species diversity. Interestingly, forests sampled there were highly fragmented and appeared to be experiencing windthrow effects, and had very open canopy conditions compared to forests sampled elsewhere. Thus, this site may be an “exception that proves the rule” because these forests may also be experiencing intermediate disturbance. The second exception was at the Heavenly site, where cleared ski runs had the lowest species diversity of any treatment. Low diversity on the cleared ski runs at this site is likely due to dominance of the low-growing shrub, pinemat manzanita (*Arctostaphylos nevadensis*). This species comprised 37–65% ground cover of all cleared ski-run plots at this site, while it was much less prevalent in graded ski runs or in forests. Other ericaceous shrubs have elsewhere been observed to create dense “recalcitrant understory layers” that hinder forest succession (Royo and Carson 2006:1346).

We found that graded ski runs were generally seeded for erosion control (with mostly nonnative grasses and

legumes), while cleared runs were not seeded. Within graded ski runs, native cover and introduced cover were significantly negatively correlated ($r = -0.54$, $P = 0.002$), and introduced cover and native richness were marginally negatively correlated ($r = -0.33$, $P = 0.069$), suggesting that seeding with nonnatives for erosion control has adverse effects on the local abundance and diversity of native plants. Revegetation efforts ideally should promote increased native plant cover and litter and reduced bare ground and erosion, thus hastening recovery. However, revegetated graded runs still had significantly more bare ground, less litter cover, and greater visible erosion than cleared runs, even after the passage of many years.

Grading ski runs significantly degrades a number of soil and hydrologic properties. Despite active seeding, graded ski runs exhibited more exposed bare ground and visible erosion than did cleared ski runs, and importantly had greatly increased erosion potential compared to cleared ski runs. The increased soil compaction and reduced soil depth that we measured on graded ski runs can reduce infiltration rates and water-storage capacity of the soil profile that, in turn, increase overland flows and erosion (Kozlowski 1999, Grismer and Hogan 2005a, b). Soil traits that limit plant growth, including nutrient levels, cation-exchange capacity (CEC), and water-holding capacity (WHC) were also significantly reduced by the greater initial disturbance associated with grading. Although cleared ski runs did exhibit somewhat lower litter cover, greater bare ground, and more visible erosion than did forests, their soils were indistinguishable in terms of other soil and hydrologic properties, including depth, compaction, nutrient status, CEC, and WHC.

The impacts on soil and hydrologic properties observed in graded ski runs may be especially long-lasting in high-elevation ecosystems where soil development is slow. Our results demonstrate that grading ski runs is detrimental to all measured indicators of soil structure and hydrologic function, compared to clearing ski runs, which left these indicators mostly unchanged from reference forest conditions. The impacts of soil disturbance on hydrologic function are very much recognized in the Lake Tahoe Basin, where runoff from degraded upland habitats has been responsible for much loss of lake clarity (Naslas et al. 1994, Claassen and Hogan 2002).

Cleared ski runs may even offer some ecological benefits in a surrounding matrix of dense forests. Because they represent diverse mid-successional communities, cleared ski runs could potentially provide important wildlife habitat and contribute to greater regional diversity through increased habitat heterogeneity. One study of bird communities in forested ski areas indicates that graded ski runs have negative edge effects on bird diversity, whereas pasturelands promote diversity (Laiolo and Rolando 2005). Cleared ski runs were not considered in that study, but the pasturelands may have been more like the cleared ski runs observed in our

study region in that they created less abrupt vegetation transitions and were characterized by diverse grass and shrub communities (Laiolo and Rolando 2005). Other studies of wildlife use of powerline rights-of-way and ski slopes demonstrate that compositional and structural diversity of vegetation leads to increased (open-habitat) wildlife use and mitigates dispersal barriers (Goldingay and Whelan 1997, Goosem and Marsh 1997, Russell et al. 2005, Rolando et al. 2007). While abrupt vegetation changes may often be detrimental to wildlife (such as those presented by the edges of graded ski runs), vegetated ecotones along the edges of cleared ski runs can possibly benefit wildlife if managed appropriately; at minimum they may not present such imposing barriers to wildlife dispersal as graded ski runs.

As mentioned previously, most published literature on the impacts of ski-slope creation focuses entirely on graded ski runs, primarily in alpine habitats, with no comparison with ungraded ski runs. These studies found similar impacts of ski-run grading in alpine habitats as we encountered in habitats below timberline: graded ski runs differ from reference habitats in terms of plant community diversity, cover, composition, and structure (Bayfield 1996, Urbanska 1997, Urbanska et al. 1998, Rixen et al. 2003, Wipf et al. 2005, Barni et al. 2007); erosion rates (Mosimann 1985); and soil characteristics (Gros et al. 2004, Barni et al. 2007, Delgado et al. 2007). Other studies have found differences between alpine graded ski runs and reference habitats in terms of winter ground temperatures (Rixen et al. 2003, 2004) and seed-rain diversity and abundance (Urbanska et al. 1998, Urbanska and Fattorini 1998). Below tree line, Ruth-Balaganskaya and Myllynen-Malinen (2000) determined graded ski-run soils were severely depleted in nutrients relative to reference forest conditions, as we also encountered in our study system. Without intervention, many graded ski runs fail to recover and remain barren of vegetation for many decades after creation (Mosimann 1985, Bayfield 1996, Urbanska and Fattorini 2000, Urbanska and Chambers 2002, Wipf et al. 2005); where time since grading was explicitly analyzed, no mitigating effects of time on plant community recovery could be detected over a 4–30 year age span (Wipf et al. 2005).

We have encountered a marked tendency in the literature and even among local agencies to consider all ski runs equal. In contrast, our research indicates that cleared ski runs present a viable, ecologically preferable alternative to graded ski runs. A similar conclusion was drawn by the only published study we encountered that explicitly compared graded and ungraded ski runs, conducted in European alpine grasslands and dwarf healthlands (Wipf et al. 2005). This begs the question as to why ski runs are graded. Informal surveys of ski area managers indicate that grading ski runs reduces topographical irregularities (depressions, hummocks, and boulders); graded ski runs thus require less snowfall to open for use than do cleared ski runs. Managers

estimate that approximately 0.5 m additional snowfall is required on average to open cleared ski runs. Consequently, graded ski runs can open earlier in the season with a concomitant increase in revenue. We monitored the internet-posted status of a set of paired cleared and graded ski runs in the early part of the 2006–2007 season and observed that, indeed, graded ski runs did open about a week earlier on average. However, managers also indicated that graded ski runs generally require more total summertime maintenance effort, due to erosion-control seeding and water-bar repairs (even though they require less effort for ongoing vegetation clearing).

In conclusion, we found that the severe disturbance intensity associated with ski-run grading resulted in increased impacts on most ecosystem properties considered and reduced similarity to reference forests. Because all ski runs are disturbed, open habitats, one might expect ski runs to share more similarities than they do differences. However, we found that cleared ski runs were actually more similar to reference forests than they were to graded ski runs. We found it particularly striking that, despite the wide range of variation in biotic, abiotic, and management conditions represented by our large sample of sites, the effects of ski-run creation methods on ecosystem properties were consistent and repeatable. The results of this study have management implications beyond ski areas to many anthropogenic disturbances, including powerline rights-of-way, firebreaks, temporary access roads, logging areas, and even restoration sites. If maintaining functionally diverse plant communities, soil structure and productivity, and hydrologic function are important goals for ski-area management, then ski runs should be cleared rather than graded whenever possible.

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APPENDIX A

Environmental characteristics of reference forest plots in the seven surveyed ski areas (*Ecological Archives* A019-094-A1).

APPENDIX B

MANOVA statistics for four analyses corresponding to aspects of ecosystem function (*Ecological Archives* A019-094-A2).

Ski tourism affects habitat use and evokes a physiological stress response in capercaillie *Tetrao urogallus*: a new methodological approach

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Summary

1. Human outdoor recreational activities are increasing and have a significant impact on wildlife. There are few methods suitable for investigating the response of rare and endangered species to human recreational activities, although the impact can be assessed at various scales by measuring both physiological and behavioural responses to disturbance.

2. Capercaillie *Tetrao urogallus* are suffering strong population declines throughout central Europe. We examined the effects of ski tourism on capercaillie habitat use and adrenocortical activity, measured non-invasively in droppings.

3. During three winters, 2003–06, we radio-tracked 13 capercaillie. In the southern Black Forest in Germany, we sampled 396 droppings of these and additional individuals before and after the start of the ski season. We tested whether the intensity of human winter recreational activities affected home range location and habitat use, and we identified those factors influencing the concentration of corticosterone metabolites (CM) in droppings.

4. Capercaillie used habitats subject to ski tourism. Although the latter did not affect home range location, capercaillie preferred undisturbed forests within their home ranges and avoided areas with high recreation intensity in the ski season. Faecal CM levels of individuals in areas with low recreation intensity were significantly lower than those in areas with moderate or high recreation intensity during the entire study period.

5. We conclude that ski tourism affects both habitat use and endocrine status in capercaillie, with potential negative consequences on body condition and overall fitness.

6. *Synthesis and applications.* This study demonstrates the relevance of studying wildlife responses at various temporal and spatial scales, and the value of using multiple methods applied to the same individuals to monitor the impact of human recreational activities on a free-ranging species. In order to protect capercaillie populations, we recommend that managers keep forests inhabited by capercaillie free from tourism infrastructure and retain undisturbed forest patches within skiing areas.

Key-words: corticosterone, grouse, habitat selection, human disturbance, stress ecology, winter tourism

Introduction

Human outdoor recreational activities are of increasing conservation concern and are one of the main causes of the decline of all threatened and endangered species in the USA

(Czech 2000). In order to investigate the impact of such activities on free-ranging species, we need to know how animals respond to the presence of humans before assessing the evidence for a link between the effect of human disturbance and population declines.

The response of free-ranging animals to human presence has been studied extensively. Animals may respond to the appearance of humans with anti-predatory behaviour (Beale

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& Monaghan 2004). Human presence can cause animals to interrupt feeding behaviour, flee or abandon preferred habitats temporally or permanently (Fernandez-Juricic & Telleria 2000). Such direct behavioural responses can affect predation risk, energy intake and energy expenditure of the animal (Cassirer, Freddy & Ables 1992) and thus have direct fitness costs (Amo, Lopez & Martin 2006). As a physiological response to stressors, glucocorticoids are secreted into the blood (Sapolsky, Romero & Minck 2000) as part of a mechanism to adjust the behaviour and physiology of an animal to prevailing environmental conditions (Wingfield & Romero 1999). Chronically elevated and prolonged high levels of corticosterone can be physiologically harmful to individuals, affecting immune function, growth, reproduction and survival (Sapolsky, Romero & Minck 2000). Thus high corticosterone concentrations may indicate that an animal is stressed, even if obvious behavioural changes cannot be detected (Walker, Boersma & Wingfield 2005). Conversely, not every behavioural response to the presence of humans leads to a physiological stress response (Müller *et al.* 2006). Animals in a critical body condition (e.g. starving in winter) may show only weak behavioural reactions to humans (Stillmann & Goss-Custard 2002). Studies investigating the effects of human recreational activities on animals usually focus on either behavioural (Stalmaster & Kaiser 2004) or physiological responses to humans (Wasser *et al.* 1997) and therefore can be misleading. Only a few studies have simultaneously measured behavioural and physiological responses to human recreational activities (Walker, Boersma & Wingfield 2005; Walker, Boersma & Wingfield 2006).

The assessment of the response of rare and endangered free-ranging species to human recreational activities is particularly difficult because few methods are available. Experimental disturbance and other invasive methods should be avoided. The capture of individuals is often restricted because of their conservation status or low capture success rates. However, measuring stress hormone levels in droppings is an appropriate non-invasive method of evaluating the endocrine status of rare and endangered species (Goymann 2005; Touma & Palme 2005).

In this study, we investigated both habitat use as a behavioural response and faecal concentrations of corticosterone metabolites (CM) as a physiological response of capercaillie *Tetrao urogallus* L. to human winter recreation activities. Many populations of capercaillie in Europe have been extirpated or declined rapidly within the last few decades (Storch 2000a). Human disturbance together with habitat deterioration and forest fragmentation are the main potential causes of population decline (Storch 2000b). The only study investigating the response of capercaillie to human recreational activities suggests that capercaillie cannot adapt to off-trail disturbances (Thiel *et al.* 2007a). Studies assessing capercaillies' physiological responses to humans and how they respond to on-trail disturbances are lacking but are needed urgently for effective management plans and conservation strategies.

The level of winter sport activity and the introduction of new outdoor sports (e.g. snow shoeing) has increased drasti-

cally during the last decade and affects essential habitats or retreats for a number of rare and shy species, such as black grouse *Tetrao tetrix* and chamois *Rupicapra rupicapra*. Human recreational activities in winter could be particularly harmful to capercaillie because they are energetically constrained by their dependence on low-quality conifer needles as food (Klaus *et al.* 1989). Body condition at the end of winter has been shown to affect reproduction success of the related rock ptarmigan *Lagopus mutus* (Moss & Watson 1984).

Materials and methods

STUDY AREA AND STUDY SPECIES

We conducted the study in the forest-dominated mountain range of the southern Black Forest in south-western Germany (47°51'N, 07°58'E). The study area (2812 ha) consisted of capercaillie habitat in two study plots (plot A and plot B; see Appendix S1 in the supplementary material), with altitudes ranging from 900 to 1400 m. The study plots were separated by a steep valley of 5 km width with unsuitable habitat. Plots were demarcated by altitude (> 900 m), paved roads or treeless pastures. The hilltops and valley bottoms were covered with patchy forests and interspersed with pasture. The forests were managed and used intensively for various recreation activities, and were dominated by Norway spruce *Picea abies* (49%), European silver fir *Abies alba* (19%) and common beech *Fagus sylvatica* (22%; Suchant, Baritz & Braunisch 2003). The winter climate in the area is temperate with high precipitation (2000 mm year⁻¹). The area is snow-covered from November/December–April, with a snow depth of 0.5–3 m. Recreation activities in the snow-free season are mainly hiking and mountain biking, and in winter cross-country skiing, downhill skiing (only in the upper part of study plot A; see Appendix S1 in the supplementary material) and hiking. Backcountry and free-riding skiing were frequent in the down-hill skiing area between ski-runs in the upper part of study plot A (see Appendix S1 in the supplementary material). The intensively used cross-country ski-tracks, with up to 1000 visitors a day (R. Roth, personal communication), near a tourist lodge in study plot A (see Appendix S1 in the supplementary material) and a biathlon shooting stand in study plot B (see Appendix S1 in the supplementary material), were mainly confined to forest roads or were situated in unforested areas. Intensive ski tourism starts between early and late December, when the snow depth allows the preparation of ski-runs. Before the ski season starts, only a few hiking tourists visit the study area. The ski season ends with the snow melt in early spring (March/April).

In the entire Black Forest (7000 km²), during the last 30 years, the highly endangered capercaillie population has declined rapidly by about 65%, to 220 males. They persist in isolated fragments of just 510 km² (Braunisch & Suchant 2006). The study area was located within the core population of the southern Black Forest and is currently inhabited by about 60 individuals.

RADIO-TRACKING AND HABITAT USE

In September–October 2003 and 2004, seven capercaillie males and eight females were caught in walk-in ground-nets set in bilberry *Vaccinium myrtillus*-rich forest patches, where capercaillie prefer to search for food (Storch 1993a). There was no bias in age or sex ratio and all were healthy individuals. Males are twice the size of females and were equipped with a 40–69-g backpack radio-transmitter;

Table 1. Number of bearings collected during the pre-ski and ski seasons for seven radio-tracked capercaillie males and eight females, and the size of their home ranges (minimum convex polygon, MCP, in ha), during the pre-ski and ski season for birds with more than 22 bearings per period. Individuals with 22 bearings or less (1–22) were not included in statistical analyses. Bearings were taken over 72 different days during the pre-ski season and over 147 different days in the ski season

Individuals	Number of bearings		Home range (MCP, ha)	
	Pre-ski	Ski	Pre-ski	Ski
Male 1	27	(5)	59	–
Male 2	23	25	141	22
Male 3	30	31	185	137
Male 4	41	63	171	125
Male 5	49	95	208	245
Male 6	51	102	548	219
Male 7	(17)	0	–	–
Female 1	29	0	179	–
Female 2	39	26	79	66
Female 3	45	(21)	130	–
Female 4	45	67	134	58
Female 5	(9)	69	–	128
Female 6	43	65	118	71
Female 7	52	96	367	104
Female 8	(6)	(14)	–	–

females were fitted with a 25–40-g backpack transmitter (model GPI, Titley Electronics Ltd, Ballina, Australia; model A1540, Attrack Advanced Telemetry Systems Inc., Isanti, MN; and model PTT-100, Microwave Telemetry Inc., Columbia, MD). Transmitters were <4% of the birds' body mass and had no noticeable effect on behaviour. We tested for a possible effect of wearing a transmitter on CM levels but none was detected (see below). During the winters 2003/04–2005/06, between 1 November and 31 March birds were located by 'homing in' (Kenward 2001) using a three-element hand-held antenna. Eight birds were tracked during one winter only, seven birds in either two or three winters. To minimize disturbance, most bearings were taken from forest roads or ski-tracks at <1 km distance. The forest canopy was relatively open with many leafless deciduous trees, access was easy and the spatial activity of capercaillie in winter low (Storch 1993b). All bearings were accurate and could be included in the analyses.

We defined two time periods because the area and intensity of human recreational activity changed over the course of the winter. The 'pre-ski season' started on 1 November (early winter with leafless deciduous trees, low snow cover) and lasted until the first heavy snow fall, when ski tourism began, usually in December. The 'ski season' started with the first day of ski tourism (when the number of tourists increases suddenly from almost zero to >1000) until 31 March, when the habitat use of capercaillie changes because of early lekking behaviour. In both periods, ecological and climatic conditions remain similar, with temperatures mostly <0 °C and capercaillie utilizing their winter habitats. In the ski season we could follow only 10 individuals because three were predated (male 1 and females 1 and 3) and one individual dispersed at the beginning of the study period (female 5; Table 1). All birds with more than 22 radio-locations per time period were included in the analyses. The time between two consecutive radio-locations ranged between 4 hours and 25 days (median 1 day).

Home ranges were determined by the minimum convex polygon method (MCP; GIS software ArcView 3.2) separately for the two time periods, pre-ski and ski season (Table 1). The extents of the study area and home ranges were calculated by excluding non-forested areas and very steep slopes >40°, which were unsuitable habitat for capercaillie; no radio-locations were recorded in such habitats.

Capercaillie prefer flat snow-rich mountain ridges and hilltops, and avoid steep slopes (Klaus *et al.* 1989; Graf *et al.* 2005). As a measure of habitat quality, we used the steepness of the slope with two categories (SLO1 = 0–10°, SLO2 = 10–40°, based on 50 × 50-m grid cells; DEM, Land Survey Office of Baden-Wuerttemberg, AZ:2851-9/3). We treated the intensity of recreation, and thus the potential of human disturbance, as another component of habitat quality. We defined three classes of recreation intensity. All forested areas without human presence during the winter (e.g. inaccessible areas and away from any ski-tracks) were digitized as REC1 (low recreation intensity). All regularly used tourism infrastructure in forests, such as ski-tracks, ski-lifts, ski-runs, hiking trails, roads, the tourist lodge and the biathlon shooting stand, with a buffer of 50 m, were digitized as REC3 (high recreation intensity; see Appendix S1 in the supplementary material). A previous study had revealed a 90-percentile flushing distance of 50 m (752 flushing events; Thiel *et al.* 2007a) between capercaillie and an off-trail hiker. All habitats that did not fall in one of the two categories were classified as areas with moderate recreation intensity (REC2). All GIS analyses for the habitat use study were conducted with GIS software ArcGIS 9.1.

As the recreation intensity classes did not reflect the same intensities in both time periods, we defined them separately except for REC1. REC1 was associated with no or very low recreation intensity in both time periods. During the pre-ski season, REC2_A accounted for off-trail recreation activities with a low intensity level, REC2_B in the ski season for off-trail recreation activities with a moderate intensity level. REC3_A during the pre-ski season included the area of all on-trail recreation activities within a buffer of 50 m, mostly forest roads with only a few hikers. In the ski season, REC3_B included on-trail recreation activities within a 50-m buffer along all intensively used ski-tracks, ski-runs and hiking trails with several hundred recreationists per day.

SAMPLING OF DROPPINGS

All droppings were sampled from 1 November to 31 March in 2003/04 and 2004/05 in the same study area. We located transmitter-equipped capercaillie every 3–5 weeks to sample their fresh droppings. In addition, fresh droppings from capercaillie without transmitters were collected by walking along contour lines crossing forests and searching for droppings by eye on the surface of the snow (Thiel *et al.* 2007b). When searching for droppings of capercaillie without transmitters, the same location was visited only three times per winter. We determined the sex of the capercaillie from the size of the intestinal droppings, i.e. the dropping diameter of males is >10 mm, and that of females <8 mm (K. Bollmann, unpublished data). As home ranges of capercaillie in winter are small (Storch 1993b; Table 1), the droppings were spatially clumped. We only sampled fresh droppings and considered droppings from the same sex within a circle of 300 m (28.3 ha) as originating from the same individual, because at low densities capercaillie only occasionally aggregate in flocks (Klaus *et al.* 1989). Therefore we assigned each dropping of an individual without a transmitter to a 'potential individual', as an approach to prevent pseudoreplication in statistical analyses. Moreover, all repeated sampling of droppings from the same location were treated as originating from the same potential individual. As we only sampled fresh droppings and we knew at the

time of sampling where the transmitter-equipped birds were located, we could avoid unintentionally sampling droppings from transmitter-equipped birds. We sampled 5–15 droppings at each location (= 1 dropping sample).

For each dropping sample, we determined the following predictor variables for the analyses: RADIO (without or with transmitter), INDIVIDUAL (potential individual for birds without a transmitter or individual transmitter-equipped bird), SEX (male or female), SEASON (pre-ski or ski season) and minimum daily temperature, TEMPMIN, from the nearest meteorological station (DWD Deutscher Wetterdienst) corrected for altitude by 0.6 °C per 100 m. Ambient temperature is known to affect energy metabolism, food intake, dropping production and therefore steroid measurements (Goymann *et al.* 2006). Furthermore, we determined the type of droppings, DROPTYPE, in three categories (night-roost droppings, droppings excreted during foraging, and droppings excreted during walking or day roosting on the ground; see definitions in Thiel *et al.* 2007b). Caecal droppings were not sampled because their different composition of micro-organisms affects enzymatic steroid metabolism (Klasing 2005). Each dropping sample was assigned to a slope category, SLOPE, (SLO1, SLO2) and a recreation intensity class, RECREATION (REC1–3). In total, we obtained 106 dropping samples from 14 transmitter-equipped individuals ($n = 2–19$ per individual, from all individuals except female 1; Table 1). The 290 droppings from birds without a transmitter were assigned to 53 potential individuals ($n = 1–14$ per potential individual) according to the method described above. All samples were stored at -23 °C until analysis. We did not have to be concerned about diet composition as a determinant of glucocorticoid metabolite concentration (Goymann 2005) because in winter capercaillie feed exclusively on conifer needles (Klaus *et al.* 1989), particularly on Norway spruce needles in the southern Black Forest (Lieser 1996). Other factors that might affect faecal CM, such as sex (Touma *et al.* 2003) and temperature (Goymann *et al.* 2006), were included as factors in our model. Sampling was restricted to winter before the reproduction period started, therefore life-cycle stage was held constant (Huber, Palme & Arnold 2003). The age and storage of droppings (Millspaugh & Washburn 2004) was not a concern because collection took place when temperatures were <0 °C and CM was stable (Thiel, Jenni-Eiermann & Palme 2005).

CM MEASUREMENTS

The faecal concentration of CM reflects the level in the plasma and can therefore be used to biomonitor the endocrine status (Touma & Palme 2005). Glucocorticoids are metabolized in various organs and therefore droppings contain a mixture of several different metabolites with a wide range of polarities. Because glucocorticoid metabolism is often species- and sometimes even sex-specific (Palme *et al.* 2005), a careful physiological validation of any method to measure faecal CM must be undertaken (Touma *et al.* 2003). We measured CM in droppings after extraction (60% methanol) with a previously described cortisone enzyme immunoassay (EIA), detecting steroids with a 3,11-dioxo structure (Rettenbacher *et al.* 2004). This EIA has been proven to measure corticosterone metabolites reliably in capercaillie droppings (Thiel, Jenni-Eiermann & Palme 2005). CM levels in capercaillie droppings remain stable for at least 21 days as long as the ambient temperature is <9 °C, which was the case throughout our study period; time of day does not influence faecal CM level (Thiel, Jenni-Eiermann & Palme 2005).

Because we were interested in measuring the potential long-term effects of recreation intensity on the baseline corticosterone, we

wanted to eliminate potential short-term effects of other stressors, such as predator appearance. Moreover, because of differences in corticosterone metabolite concentrations between droppings (Baltic *et al.* 2005), probably caused by the pulsed excretion of corticosterone by the bile (K. Klasing, personal communication), we collected and homogenized the 5–15 droppings per individual and sampling location to obtain a mean concentration of these metabolites over a longer time span.

STATISTICAL ANALYSES

We used mixed models (residual maximum likelihood analysis, REML; Patterson & Thompson 1971) to test whether individual home range size varied with the number of bearings per individual (BEARINGS) or with season (SEASON). INDIVIDUAL was included as a random effect, BEARINGS, SEASON and its interaction term as fixed effects.

We combined the categories of the two habitat classifications (REC and SLO), resulting in six habitat types: REC1SLO1, REC1SLO2, REC2SLO1, REC2SLO2, REC3SLO1 and REC3SLO2. To test whether habitat use by capercaillie was influenced by recreation intensity, we applied compositional analysis (Aebischer, Robertson & Kenward 1993) using an Excel macro (Smith 2005) for two types of analyses.

First, we compared the composition of the six habitat types in the home ranges with the availability of the habitat types in the entire study area. This was done for the pre-ski and ski season periods separately, to test whether the home ranges of capercaillie were preferentially located in areas of particular habitat types.

Secondly, we compared habitat use within each home range, as revealed by the composition of the habitat types from the telemetry locations, with availability (habitat composition of the corresponding home range). For both periods separately, we tested whether capercaillie preferred or avoided certain habitat types within their home ranges.

Following Aebischer, Robertson & Kenward (1993), we substituted missing values by a small proportion (0.001%) for available but unused habitat types; 1000 iterations for randomizations were used. For each compositional analysis of capercaillie habitat use, Wilk's lambda (λ) and randomized *P*-values were reported.

We used REML to identify factors affecting CM levels. Data from all years were pooled, and data from birds with and without transmitters were analysed in the same model, because we tested for any effects of year and of wearing a transmitter by the variable RADIO. The model contained all six predictor variables as fixed effects and the variable INDIVIDUAL as a random effect. Furthermore, we included the three interaction terms SEX $\times$ SEASON, SEX $\times$ RECREATION and SEASON $\times$ RECREATION because we expected them to be biologically relevant. Non-significant interaction terms were omitted from the final model. We used GenStat for Windows version 7.3 (Payne 2003) for the analysis.

Results

HABITAT USE

Areas with intensive human activity (the tourist lodge, ski-runs and biathlon shooting stand) were used during the pre-ski season but mainly avoided in the ski season (see Appendix S1 in the supplementary material). In contrast to

ski-runs, areas with cross-country ski-tracks were used during both the pre-ski and ski seasons. During the pre-ski season, capercaillie were more evenly distributed in the study area than in the ski season, when capercaillie locations were more aggregated in certain areas (see Appendix S1 in the supplementary material). In the ski season, 50% of 84 locations in areas with high recreation intensity (REC3_B) occurred on days with only a few skiers because of snowfall and storm. Compared with an expected frequency of 25% (proportions of days with low recreation activity when birds were radio-tracked), this shows that capercaillie used REC3_B areas in the ski season when recreationists were mostly absent.

Home range size, as determined by telemetry in nine birds, differed significantly with SEASON (Wald χ^2 -probability = 0.006) and was not influenced by the number of bearings (Wald χ^2 -probability = 0.940). Home ranges during the pre-ski season were larger than in the ski season for all individuals except for male 5 (Table 1). The location of the home ranges did not change between the two periods; $75 \pm 5.3\%$ (mean $\pm$ SE, $n = 9$) of the home range area in the ski season was already part of the home range area before the ski season started. Hence capercaillie did not markedly relocate or change their home range with the start of the ski season, except for male 1. During the pre-ski season, this male used forests with ski-runs and ski-lifts. With the beginning of the ski season, it relocated to an area 2700 m away with moderate recreation intensity, REC2_B (cross-country skiing area), by crossing a valley 1500 m wide. After 3 weeks this bird returned near to its previous location but in a forest with low recreation intensity (REC1), where it was predated by a red fox *Vulpes vulpes*.

In a next step, we analysed, at the individual level, whether the composition of the six habitat types (combination of slope and recreation intensities) in the home ranges differed from the habitat composition of the entire study area. During the pre-ski season, capercaillie home range composition did not differ from the composition of the study area (Wilk's $\lambda = 0.618$, $\chi^2 = 5.777$, randomized $P = 0.539$; Fig. 1a). In the ski season, habitat composition of capercaillie home ranges differed only slightly from availability in the study area (Wilk's $\lambda = 0.138$, $\chi^2 = 19.841$, randomized $P = 0.045$) and there were no significant differences between habitat types (Fig. 1b).

On a smaller spatial scale, we analysed whether habitat use, as revealed by the locations within home ranges, differed from the habitat composition of the corresponding individual home ranges. During the pre-ski season, capercaillie preferred areas with moderate recreation intensity, REC2_A, to REC1 and REC3_A, independent of slope (Wilk's $\lambda = 0.252$, $\chi^2 = 16.539$, randomized $P = 0.018$; Fig. 2a). In the ski season, capercaillie significantly preferred undisturbed areas, REC1, to highly disturbed areas, REC3_B, independent of slope (Wilk's $\lambda = 0.1522$, $\chi^2 = 18.824$, randomized $P = 0.046$; Fig. 2b).

STRESS HORMONE ANALYSES

Five out of seven variables (SEX, SEASON, TEMPMIN, DROPTYPE and RECREATION) contributed significantly

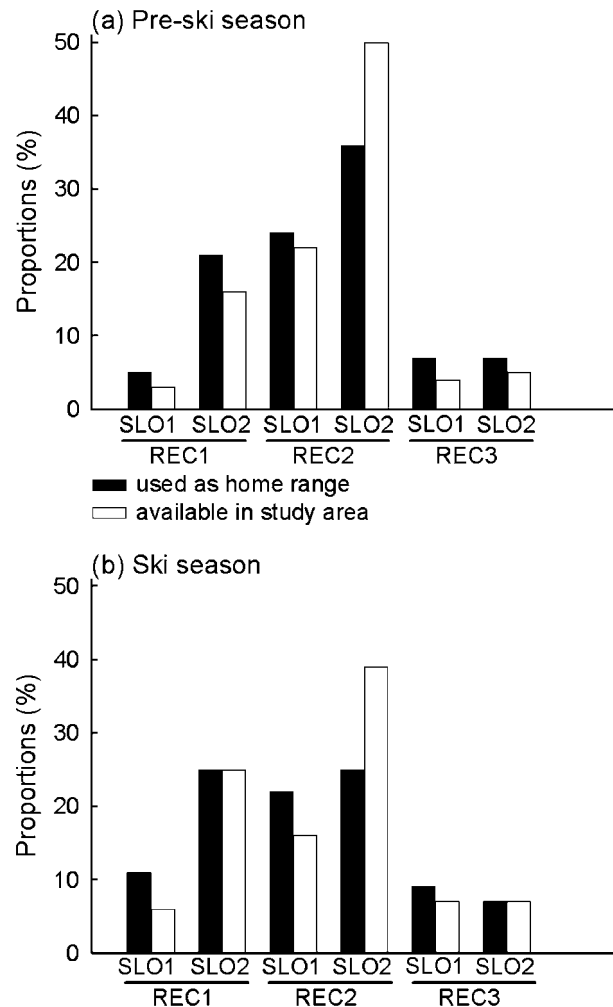


Fig. 1. Proportions of six habitat types of recreation intensity classes [REC1, no/low recreation intensity; REC2, off-trail recreation activities with low (during the pre-ski season) or moderate (in the ski season) intensity level; REC3, on-trail recreation activities within a buffer of 50 m] and habitat slope categories (SLO1, 0–10°; SLO2, 10–40°) of capercaillie winter home ranges compared with the availability in the entire study area during the (a) pre-ski season and (b) ski season. There were no significant differences between use and availability of the six habitat types.

to explaining the variation in CM level (Table 2). Males (predicted mean $\pm$ SE, 45.0 ± 2.4 ng g dropping⁻¹) exhibited generally higher faecal CM levels than females (37.7 ± 2.3 ng g dropping⁻¹; Fig. 3). The CM level during the pre-ski season (34.6 ± 3.1 ng g dropping⁻¹) was significantly lower than in the ski season (48.6 ± 1.9 ng g dropping⁻¹; Fig. 3). The CM level increased with decreasing minimum daily temperatures (Table 2). The CM level from night-roost droppings (41.3 ± 1.4 ng g dropping⁻¹) was lower than those excreted during foraging (44.0 ± 1.5 ng g dropping⁻¹) and during walking or day roosting on the ground (49.5 ± 2.5 ng g dropping⁻¹). In both periods, CM levels of capercaillie were lower in areas with low (REC1) compared with moderate (REC2) recreation intensity (Fig. 3).

Independent variables	Effect $\pm$ SE	Wald statistics	d.f.	P
Constant	31.49 $\pm$ 4.65			
RADIO (yes)	2.86 $\pm$ 3.01	0.23	1	0.63
SEX (female)	-7.82 $\pm$ 2.59	11.37	1	< 0.001
SEASON (during)	13.61 $\pm$ 3.25	10.66	1	0.001
TEMPMIN	-0.57 $\pm$ 0.23	9.50	1	0.002
DROPTYPE		7.25	2	0.027
Foraging	-1.02 $\pm$ 2.68			
Day roosting/walking	5.30 $\pm$ 2.68			
SLOPE (10–40°)	-3.09 $\pm$ 2.14	3.18	1	0.074
RECREATION		17.91	2	< 0.001
Moderate	9.96 $\pm$ 2.88			
High	8.89 $\pm$ 2.88			

Table 2. Dependence of the concentration of CM in capercaillie droppings ($n = 396$) on various predictor variables analysed in a multivariate linear REML model with the individual bird INDIVIDUAL as the random effect. Effects $\pm$ SE were calculated considering a reference value of zero for RADIO (no), SEX (male), SEASON (pre-ski season), DROPTYPE (night roosting), SLOPE (0–10°) and RECREATION (low). None of the two-way interaction terms was significant

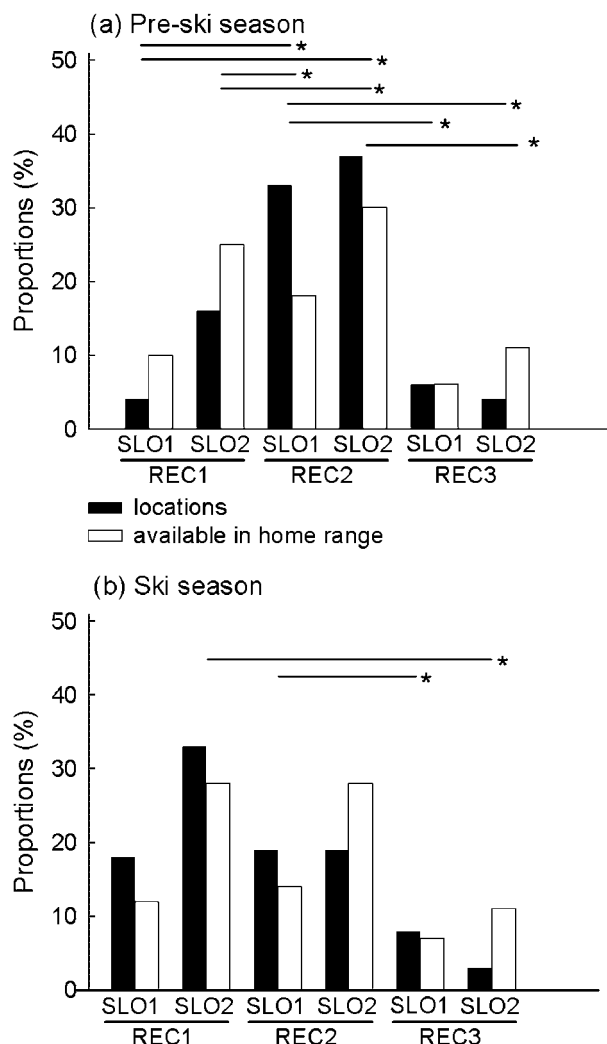


Fig. 2. Proportion of the six habitat types (see Fig. 1 for explanation) used within home ranges (locations) compared with the composition of their individual home ranges during (a) the pre-ski season and (b) the ski season. $^*(P < 0.05$, compositional analysis) indicates significant differences between habitat types connected by a line.

CM levels of capercaillie in areas with REC2 did not differ from those with high recreation intensity, REC3 (Fig. 3). Faecal CM levels of capercaillie with or without a transmitter did not differ. SLOPE did not contribute to explaining the

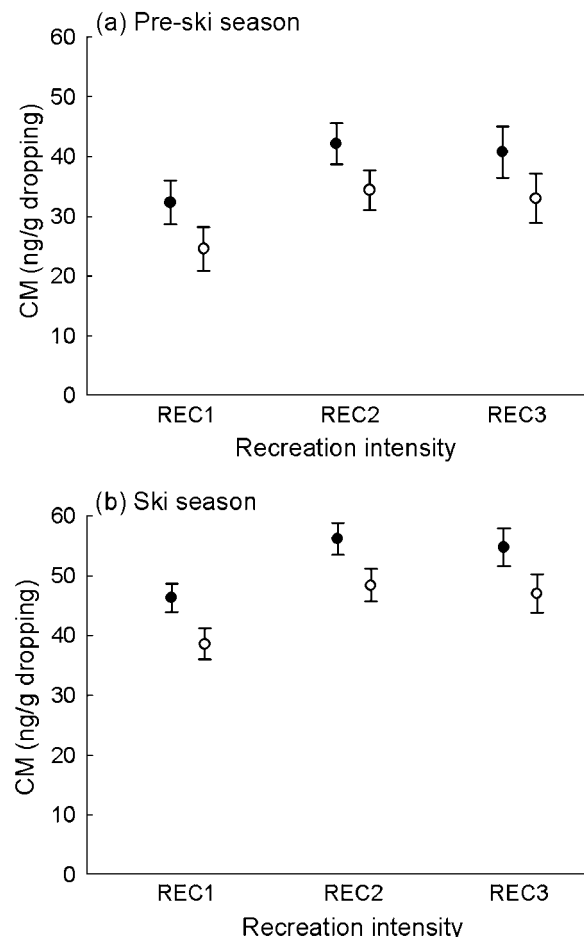


Fig. 3. Predicted means ($\pm$ SE) of the REML analysis (Table 2) of concentrations of CM in capercaillie droppings ($n = 396$) of males (filled circles) and females (open circles) for three recreation intensity levels during (a) the pre-ski season and (b) the ski season.

variation in CM level. Analysis of the 106 droppings from the 14 individually known radio-tracked birds without the variable RADIO revealed that the same variables were significant except for SEX ($P = 0.456$) and DROPTYPE ($P = 0.466$). RECREATION had by far the largest impact of all variables ($P = 0.002$, effect size 13.2 for REC2 and 11.0 for REC3).

Discussion

METHODOLOGICAL APPROACH

This study has demonstrated the importance of measuring both physiological and behavioural responses of marked individuals in order to evaluate their susceptibility to human recreational activities. In addition, by investigating habitat use at two spatial and two temporal scales we could assess the scale at which capercaillie modify their behaviour in response to winter tourism. Had we focused on a specific scale or only investigated either the physiological or the behavioural response, we may have drawn the wrong conclusions. Several studies have shown that, under certain circumstances, animals do not, or only weakly, respond behaviourally to disturbances because this would be too costly, although they are stressed (Frid & Dill 2002; Stillmann & Goss-Custard 2002). Thus the reliability of studies focusing only on behavioural responses can be limited or misleading. Therefore a physiological measure of stress from the same individuals provides important additional information with which to evaluate possible responses to human disturbance. However, a physiological measure of stress does not provide information on behavioural reactions and the precise circumstances under which human presence has an impact on the animal, information which is needed for mitigation measures. This calls for a combination of methods.

The capercaillie/winter tourism system was particularly appropriate for this methodological approach because the large body size and longevity of capercaillie allowed the use of heavy and long-lived transmitters to follow the birds for up to three consecutive winters. In addition, snowy conditions increased the efficiency of finding sufficient droppings for powerful statistical analyses, and frost kept the corticosterone metabolites stable. Therefore this methodological approach is most appropriate for studying species that can be radio-tracked over a long period and where droppings can be collected in an environment that stabilizes stress hormone metabolites.

HABITAT USE

This study revealed that winter tourism affected habitat use at a small spatial scale within home ranges, that capercaillie preferred disturbance-free forest patches and that areas with tourism infrastructure were only used when tourists were absent. The decrease in home range size with the start of the ski season could be related to the concomitant increase in snow depth. With this increase, foraging on ground vegetation becomes impossible and birds are restricted to low-quality conifer needles, which is likely to reduce their spatial activity (Gjerde & Wegge 1987). However, the preference of capercaillie in the ski season for areas with low human recreational intensity within their home ranges is unlikely to be caused by snow depth or food availability, because capercaillie in our study area mainly fed on the superabundant and spatially evenly distributed Norway spruce (Lieser 1996). An effect of predators is also possible, but data on this were not available.

STRESS HORMONES

We found a physiological response in capercaillie to human recreation during the pre-ski and ski seasons at a small spatial scale (between individuals) and at a landscape scale (between home ranges). These findings seem to be robust because the increase of faecal CM level appeared in both sexes, both seasons and for birds with and without transmitters. The physiological response of capercaillie to winter tourism was more pronounced and obvious than the behavioural response; droppings on hiking trails with a low frequency of tourists during the pre-ski season showed higher CM levels compared with areas away from any human presence. In accordance with our findings, faecal glucocorticoid metabolites in wolves *Canis lupus* and pine marten *Martes martes* were higher in areas used by humans, and day-to-day variation in these levels in elk *Cervus elaphus* paralleled variation in the number of snowmobiles (Creel *et al.* 2002; Barja *et al.* 2007).

Higher levels of faecal CM in males than females is similar to a study on chickens using the same EIA (Rettenbacher *et al.* 2004). This may indicate a different metabolism of corticosterone (Goymann 2005; Touma & Palme 2005), a difference in steroid-binding plasma globulins (Breuner & Orchinik 2002) or reflect sex-specific differences in plasma corticosterone levels indicating that males are more stressed than females. Thiel *et al.* (2007a) have suggested a higher susceptibility of capercaillie males to human recreational activities when reporting longer flushing distances as a response to an off-trail hiker.

The strong effect of season on CM level (higher CM levels in the ski season than in the pre-ski season) could be caused either by the higher recreation activity in the ski season or by environmental changes. With the increase of snow depth, capercaillie change their forage from energy-rich and easily digestible bilberries on the forest ground to low-quality conifer needles in trees. This change in food could be stressful, leading to increased faecal CM levels. Low temperatures, occurring more frequently in the ski season than the pre-ski season, may also result in an increase in CM levels. However, the effect of season on CM level is not because of a correlation of season with temperature, as the significance of season remained the same even when we first corrected for temperature by changing the order of the predictor variables in the REML analysis.

THE IMPORTANCE OF REFUGES

Several reasons can be offered to explain why capercaillie used skiing areas despite the possible negative consequences, and why the effect of winter recreation on capercaillie habitat use was spatially scale-dependent. Habitat selection of capercaillie and skiers are similar. Winter tourism in the southern Black Forest is restricted to the highest snow-rich altitudes, mostly dominated by flat and gently sloped coniferous forests with low tree density. These forests are the last high-quality capercaillie habitat in the region (Braunisch & Suchant 2006). Capercaillie may remain within disturbed areas because they

cannot find alternative suitable habitat nearby, a situation also found in Malaysian plovers *Charadrius peronii* on tourist beaches (Yasué & Dearden 2006). It is possible that frequent or long-distance movements in response to human recreation may be too costly or too risky, decreasing body condition and increasing predation risk. Capercaillie probably use skiing areas only when undisturbed refuges are also available within their home ranges. Forest patches that are inaccessible to humans might provide a visual and acoustic shield from recreation activities in adjacent areas.

The question is whether the avoidance of tourist areas within home ranges and high stress hormone levels indicate adverse effects of winter tourism on capercaillie. It is well known that chronically elevated corticosterone levels have negative impacts on physiology, immune system and behaviour (Sapolsky, Romero & Minck 2000), although we do not know whether the CM levels observed in this study were at a detrimental level. Juvenile hoatzins *Opisthocomus hoazin* living at ecotourist-exposed sites had a lower body mass and higher mortality and showed a stronger increase in corticosterone levels to experimental stress compared with individuals at undisturbed sites (Müllner, Linsenmair & Wikelski 2004).

CONCLUSIONS AND MANAGEMENT IMPLICATIONS

We conclude that areas with frequent human winter recreational activities are suboptimal capercaillie habitat. We recommend that the creation of new skiing areas should be avoided and that existing sites should not be developed further in or adjacent to capercaillie habitats. In areas where capercaillie habitat overlaps with human winter recreational activities, management plans should ensure that forest patches without human access are interspersed as refuges, and off-trail activities in capercaillie core areas should be prevented. Regulations should stipulate that tourists stay on the marked trails. Wherever possible, trails in capercaillie core areas should be closed or relocated to reduce the extent of disturbance, and thus increase suitable capercaillie habitat. Hazel grouse *Bonasa bonasia*, black grouse and other species are also likely to benefit from such management activities because they share similar habitat requirements with capercaillie and are probably affected similarly by disturbance from human winter recreational activities (Arlettaz *et al.* 2007).

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Supplementary material

The following supplementary material is available for this article.

Appendix S1. Locations of radio-tracked capercaillie in the southern Black Forest during the pre-ski season and ski seasons.

This material is available as part of the online article from: <http://www.blackwell-synergy.com/doi/full/10.1111/j.1365-2664.2008.01465.x>

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Impact of outdoor winter sports on the abundance of a key indicator species of alpine ecosystems

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Summary

1. Tourism and leisure activities have increased continuously all over the world during the past decades, exerting a growing pressure upon naturally fragile ecosystems, such as mountainous habitats. Recent studies have established that disturbance by outdoor winter sports (e.g. skiing, snowboarding and snowshoeing) is a source of stress for wildlife. This may in turn affect its abundance, but we still lack quantitative evidence.

2. We tested the effect of outdoor winter sports (ski lifts and related recreational activities) on the abundance of the alpine black grouse *Tetrao tetrix*, a vulnerable indicator species of the timberline ecosystem, the favoured habitat for outdoor winter sports in the European Alps.

3. Generalized linear models and a model selection approach were used to rank environmental factors influencing black grouse abundance and to make predictions about population status in the theoretical absence of ski resorts. We modelled the number of displaying cocks along census transects in spring, as a function of habitat characteristics (vegetation structure and typology), ski lift density and hunting pressure at 15 natural sites (none or a very low level of anthropogenic disturbance) and 15 ski resorts in the south-western Swiss Alps.

4. Ski lift density and habitat typology were the principal determinants of black grouse abundance, whereas hunting pressure had no discernable effect. Ski lifts and related winter sport activities had a strong negative effect on the number of displaying cocks, which may have led to a mean 36% reduction of local abundance in ski lift areas, as determined after controlling for the confounding effect of habitat type.

5. *Synthesis and applications.* Conservation action plans for black grouse should aim at reducing the multiple negative effects generated by outdoor winter sports (ski facilities and related winter sport activities). First, vegetation patchiness (i.e. a mosaic of grassy shrubland with scattered trees) should be maintained along ski runs. Secondly, wintering preserves where human access is banned or strictly limited should be promoted within ski resorts. Spatially explicit human–wildlife conflict maps can be constructed from the present model to allow delineation of those areas likely to become effective protection areas.

Key-words: AIC, alpine ecosystems, habitat quality, human disturbance, hunting, ski lifts, *Tetrao tetrix*, winter recreation

Introduction

Tourism and other public recreational activities have been continuously increasing over the past decades, even in the most remote areas of the world. They potentially constitute a new threat to endangered and vulnerable wildlife. The impact of these increasingly popular activities on wildlife is often complex and variable in space and time, with their actual

effects still poorly understood (Taylor & Knight 2003; Blumstein *et al.* 2005; Sutherland 2007). Human disturbance, such as repeated flushing events of resting wildlife by people practicing outdoor winter sports, may evoke stress responses (Arlettaz *et al.* 2007). This is often associated with compensatory behavioural adaptations and incurs additional energetic costs (Baltic 2005; Williams, Lusseau & Hammond 2006). Repeated disturbance often constrains animals to occupy suboptimal habitats (Taylor & Knight 2003; Thiel *et al.* 2008), and may affect reproductive and survival functions

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as well as overall fitness (Mullner, Linsenmair & Wikelski 2004; Watson & Moss 2004). The combination of these detrimental effects will ultimately lead to a reduction of local population density, if not species richness (Mallord *et al.* 2007; Rolando *et al.* 2007; Walker, Naugle & Doherty 2007).

Through the steady increase of the winter tourism industry mountainous and alpine ecosystems are put at risk due to their natural fragility. The construction of ski lifts has profoundly modified the landscape through total destruction, degradation and/or fragmentation of the original natural habitats (Wipf *et al.* 2005). Animals inhabiting alpine habitats already have a finely-tuned physiology for coping with the harsh winter conditions (Marchand 1996). They now in addition have to cope with disturbance generated by winter sport activities (Arlettaz *et al.* 2007). It has also been established that close to mountain hostels and restaurants, the density of generalist predators may be artificially increased by the availability of food remains and other garbage (Storch & Leidenberger 2003). Independent of the increase of winter tourism, the progressive abandonment of traditional farming practices, such as cattle grazing, may further reduce the overall species richness and attractiveness of these habitats for wildlife due to diminished heterogeneity and patchiness of the landscape (Laiolo *et al.* 2004). Finally, hunting, which bears great cultural and economic significance in the Alps, could additively impact on the dynamics of wildlife populations that are already weakened by other factors (Baines & Lindén 1991).

The black grouse *Tetrao tetrix* is a key indicator species of timberline ecosystems, which is suffering a decline in parts of its geographic distribution (Storch 2007). In the Alps, severe declines have been reported locally in the recent past, especially in marginal areas far from the species' core distribution range (Zbinden, Salvioni & Stanga 2003). Alpine black grouse live almost all year-round within the narrow timberline belt [1800–2300 m above sea level (a.s.l.)], where most ski facilities and related winter recreation concentrate. The International Union for the Conservation of Nature (IUCN) has suggested that this decline is linked to the spread of winter sports, although scientific evidence is lacking (Storch 2007).

The aim of the present study was to quantify and rank the various threats affecting black grouse population dynamics in the north-western European Alps. Specifically, we assess the relative impact of ski lifts and related outdoor winter sport activities, as well as hunting pressure, on black grouse abundance, while controlling for the effect of habitat type.

Methods

STUDY AREA

The study was conducted in the Swiss Alps, within the cantons of Valais and Vaud (south-western Switzerland, 46°10'N, 7°20'E), between 1400–2300 m a.s.l. (Klaus *et al.* 1990). The study area is situated on both sides of the Rhône Valley, which extends from the Lake of Geneva to the Rhône glacier and covers an area of about

3000 km². The dominant tree species of the upper subalpine forests and the adjacent timberline is larch *Larix decidua*, with arolla pine *Pinus cembra* present in the centre of the study area. Spruce *Picea abies* dominates the more marginal areas in the Prealps. Dwarf shrubs (*Ericaceae*, *Rhododendron ferrugineum* L., *Juniperus communis* L.) and grasses (*Nardus stricta* L., *Calamagrostis villosa* L., etc.) represent the understorey. The climate is sub-continental to continental, with warm, dry summers, and cold, relatively wet winters (Reisigl & Keller 1999).

BLACK GROUSE ABUNDANCE

Black grouse abundance was estimated by counting lekking males displaying at or above the timberline, along transects, in spring 2005. Fifteen ski resort and 15 'natural' sites were chosen with the following key selection criterion: the presence of a lookout (accessible on foot) from which an observer could recognize (using a telescope) cocks displaying along a 1.5 km transect situated on the opposite side of the valley at the same elevation, without interfering with the birds' behaviour. The mean ($\pm$ SD) observation distance was 2.1 ± 1.1 km; this did not differ between natural sites and ski resorts (*t*-test, *t* = 0.25, *P* = 0.80). Disturbed sites were all located within ski resorts, with at least one ski facility (e.g. ski lift) crossing the transect and several other facilities in the surroundings. The natural sites were areas with minimal or limited disturbance by outdoor winter sports – including ski mountaineering – and absence of ski lifts within a radius of 3 km around the centre of the transect. Transects were distributed across the study area at least 1.5 km apart and averaging ($\pm$ SD) 4.6 ± 3.4 km. As adult male black grouse are sedentary (Klaus *et al.* 1990; P. Patthey *et al.* unpublished data), mean natal dispersal distance for juvenile males in the Alps (Caizergues & Ellison 2002) and mean recorded distance between leks along the timberline in the Alps (Klaus *et al.* 1990) is ~ 1.5 km; thus, the distribution of transects reduced the risk of counting the same cocks on two different transects and consequently, any risk of interdependency between transects. Censuses were performed three times during the season from mid-April until late May (Klaus *et al.* 1990). Detection probability was high as black grouse males with their black plumage were highly conspicuous against the snow background. The sampling protocol for site visits was randomized in a pairwise fashion, ensuring equal number and timing of visits to ski resort and natural sites during each of the census period. Surveys started at dawn and consisted of three 15-min periods of observation, separated by 15-min gaps. Local abundance of black grouse was estimated as the maximum number of displaying cocks observed simultaneously, in any of the nine 15-min censuses, in a habitat belt along each transect (100 m below and 200 m above the timberline).

PREDICTORS OF ABUNDANCE

Habitat typology

We mapped 13 different habitat types along the transects (including a 20-m buffer), which encompassed all main habitats present in the altitudinal belt where black grouse occur. Mapping was performed by the same observer in August 2005, by walking along each transect at the average elevation of displaying cocks. We recorded the boundaries of each habitat type with a Global Positioning System (GPS; Garmin eTrex Summit, Garmin Ltd, USA). Habitat types were characterized based on the vertical and horizontal vegetation structure, and accounting for a humidity

gradient (Supporting Information Table S1). This enabled us to estimate the local proportion of each of the habitat types. To reduce both the number of variables and their interdependency, we performed a principal component analysis (PCA), based on these proportions. The five main factor(s) encompassing most (63%) of the system variance (principal components PC-1 to PC-5; selected with the broken-stick method; Jackson 1993) were used in subsequent analyses (thereafter HABITAT predictors). Principal components were standardized.

Ski lifts and winter sport activities

We used ski lift density as a proxy for landscape-habitat alterations by outdoor winter sports and disturbance by sportspeople in winter. These two factors are thus confounded in the present study. As we could not assess how far skiers may move from ski lifts (off-piste, or free-riding recreation, see Arlettaz *et al.* 2007), potentially representing a source of disturbance, we constructed several GIS raster maps. First, we estimated ski lift density (length of all types of lift wire per surface [$\text{m } 100 \text{ m}^{-2}$]) within circular buffers of 250, 500, 750, 1000 and 1500 m radii. Secondly, we built a sixth map of the minimum distance to the nearest ski lift cable. Raster maps had a cell size of 625 m^2 . As with habitat variables, we performed a PCA on these GIS ski lift maps. For further analyses, we retained only the first principal component (PC-1), which explained 80% of the overall variance. PC-1 correlates negatively with mean distance to ski lifts, and positively with densities of ski lifts within different radii. It can thus be seen as a compound index of ski lift density and winter sport activities (SKI LIFTS). Finally, the mean PC-1 pixel value was calculated for each census transect.

Hunting pressure

In some Alpine cantons of Switzerland, black grouse cocks can still be hunted during late autumn, outside federal and cantonal game reserves. To obtain a spatial estimate of hunting pressure, the area within a community territory (the smallest administrative unit) was restricted both to the altitudinal belt occupied by black grouse (1400–2300 m a.s.l.) and to the area subjected to hunting, excluding game reserves. The mean harvests for 2000–2004 (long-term cumulative effect) and for only 2004 (short-term effect) were attributed to these areas. On the basis of the geo-referenced maps, we calculated the harvest density within circular buffer radii similar to the procedure used for SKI LIFTS. Principal component analyses were run with the five resulting variables. The first principal component from each analysis (2000–2004, 96% of variance; 2004, 95% of variance) was retained for the following analyses. These two components were positively correlated to harvest densities and were used as indices of hunting pressure (HUNTING). Mean pixel values of the resulting PC-1 maps were extracted for each transect.

MODELLING BLACK GROUSE ABUNDANCE

We used a Generalized Linear Model procedure, with Poisson error distribution and a log link function (McCullough & Nelder 1989) to model black grouse abundance as a function of habitat typology, ski lift density and hunting pressure:

$$\log(p) = \beta_0 + \beta_1 X_1 + \dots + \beta_N X_N,$$

where p is the abundance, X_N the N th predictor and β_N is the Poisson regression coefficient. We followed an information-theoretic

Table 1. Summary of the model selection procedure for predicting Alpine black grouse abundance. The seven candidate models (see the combinations of X) include the following descriptors: habitat type (HABITAT), ski lifts and winter sport activities (SKI LIFTS), and hunting pressure (HUNTING). The models are ranked according to Akaike's Information Criterion (AIC_c) and their weights (w_i). k indicates the number of parameters in the model

SKI LIFTS	HABITAT	HUNTING	k	ΔAIC_c	w_i
X	X		4	0.00	0.872
X	X	X	6	3.91	0.123
X			2	11.05	0.003
	X		3	14.36	0.001
X		X	4	14.85	0.001
	X	X	5	16.05	0.000
		X	3	27.03	0.000
0.999*	0.996*	0.124*			

*selection probability (see Material and methods for details).

approach (Burnham & Anderson 1998; Johnson & Omland 2004) and predefined seven candidate models (Table 1), resulting from the combinations of the three main groups of predictors: HABITAT, SKI LIFTS and HUNTING. Models were ranked according to Akaike's Information Criterion, corrected for small samples (AIC_c), AIC_c differences (ΔAIC_c) and Akaike weights (w_i). We used a two-stage process (e.g. Johnson *et al.* 2005). First, we selected the best set of predictors within the HABITAT group of variables. Among all possible combinations of PC-1 to PC-5, we retained the predictors that had $\Delta AIC_c < 2$, compared to the best sub-model (i.e. the best model within the group of predictors; Burnham & Anderson 1998). Secondly, we integrated these sets of predictors, where appropriate, into the seven candidate models. Our approach allowed the number of predictors to be reduced and the most likely explanatory predictors selected. This also avoided testing all possible combinations of predictors, which would have dramatically increased the number of candidate models at the second stage. We estimated the relative importance of each group of predictors by summing the AIC_c weights for each group across all models that contained that group of predictors. According to Burnham & Anderson (1998), this sum corresponds to a selection probability. Finally, we used a model-averaging approach to estimate coefficients and 95% confidence intervals (CI) for each predictor into a final, general model (Burnham & Anderson 1998). The predictive performance of the final model was evaluated with a Spearman's rank correlation test (r_s) (e.g. Potts & Elith 2006), coupled with a randomization procedure (Vaughan & Ormerod 2005). This procedure had to be adopted, first, because our sample size would have been too small ($n = 30$ sites) to reasonably cross-validate our model; and secondly, because there is no other similar abundance data for other sites in the Swiss Alps, rendering it impossible to validate with an external data set. Thus, we generated 1000 bootstrap samples of equal size to the original data set by random sampling with replacement. For each bootstrap sample, we recalculated the model coefficients. We used these and the original data set to predict black grouse abundance and to estimate the correlation between the predicted and observed abundance. We also computed the mean and standard deviation of the Spearman's rank correlation tests. This method simulates the use of independent data to evaluate the predictive performance of the original model (Vaughan & Ormerod 2005). We considered the correlation to be significant if the Spearman's tests were statistically significant ($P < 0.05$) more than 950 times from the 1000

bootstrap repeats (Manly 1997). Homoscedasticity and normality were determined based on residuals.

CONSTRUCTING LARGE-SCALE ABUNDANCE MAPS

The habitat typology section of the black grouse abundance model was based on precise data collected in the field. Such detailed habitat maps do not exist across the entire study area, contrary to the self-constructed GIS HUNTING and SKI LIFTS maps. It was therefore not possible to directly and spatially extrapolate the relationships between local bird abundance and habitat type to the entire study area. In order to construct predictive abundance maps, we had to find GIS surrogates for the HABITAT principal components. First, we extracted monthly indices of vegetation productivity (NDVI, see Pettoirelli *et al.* 2005) from three LANDSAT-5 satellite images taken in April, May and August 1998. In subsequent analyses, we retained the first principal component obtained through a PCA conducted on these three NDVI data sets. Secondly, for each of the three monthly satellite images, we ran a separate PCA using six reflectance wavelengths in the visible (blue, green, red), near-infrared, shortwave, and thermal infrared sections of the electromagnetic spectrum, again retaining PC-1 from each seasonal analysis, for use in subsequent analyses. Another PCA was finally carried out on these three monthly principal components, in order to integrate the information obtained throughout the season. We then used a vector-based habitat data base (Swisstopo, Wabern, Switzerland) to calculate the density of isolated trees, bushes, open forests and closed forests, in circular buffers, using the same buffer radii as for the other predictors (see above) and likewise, the first factor(s) of a PCA applied to these density maps were retained for further analyses. Then, we performed stepwise (forward and backward) linear regression to model surrogates of the HABITAT PCs. The independent variables were the GIS habitat predictors created previously and their associated quadratic terms. Here, we used stepwise modelling instead of model averaging, since we wanted to obtain a simple model and, additionally, we were not interested in the model composition (Whittingham *et al.* 2006). We used R^2 to assess whether a given model had sufficient predictive power to be considered reliable.

A post-development abundance map for the period following the construction of the ski resorts, based on present-day habitat typology (main vegetation communities only change over the very long term in the Alps) was generated by applying the black grouse abundance model using the HABITAT surrogates, as well as the SKI LIFTS and HUNTING maps. Similarly, a final pre-development abundance map (i.e. in the theoretical absence of ski lifts and related winter sport activities) was created using the abundance model; this time, however, the overall SKI LIFTS predictor was held constant, using the average value obtained from the natural sites. This approach was used to predict the effect of winter tourism development on black grouse abundance, whilst accounting for other covariates.

We used ArcGIS 9.1 (Environmental Systems Research Institute, California), IDRISI32 (Clark Labs) and Biomapper (Hirzel, Hausser & Perrin 2002) software for GIS analyses. Statistical analyses were performed using the statistical package R (version 2.4.0, R Core Team 2006).

Results

MODEL SELECTION

Between one to 20 black grouse cocks (average $\pm$ SD: 5.6 ± 4.2) were observed along the 30 transects. During the

first stage of the model selection process, two HABITAT predictors (HABITAT PC-2 and PC-5) substantially explained the black grouse abundance pattern within this predictor group. These were retained for the second stage of modelling and integrated in the seven subsequent candidate models. These two predictors were not correlated with the SKI LIFTS predictor ($r_s = -0.10$, $P = 0.60$ and $r_s = 0.10$, $P = 0.62$, respectively). Neither were the two HUNTING pressure indices (i.e. the long-term cumulative and the short-term effect) correlated with the SKI LIFTS predictor ($r_s = -0.29$, $P = 0.13$ and $r_s = -0.32$, $P = 0.09$, respectively), showing that ski resorts and natural sites did not differ regarding hunting pressure and habitat typology.

Among the set of candidate models, SKI LIFTS and HABITAT variables were the most likely ecological correlates of black grouse abundance (selection probabilities of 0.999 and 0.996, respectively; Table 1). In comparison, the probability of linking HUNTING predictors with black grouse abundance was lower (0.124). The most parsimonious model consists of a combination of SKI LIFTS and HABITAT predictors ($w_i = 0.87$; Table 1), with a good predictive power, as shown by the significant correlation between observed and predicted abundance ($r_s = 0.54 \pm 0.08$, $P < 0.05$).

BLACK GROUSE ABUNDANCE MODEL

In the averaged model, both HABITAT PC-2 and PC-5 were positively correlated with black grouse abundance. We ranked raw habitat variables by combining (not shown) their loadings with the Poisson regression coefficients (Table 2); high proportion of mixed *Rhododendron-Vaccinium* shrubs, open young forest with grass-Ericaceae, open old forest with grass, *Alnus* forest and open old forest with grass-Ericaceae were associated with high black grouse abundance. Among these habitat variables, mixed *Rhododendron-Vaccinium* shrubs clearly had a stronger effect. On the contrary, a high proportion of other habitat types, but mainly of rocks and scree, *Rhododendron-Vaccinium* and pasture, *Juniperus* and pasture, open young forest with grass and *Juniperus* shrubs decreased the likelihood of high black grouse abundance.

The covariate SKI LIFTS PC-1 had a negative effect on black grouse abundance, meaning that a higher density of ski lifts and a shorter distance to them lowered the abundance of black grouse (Table 2). According to their PC loadings, higher ski lift densities within radii of 500 to 1000 m have a stronger negative effect than a higher ski lift density close to the transect (250 m; Table 2).

The two HUNTING predictors were not correlated with black grouse abundance, as their coefficients overlapped with zero (0.0041, 95% CI: $-0.0058 - 0.0139$; -0.0045 , CI: $-0.0142 - 0.0053$, respectively). Moreover, the HUNTING predictors had a low model selection probability (Table 1).

Thus, we predicted black grouse abundance as a function of the SKI LIFTS predictor by holding the HABITAT predictors constant at their mean value, and without considering any effect of HUNTING. Mean predicted black grouse abundance in natural sites was 6.6 cocks 1.5 km^{-1} linear transect along the timberline vs. 4.2 in ski resorts (Fig. 1).

Table 2. The SKI LIFTS and the two HABITAT variables derived from a principal component analysis, included in the averaged Poisson regression model of black grouse abundance. Proportion of the variance accounted for by the principal component is indicated between brackets. Loadings are the correlation coefficients of each original variable onto the principal components (PC). SKI LIFTS PC-1 is composed of five densities of ski lifts (calculated in circles of 250, 500, 750, 1000 and 1500 m radii; r is for radius) and the minimum distance to the nearest ski lift

SKI LIFTS PC-1 (80%)		HABITAT PC-2 (14.6%)		HABITAT PC-5 (9.3%)	
Variable	Loading	Variable	Loading	Variable	Loading
Density r250	0.81	<i>Juniperus</i> shrub	-0.37	Rocks, scree	-0.36
Density r500	0.94	Open old forest with Ericaceae	-0.28	Pasture with <i>Juniperus</i>	-0.35
Density r750	0.97	Dense <i>Alnus viridis</i> forest	-0.27	Pasture with <i>Rhododendron</i> , <i>Vaccinium</i>	-0.34
Density r1000	0.96	Open young forest with Ericaceae	-0.23	Open young forest with grass	-0.23
Density r1500	0.90	Open young forest with grass	-0.16	Alpine pasture	-0.16
Distance	-0.51	Rocks/scree	-0.14	Open old forest with grass, Ericaceae	-0.14
		Pasture with <i>Rhododendron</i> , <i>Vaccinium</i>	-0.11	Open young forest with Ericaceae	-0.08
		Alpine pasture	-0.10	Open old forest with grass	-0.05
		Pasture with <i>Juniperus</i>	-0.03	<i>Juniperus</i> shrub	-0.03
		Mixed <i>Rhododendron</i> - <i>Vaccinium</i> shrub	0.05	Open young forest with grass, Ericaceae	0.03
		Open old forest with grass	0.37	Open old forest with Ericaceae	0.05
		Open young forest with grass/Ericaceae	0.39	Dense <i>Alnus viridis</i> forest	0.42
		Open old forest with grass/Ericaceae	0.55	Mixed <i>Rhododendron</i> - <i>Vaccinium</i> shrub	0.59
Poisson regression coefficient	-0.051		0.171		0.244
SE	0.014		0.075		0.072

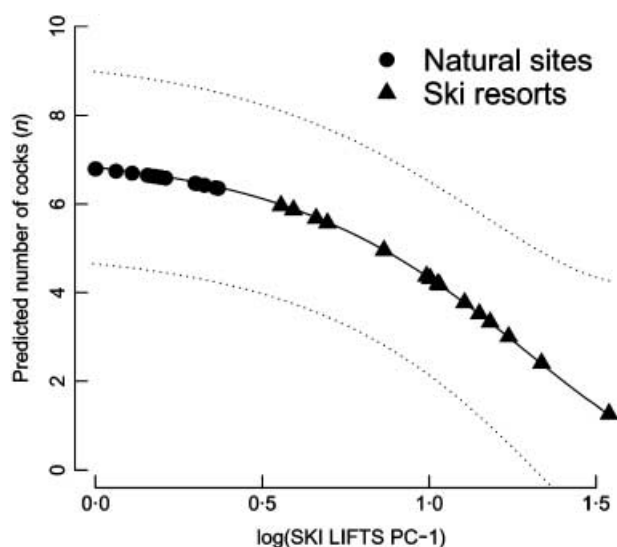


Fig. 1. Predicted Alpine black grouse abundance relative to ski lifts and winter sport activity with 95% confidence limits. Abundance was allowed to vary with the ski lifts and winter sport activity index (SKI LIFTS PC-1), while HABITAT covariates were held at their mean values. Predictions are based on the averaged model.

This would translate to a 36% mean reduction of abundance within ski lift areas, compared to natural sites. Based on this result and on the relationship between the SKI LIFTS index and our site classification into ski resorts or natural sites (Fig. 1), we estimated that 20% of the potential range of black grouse in our study area is already moderately affected by winter sports close to ski facilities [Fig. 1; $0.5 < \log(\text{SKI LIFTS PC-1}) < 1$; with abundance of cocks reduced by ~18%]. The proportion of the area already under high pressure is

24% [Fig. 1: $\log(\text{SKI LIFTS PC-1}) > 1$, ~49% reduction in abundance]. This leaves 56% of the potentially suitable area for black grouse currently unaffected by winter recreation linked to ski resorts. Extrapolating from these figures, we can estimate that the development of ski lifts and related winter sport activities, has contributed to a 15% reduction of the whole Valais black grouse population ($56\% \times 0\% + 20\% \times 18\% + 24\% \times 49\%$).

BLACK GROUSE ABUNDANCE MAP

It was possible to find adequate GIS surrogates for the HABITAT predictors selected in the final averaged model (Supporting Information Table S2). The linear regression between the HABITAT predictors and their GIS surrogates showed good predictive power (HABITAT PC-2 = $1.00 \pm 0.18 \times \text{HABITAT PC-2 GIS surrogate}$, $P < 0.0001$, $R^2 = 0.49$; HABITAT PC-5 = $1.00 \pm 0.09 \times \text{HABITAT PC-5 GIS surrogate}$, $P < 0.0001$, $R^2 = 0.80$). Post-development and pre-development abundance maps constructed for a major ski resort in the European Alps gives a visual representation of the negative impact of ski lifts and related winter sport on activities black grouse (Fig. 2).

Discussion

This study provides the first quantitative evidence that ski lifts and related outdoor winter sports negatively impact on a key alpine indicator species on a large scale. Our model suggests that black grouse abundance is approximately 36% lower in ski resort sites than in natural areas, after accounting for the effect of habitat type, given that grassy shrubland with

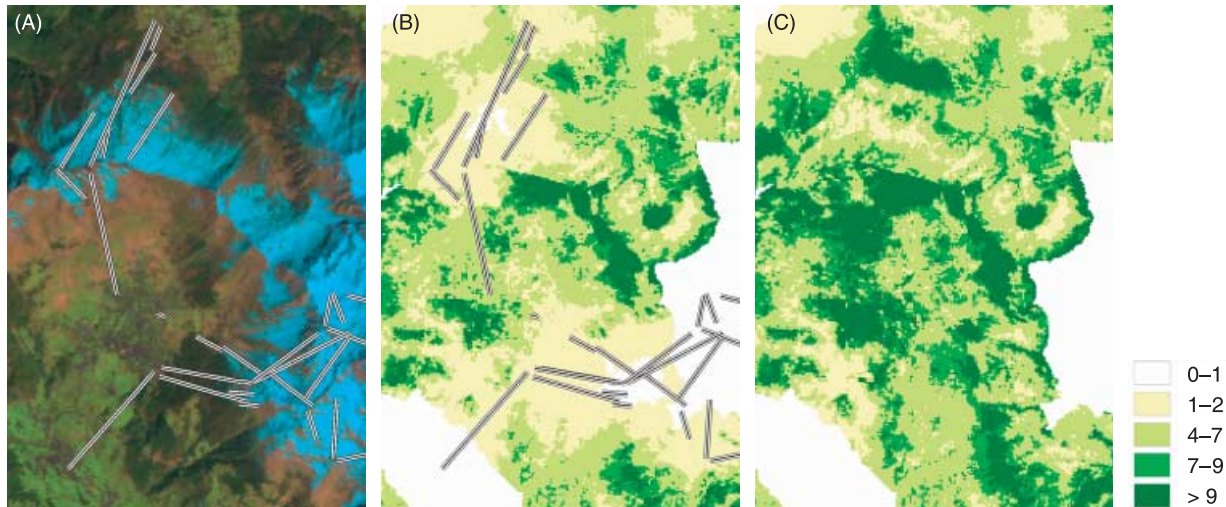


Fig. 2. Illustration of the effect of ski lifts and winter sports activity on relative spatial abundance of black grouse in the ski resort of Verbier, Valais. (A) Satellite view: blue, snow cover; dark green, closed forests; dark red, shrubland; light green, pasture; violet, built areas. (B) Current abundance map (post-development, i.e. after the construction of the ski resort). (C) Pre-development abundance map: theoretical distribution in the absence of ski lifts. Lines depict aerial ski lift cables. In B and C, colour gradient indicates the predicted number of cocks per horizontal transect of 1.5 km. The negative effect of ski lifts on relative abundance is recognizable: the average pixel value is 5.1 ± 2.8 cocks for the current situation and 6.9 ± 3.0 cocks for the pre-development situation.

scattered trees is the most favoured habitat type (N. Signorell *et al.* unpublished data). Modification of native vegetation on ski runs has been shown to reduce faunal species richness up to 100–200 m from the ski runs (Wipf *et al.* 2005; Rolando *et al.* 2007). Ski resorts also affect threatened wildlife on a much broader scale, predominantly within 500–1000 m distance, and up to 1500 m from ski lifts (this study). Influences at a larger scale cannot be ruled out as 1500 m was our greatest radius. Our estimation suggests that ski facilities and the related winter sport activities may induce a 15% decrease in the carrying capacity of the entire black grouse population in Valais. We have to stress here that this estimate is very conservative, as it only accounts for the impact of outdoor winter sports close to ski resorts. Actually, Arlettaz *et al.* (2007) have shown that rapidly spreading, free-riding winter sports such as ski mountaineering, evoke a stress response in black grouse well beyond the boundaries of the marked snow fields of ski resorts.

The negative effect of ski lifts and related winter sport activities on black grouse abundance is probably due to a combination of different factors: (i) habitat destruction or alteration (Ingold 2005); (ii) higher predation rate caused either by habitat fragmentation, which increases foraging opportunities for predators (Storch, Woitke & Krieger 2005), or by deposition of food remains, which may enhance predator density (Storch & Leidenberger 2003; Wittwer *et al.* unpublished data); (iii) increase of direct disturbance by humans inducing higher stress levels (Arlettaz *et al.* 2007; Thiel *et al.* 2008) and extra energetic, compensatory costs (Baltic 2005); finally, (iv) additional mortality due to collisions with cables (Miquet 1986). At this stage, we still do not know which factor(s) contribute most to lowering black grouse density in the Alps. In a recent study from England, Baines & Richardson (2007) did not detect any difference

in fecundity or summer flushing distance between varying experimental disturbance treatments, which would possibly infer an effect of predation. However, English black grouse do not face such harsh winters as their Alpine relatives; they are also less exposed to human disturbance from recreational activities (e.g. no skiing facilities). Refined investigations are thus required in the Alps to disentangle these various factors. We recommend that winter disturbance intensity should be measured through an assessment of the actual winter sport traffic, instead of relying on a crude ski lift density index, as in this study.

Our results confirm former views that both young and old open forest stands, with a wide Ericaceae-grass cover represent preferred black grouse habitat in the European Alps (Swenson & Angelstam 1993; Storch 2007; Pearce-Higgins *et al.* 2007; N. Signorell *et al.* unpublished data). Common habitat features across species' range seem to be richly structured, semi-open habitats with scattered trees, within a matrix dominated by a mosaic of shrubs and grasses.

We did not find any significant link between hunting pressure and black grouse abundance. It seems therefore likely that at the scale of our study area, hunting is principally a trigger of compensatory mortality (Zbinden *et al.* 2003), where harvesting is relatively low (104–187 cocks shot yearly in our study area (3000 km²), with an unknown black grouse population size). These results contrast with the past situation in the UK, where hunting mortality was observed to be locally additive (Baines & Lindén 1991). Although the current hunting regime had no discernable effect on black grouse abundance, at least compared to other more decisive factors, such as habitat type and presence of ski lifts, it would be interesting to see whether, and if so, how, hunting affects local survival and population dynamics. This holds especially for

areas where harvesting is intensive, such as in highly accessible areas, namely ski resorts. The development of individual-based capture–recapture models (using marked birds) could provide decisive insights and lead to the development of spatially explicit hunting plans adapted to the local geographic context.

Conservation implications

Given the great number of ski resorts in the European Alps, a negative impact of ski lifts and related recreational activities on black grouse is likely to be widespread. According to our estimation, a quarter to a half of the potentially suitable black grouse habitat in Valais is potentially affected. This does not include human disturbance outside the main ski resorts, caused mostly by the rapid spread of free-riding winter sports (Arlettaz *et al.* 2007).

Clear guidelines for species conservation can be drawn from our results. First, alpine vegetation is often severely damaged by both skiing and the preparation of ski runs (Wipf *et al.* 2005): shrubs, small trees and grass cover are reduced in height and density in order to smooth the ski runs (although this may also restrict natural shrub encroachment following abandonment of traditional grazing practices). In addition, road networks are generally more dense, to facilitate access and maintenance of the facilities (Ingold 2005). The conservation or restoration of a patchy shrub–grass vegetation cover should be promoted along ski runs and roads along the timberline. Where the preservation of a vegetation mosaic is not possible or where damage is already too severe, restoration methods such as safe-site islands, that is, small undisturbed patches of native plants (Urbanska 1997), grass seeding (Bayfield 1996) and transplants of native grass (Fattorini 2001), may be applied to help accelerate the recolonization process of the native vegetation. In areas where closure of vegetation and bush encroachment have occurred after the abandonment of summer pastures (Laiolo *et al.* 2004), forestry measures should be considered, such as tree-thinning and removal of dense bush cover. Alternatively, extensive farming practices, such as grazing, should be promoted (Storch 2007).

The present study could not identify the proximate mechanisms that affect black grouse abundance. These are likely to be embedded within our general index of ski lifts and winter sport activities, which mostly impact on local black grouse abundance. Previous studies, however, have shown that black grouse have to cope with a more pronounced stress challenge within ski resorts and ski mountaineering areas, compared to natural, undisturbed sites (Arlettaz *et al.* 2007). Additionally, repeated flushing events induce an immediate stress response (Arlettaz *et al.* 2007), as well as extra energetic costs linked to compensatory feeding in disturbed birds (Baltic 2005). The creation of specific wintering preserves within ski resorts may therefore improve the survival of black grouse, potentially leading to an increase in their local abundance. Our pre-development abundance map (abundance of black grouse in the theoretical absence of ski lifts and

related winter recreation) offers the opportunity to locate suitable sites (e.g. Doherty *et al.* 2008), providing vegetation conditions are not too degraded. In these refuges, human access should be banned or severely restricted throughout the winter. Our spatial abundance model may also serve as a tool for creating or modifying ski lift routes, so that their impact on wildlife is minimized. Alternative ski lift routes may be evaluated by virtually modifying the landscape and assessing the effect on black grouse abundance (e.g. Johnson *et al.* 2005). In addition, virtual modification of habitat typology could also be tested. The comparison of these scenarios, or of pre-development maps with maps of winter sport activities, should enable zones of potentially high human–wildlife conflict to be recognized, and sustainable, wildlife-friendly management of ski resorts to be promoted. Nevertheless, we recommend creating new abundance maps based directly on raw GIS data (without referring to surrogates) to delineate the spatial distribution of black grouse abundance. The main reason for basing our modelling on habitat surrogates was to allow the impact of our groups of predictors on the abundance of black grouse to be tested independently. This was the only way to evaluate different scenarios of habitat management in a biologically meaningful way.

Based on our results, we predict that regions of the Alps where black grouse habitat is suboptimal (shrub encroachment, closure of forest stands, etc.) such as at the periphery of the species' Alpine distribution, and which also harbour extensive ski resorts, will experience severe declines in their black grouse population (Zbinden *et al.* 2003). In more central locations, where populations are more stable, further declines are to be expected if the winter tourism industry continues to expand, which seems very likely (Arlettaz *et al.* 2007). Although further research is needed to identify the main mechanism(s) involved in the decline of black grouse populations, the mitigation measures listed above, which aim to increase local carrying capacity, should be implemented at an early stage. If so, they are likely to benefit key indicator species and other elements of biodiversity within the Alpine timberline ecosystems.

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Supporting Information

Additional Supporting Information may be found in the online version of this article:

Table S1. Description of habitat types as characterized in the field

Table S2. Composition of the GIS HABITAT surrogates

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NORTHERN GOSHAWK ECOLOGY: AN ASSESSMENT OF CURRENT KNOWLEDGE AND INFORMATION NEEDS FOR CONSERVATION AND MANAGEMENT

JOHN R. SQUIRES AND PATRICIA L. KENNEDY

Abstract. The contentious and litigious history associated with managing Northern Goshawks (*Accipiter gentilis*) has focused much research attention toward understanding this species' life history. Results from these studies address many key information needs that are useful to managers and decision makers, but many pressing information needs exist to address key conservation questions. Our goal was to assess the current state of knowledge in light of recent research. We focused on published information, but we also include unpublished studies if necessary to address key information needs. We included key European studies, for areas where there is little information for North American populations. Based on our assessment of current knowledge, we review goshawk conservation and management in terms of threats, ecological relationships; information needs, survey and monitoring, managing in the face of uncertainty, and the increasing demands for science-based management. We conclude by offering our understandings or qualified insights relative to some of the most salient issues confronting goshawk conservation and management.

Key Words: *Accipiter gentilis*, goshawk ecology, goshawk management, Northern Goshawk.

ECOLOGÍA DEL GAVILÁN AZOR: UNA VALORACIÓN DEL CONOCIMIENTO ACTUAL Y DE LAS NECESIDADES DE INFORMACIÓN PARA EL MANEJO Y LA CONSERVACIÓN

Resumen. La contenciosa y discordante historia asociada al manejo del Gavilán Azor (*Accipiter gentilis*) ha enfocado la atención de investigación hacia el entendimiento de la historia de la vida de esta especie. Los resultados de estos estudios dirigen mucha información clave necesaria que es útil para administradores y los tomadores de dediciones, sin embargo, existen muchas necesidades urgentes de información, para dirigir preguntas clave. Nuestro objetivo fue valorar el estado actual del conocimiento sobre investigación reciente. Nos enfocamos en información publicada, pero también incluimos estudios no publicados si era necesario, para dirigir necesidades de información clave. Incluimos estudios Europeos clave, para áreas donde existe poca información para poblaciones de Norte América. Basados en nuestra valoración del conocimiento actual, revisamos la conservación y el manejo del gavilán, en términos de amenazas, relaciones ecológicas, necesidades de información, estudio y monitoreo, incertidumbre en el manejo, y en las crecientes demandas por el manejo basado en la ciencia. Concluimos ofreciendo nuestros conocimientos o ideas relacionadas a algunas de las cuestiones más sobresalientes enfrentadas en la conservación y el manejo del gavilán.

Since the early 1980s, researchers have investigated how forest management impacts Northern Goshawk (*Accipiter gentilis*, hereafter referred to as goshawk) populations (Reynolds et al. 1982, Moore and Henny 1983, Reynolds 1983). Crocker-Bedford's (1990) contention that goshawk populations in the Southwest were dropping precipitously catalyzed state and federal agencies to begin research programs. The goshawk has been proposed for listing several times under the Endangered Species Act (ESA) and its status has been, and still is, the object of considerable litigation (Peck 2000).

Many aspects of goshawk ecology are poorly understood putting decision-makers in the difficult position of having to make important management

decisions based on incomplete information. Increasingly, decision-makers are also being asked via the courts and public opinion to define what is defensible information given our limited knowledge and high uncertainty regarding many aspects of goshawk ecology. The primary goal of this paper is two-fold. First, we provide a thorough literature review of goshawk ecology to define our current state of knowledge. Second, based on these understandings, we discuss pressing management issues and information needs. This second goal also includes discussions of data quality standards because they help define defensible information that in turn affects goshawk research and management. We conclude by providing qualified insights which are an attempt to embrace science while

recognizing uncertainty (Ruggiero et al. 2000). Qualified insights are specific statements that are backed by the balance of scientific evidence (Ruggiero and McKelvey 2000); these statements help communicate to land managers and decision makers the critical issues in a distilled format.

To describe our current state of knowledge, we drew primarily from the recent reviews of Squires and Reynolds (1997) and Kennedy (2003) and updated these reviews with new information. Not all publications on goshawks were referenced in this assessment, nor were all published material considered equally reliable. Literature that was not included does not mean these studies were inferior scientifically. Rather, the results were not directly relevant to our assessing the current state of knowledge relative to management and conservation. We preferentially referenced peer-reviewed literature because this is the accepted standard in science. Non-refereed publications or reports were regarded with greater skepticism, but were included if these papers addressed important information gaps not reported in published literature. Moreover, we recognize that researchers in Europe have many important insights regarding this species, but we do not know how well these understandings can be generalized to North American populations. Thus, we included European publications that were particularly relevant to important information gaps, but we did not exhaustively review studies outside North America. Further, we downplayed certain topics that are important, but were either too extensive to cover in this paper or were better addressed in a different format. For example, we did not rigorously discuss the ecology of individual prey species nor did we discuss the forest ecology associated with the many habitat types used by goshawk. We minimized our discussions of distribution and systematics because this was reviewed in Squires and Reynolds (1997) and little new published information is available on this topic. We also did not discuss field identification due to the many excellent field guides that provide a better format (Wheeler and Clark 1995, Wheeler 2003). Finally, in reporting the current state of knowledge, we could not conduct a comprehensive meta-analysis of goshawk literature nor did we conduct new analyses aimed at addressing conservation concerns. For example, we did not examine current federal land management plans to discern the direction of forest management relative to goshawks, nor did we analyze geographic information systems (GIS) and other spatial data to assess habitat trends like changes in the abundance and spatial arrangement of mature

forests. Thus, we only discuss key conservation issues and information needs based on the current state of knowledge and our collective experience researching goshawks.

DISTRIBUTION AND SYSTEMATICS

SUBSPECIES IN NORTH AMERICA

Approximately 8–12 subspecies of goshawks exist worldwide depending on the taxonomic source (Brown and Amadon 1968, del Hoyo et al. 1994, Squires and Reynolds 1997). Although some authorities recognize three subspecies in North America (Johnsgard 1990), the American Ornithologists' Union (1998) recognizes only two—*A. g. atricapillus* and *A. g. laingi*. *A. g. atricapillus* breeds throughout Alaska, Canada, and the mountains of the western and eastern US. *A. g. laingi*, breeds on Queen Charlotte and Vancouver Islands (Taverner 1940, Johnson 1989), possibly extending north to Baranof Island in southeast Alaska or Prince William Sound in south-central Alaska (Webster 1988, Iverson et al. 1996, Cooper and Stevens 2000). A third subspecies, *A. g. apache*, is not recognized by the AOU as a legitimate subspecies, but its putative distribution is from southern Arizona south to Jalisco in the mountains of Mexico (van Rossem 1938). The USDI Fish and Wildlife Service (USFWS) (USDI Fish and Wildlife Service 1998a) considers the validity of this subspecies to be unresolved; *A. g. apache* is recognized by some scientists (Snyder and Snyder 1991, Whaley and White 1994). The Eurasian subspecies (*A. g. gentilis*) is larger in size and body weight than any of the North American subspecies (del Hoyo et al. 1994).

NORTH AMERICAN BREEDING DISTRIBUTION

In North America, *A. g. atricapillus* breeds from boreal forests of north-central Alaska to Newfoundland and south to western and southwestern montane forests in the US, and locally in the mountains of northwestern and western Mexico (Fig. 1). In central to eastern North America, goshawks breed in the western Great Lakes region and eastward to Pennsylvania, central New York, northwestern Connecticut, and locally south in montane habitats at least to West Virginia and possibly eastern Tennessee and western North Carolina (Brown and Amadon 1968, Squires and Reynolds 1997, USDI Fish and Wildlife Service 1998a). Factors that limit the southern extent of the goshawk range are unknown (Kennedy 1997).

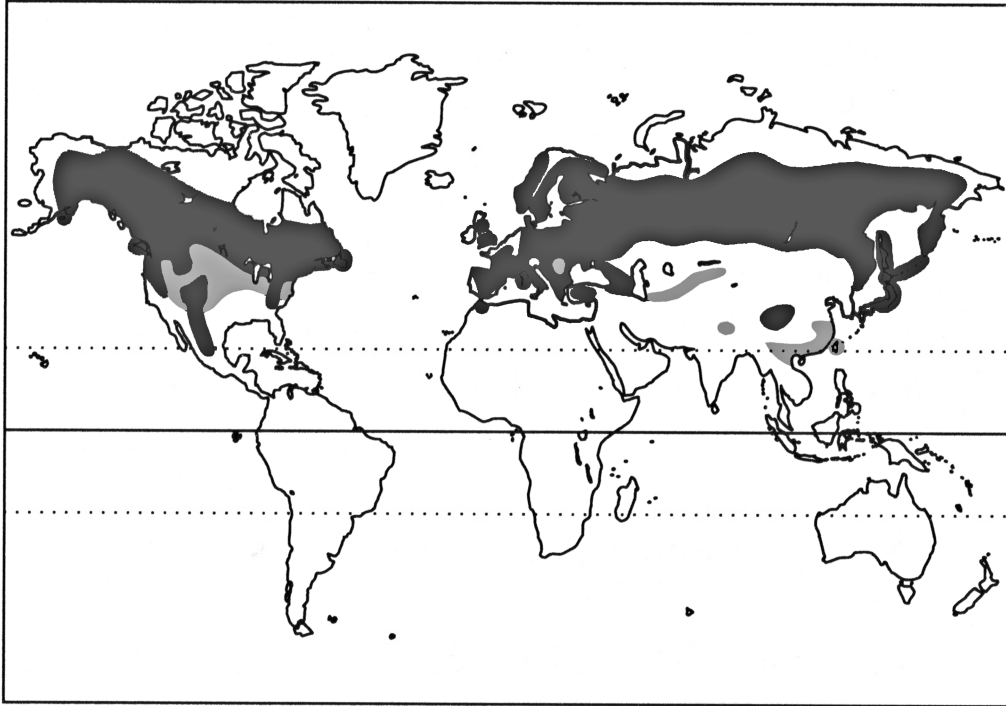


FIGURE 1. Global distribution of the Northern Goshawk. Dark shading delineates current breeding range; light shading indicates areas occupied by goshawks outside the breeding season or in areas where breeding has not yet been documented (from del Hoyo et. al. 1994).

Although few data exist regarding historical changes, Squires and Reynolds (1997) suggested the distribution of the goshawk in the northern and western portions of its range is relatively unchanged since Europeans settled North America. However, the goshawk's range may have been more widespread in the eastern US before the extinction of the Passenger Pigeon (*Ectopistes migratorius*) in the early 1900s, because the pigeon may have been an important prey species. The goshawk's range may also have been more extensive before the substantial deforestation of this region, which reached a peak at the end of the 19th century (Kennedy 1997). Some evidence suggests these populations may be recovering as forests re-establish and mature (Speiser and Bosakowski 1984, Kennedy 1997). For example, during the mid-1950s in Massachusetts, nesting was restricted to the western part of the state, but the species now nests throughout the state (Veit and Petersen 1993). In Minnesota and Wisconsin, the goshawk is currently nesting in more counties than was documented historically (Janssen 1987, Rosenfield et al. 1998, Roberson et al. 2003). Evidence that eastern goshawk populations may be expanding or reoccupying their

former range should be interpreted cautiously; such reports could merely reflect increased search efforts (Kennedy 1997).

NORTH AMERICAN WINTER DISTRIBUTION

Goshawks winter throughout their breeding range, extending south to southern California (Small 1994, Squires and Reynolds 1997) and northern and central Mexico (Sonora, Sinaloa, Durango, and Chihuahua). Wintering goshawks are occasionally observed in the lower Colorado River valley of Arizona (Rosenberg et al. 1991), northern and central Texas (Oberholser 1974), and north to Arkansas (James and Neal 1986). During incursion years, a few recorded sightings of goshawks were documented for Missouri (Robbins and Easterla 1992), in the Appalachian Mountains of Tennessee (Robinson 1990), and east to the Atlantic Ocean (Root 1988, American Ornithologists' Union 1998). Christmas Bird Count (CBC) data suggest goshawks generally avoid wintering in southeastern North America (Root 1988), but occasionally winter in northern portions of the Gulf States, including west-central Florida (American Ornithologists' Union 1998).

LEGAL AND ADMINISTRATIVE STATUS IN THE UNITED STATES

HISTORY OF GOSHAWK LITIGATION

Accipiter gentilis atricapillus

Based on findings of Crocker-Bedford (1990) and unpublished research conducted on the Kaibab National Forest in Arizona, environmental organizations sought more extensive protection of goshawk habitat. They thought that current logging practices threatened goshawk viability and thus, violated the National Forest Management Act (NFMA) (Peck 2000). This resulted in a series of legal actions that extend from 1990, when environmental groups first formally requested the Southwestern Region (Region 3) of the USDA Forest Service (USFS) to halt timber harvest in southwestern forests on the Kaibab Plateau, to the present time (Table 1). A goshawk scientific committee (GSC) and a goshawk task force were formed to review goshawk management needs in the Southwest Region of USFS. The GSC produced the *Management Guidelines for the Northern Goshawk in the Southwestern Region* that provides the current basis for goshawk management in this USFS Region (Reynolds et al. 1992).

In September 1991, the USFWS was petitioned to list the goshawk as endangered west of the 100th meridian, and later was listed as a candidate, or category 2 species, under the ESA (Table 1). In June 1992, the petition was denied on taxonomic grounds (no evidence suggests that goshawks west of the 100th meridian are a distinct population), and suits were subsequently filed to reverse the action. From this, the courts claimed the USFWS's findings were arbitrary and capricious and ordered the agency to issue another decision. In 1996, the USFWS issued another decision again denying listing based on taxonomic reasons and the courts again did not support this decision. Thus, in 1997 the USFWS issued a positive 90-d finding that sufficient evidence existed to warrant a status review. They completed their status review in 1998 and concluded there was insufficient evidence to support listing the goshawk under the ESA. This decision has been supported by the courts (Center for Biological Diversity vs USFWS No. 01-35829 [Ninth Circuit Court Decision CV-99-00287-FR issued 21 July 2003]). Also, a recent technical review of this decision by a joint committee of scientists from The Raptor Research Foundation (RRF) and The Wildlife Society (TWS) (Andersen et al. 2005) found that available habitat and demographic information are not sufficient to evaluate goshawk demographic trends.

The USFWS based its decision not to list the goshawk on a review of existing data and the findings of a status review team of nine biologists (including two USFS biologists). The status review team found it was not possible to determine whether goshawk population numbers in the review area were stable, increasing, or decreasing, and concluded the distribution of breeding goshawks in the West did not appear to have changed from the historical range. The USFWS also concluded the goshawk is a forest habitat generalist and is not dependent solely on old-growth forests.

In 1995, the Southwestern Region of the USFS (Region 3) issued an environmental impact statement (EIS) to modify its forest plans to incorporate the Reynolds et al. (1992) goshawk guidelines. The final EIS (FEIS) claims the goshawk is a habitat generalist and this claim was challenged by a consortium of conservation groups, individuals, and state agencies. In November 2003, the U.S. Ninth Circuit Court of Appeals ruled the USFS had inadequately disclosed responsible scientific opposition in preparing the final environmental impact statement for southwestern forests. The court recently reversed and remanded the decision stating the EIS violated the National Environmental Policy Act (NEPA) because it did not review the opposing scientific information that indicated the goshawk was a habitat specialist (Center for Biological Diversity and Sierra Club v. U.S. Forest Service, No.02-16481 [9th Circuit Court opinion No. CV-00-01711-RCB issued 18 November 2003]). The USFS has written a Draft Supplement to the FEIS evaluating the scientific debate over goshawk habitat preferences. The public comment period on the Draft Supplement closed November 2004. Interestingly, the recent RRF-TWS review of the USFWS decision (Andersen et al. 2005) concluded goshawks use late-successional forests in almost all landscapes where they have been studied. However, they also concluded the species demonstrates considerable versatility in habitat use, and thus, assessing its status based solely on the distribution of late successional forest is not warranted based on the current understanding of goshawk-habitat relationships.

Accipiter gentilis laingi

In May, 1994, a petition was filed to list the Queen Charlotte subspecies as endangered under the ESA (Table 2). Twelve months later, the USFWS decided the listing was not warranted. The USFWS acknowledged that continued large-scale removal of old-growth forest in the Tongass National Forest

TABLE 1. THE HISTORY OF LEGAL AND ADMINISTRATIVE ACTIONS RELATIVE TO THE STATUS AND MANAGEMENT OF NORTHERN GOSHAWKS IN THE UNITED STATES (ADAPTED FROM KENNEDY 2003).

Date	Legal or administrative action
February 1990	Formal request to Region 3 regional forester to suspend all harvesting in goshawk territories until long-term survival was assured.
August 1990	Region 3 regional forester organized a goshawk scientific committee (GSC) and goshawk task force (GTF) to review goshawk management needs in USFS Region 3.
September 1991	Petition filed to list the goshawk (<i>A. g. atricapillus</i>) as endangered west of 100th meridian.
January 1992	The goshawk (all subspecies) was listed as a candidate species (category 2) for possible future listing under the ESA throughout its range in the U.S. Category 2 species were those species for which there was inadequate data to justify a listing proposal under ESA at that time. The USFWS issued a 90-d finding that the petition did not present substantial information to indicate the goshawk in the western US should be listed. However, the USFWS concluded that the the petition presented substantial information indicating that goshawk population declines and loss or modification of habitat may be occurring. Therefore, the USFWS initiated a status review for the goshawk throughout its range in the U. S. They specifically solicited information to be used to evaluate the potential for distinct population segments within the range of the goshawk. GSC produced the Management Guidelines for the Northern Goshawk in the Southwestern Region (Reynolds et al. 1992).
June 1992	USFWS issued a 90-d finding that the petition did not present substantial information to indicate the goshawk in the western US should be listed (57 FR 474). The USFWS found that the petition presented no evidence of reproductive isolation or genetic differentiation between the western and eastern goshawk populations. They also concluded that goshawk habitat was contiguous throughout North America.
1992–1995	Reynolds et al. (1992) generated intense controversy. The focus of the controversy was whether or not the goshawk was a forest generalist. Reynolds et al. (1992) claimed goshawk populations were regulated by prey availability and that data suggest the goshawk is a prey generalist and thus, hunts in heterogeneous landscapes. The opposing state agencies and environmental groups claimed (without any supporting data) the goshawk was an old-growth obligate. Other concerns are detailed in Peck (2000).
1996	Region 3 regional forester issued a record of decision (ROD) to amend all regional forest plans to include the Reynolds et al. (1992) guidelines as well as recommendations from the Mexican Spotted Owl. This ROD is to be in effect for 5–10 yr until the forest plans are revised (scheduled to be completed by 2003) (Cartwright 1996). This is the only region to implement Reynolds et al. (1992) on a regional basis.
February 1996	The U.S. District Court found the June 1992 finding to be arbitrary and capricious, and remanded the finding to the USFWS for a new 90-d determination [926 F. Supp. 920 (D. Ariz. 1996)].
June 1996	USFWS issues a second 90-d finding, again determining the petition does not present substantial information that listing the goshawk in the western US may be warranted (61 FR 28834-35).
September 1996	Suit filed to overturn denial.
June 1997	Court overturns second 90-d finding as arbitrary and capricious, also finding the USFWS national policy on listing populations to be illegal (980 F. Supp. 1080 [D. Ariz. 1997]). The USFWS final policy on distinct population segments (DPS) allowed for only one subspecies per distinct population segment. The USFWS claimed, in the 1997 phase of the litigation, that there were three subspecies of Northern Goshawk west of the 100th meridian, (1) <i>A.g. atricapillus</i> , (2) <i>A.g. laingi</i> , and (3) <i>A.g. apache</i> . The court found this aspect of the DPS policy arbitrary and capricious because the ESA specifically states that in the definition of species, a species may include any subspecies and any distinct population segments of any species. If congress had intended a DPS contain only one subspecies, it would have allowed only the listing of DPSs of subspecies. The court then remanded the case back to the USFWS, which led to the positive 90-d finding in September 1997 (Ellen Paul, Executive Director, Ornithological Council, pers. comm.).
September 1997	USFWS issues a positive 90-d finding on western petition (62 FR 50892). It was then required to conduct a full status review by June 1998. Candidate status dropped. Prior to 1997, the USFWS maintained a category 2 list that included species whose status was unknown but of concern due to declines in population trend or habitat. These were also referred to as candidate species. Thus, the goshawk was no longer considered a candidate for listing due to the lack of information supporting a proposed rule (M. Nelson, Chief, Branch of Candidate Conservation, USFWS, pers. comm.).

TABLE 1. CONTINUED.

Date	Legal or administrative action
June 1998	USFWS issues negative 12-mo finding, finding the petition to list the goshawk in the western US as not warranted. (63 FR 35183). See summary of these findings in the text.
February 1999	Suit filed to overturn June 1998 90-d finding.
May 2000	Suit filed against the Sitgreaves National Forest to halt a timber sale which contained 5 of the 42 known goshawk territories on this forest (Center for Biological Diversity v. Bedell U. S. District Court, District of Arizona case No. 3:00-cv-00849-SLV). The suit alleged that the goshawk population on the Sitgreaves is in serious decline and would be extirpated in 40 yr if it was a closed population. This case was dropped in 2002 after the parties reached an agreement with the USFS.
September 2000	Suit filed to challenge logging on 3,240,000 ha of forest in the Southwest (Center for Biological Diversity v. Bosworth Civil-01711-PHX-RCB, U. S. District Court, District of Arizona). The plaintiffs have asked for an injunction on logging within goshawk habitat on 11 Arizona and New Mexico national forests until the USFS prepares a new goshawk conservation plan.
June 2001	The USFWS's decision not to list the goshawk as a threatened or endangered species was upheld by a federal judge, who found the USFWS's decision not arbitrary and capricious (U.S. District Court, District of Oregon, Civil No. 99-287-FR).
November 2003	U. S. Ninth Circuit Court of Appeals ruled the USFS had inadequately disclosed responsible scientific opposition in preparing the final environmental impact statement for southwestern forests. The Court recently reversed and remanded the decision stating the EIS violated NEPA because it did not review the opposing scientific information that indicated the goshawk was a habitat specialist (Center for Biological Diversity and Sierra Club v. U.S. Forest Service, No.02-16481 (9th Circuit Court opinion No. CV-00-01711-RCB). Case was sent back to district court.
September 2004	The USFS, Southwestern Region has prepared a draft supplement to the final EIS for amendment of forest plans in Arizona and New Mexico to disclose, review and assess scientific arguments challenging the agency's conclusions over goshawk habitat preferences. The supplement will update the final EIS, which amended the 11 forest plans in the Southwestern Region for goshawks. Public comment period closed November 2004. No further updates are available.

would adversely affect the Queen Charlotte Goshawk in southeast Alaska, but that revised land-use strategies would ensure goshawk habitat conservation. Thus, the USFWS believed the proposed actions to protect goshawks would preclude the need for listing. In September 1996, the U.S. District Court (District of Columbia) remanded the 12-mo finding to the Secretary of Interior, instructing him to reconsider the determination "on the basis of the current forest plan, and status of the goshawk and its habitat, as they stand today." In May 1997, the USFS revised the Tongass Land Management Plan, and the USFWS was granted a 90-d extension to reevaluate the status of the goshawk under the new plan. In April 1998, a suit was filed to overturn the USFWS's refusal to list the Queen Charlotte Goshawk as an endangered species. In August of that year, the U.S. District Court overruled the USFWS's decision not to list the Queen Charlotte Goshawk on the basis that the agency did not use the best available science. However, the U.S. Ninth Circuit Court stated in June 2000 that the district court had exceeded its authority in ordering the government to conduct a population count, stating that the district court is to only consider if the USFWS used the best available science. In May 2004, the U.S. District Court ordered the USFWS to determine if the

Queen Charlotte Goshawk is endangered or threatened on Queen Charlotte Island. In December 2005, USFWS requested public comments on the status of the Queen Charlotte Goshawk throughout its range. This comment period closed February 2006.

In summary, over a decade of litigation over the federal status of *A. g. laingi* and *A. g. atricapillus* has been conducted, respectively. No changes in listing status have resulted from this litigation.

SENSITIVE SPECIES DESIGNATION

The goshawk is listed as a species of concern in all regions of the USFWS and is on the USFS sensitive species list for all regions. The Bureau of Land Management (BLM) lists the goshawk as a sensitive species in six states.

USDA FOREST SERVICE, REGION 3 GUIDELINES FOR SOUTHWESTERN FORESTS AND OTHER MANAGEMENT PLANS

As mentioned in the previous section, the GSC, as assembled by the USFS's Southwestern Region, completed a document in 1992 titled *Management Recommendations for the Northern Goshawk in the*

TABLE 2. THE HISTORY OF LEGAL AND ADMINISTRATIVE ACTIONS RELATIVE TO THE STATUS AND MANAGEMENT OF THE QUEEN CHARLOTTE SUBSPECIES OF NORTHERN GOSHAWKS (*A. g. laingi*) IN THE UNITED STATES (ADAPTED FROM KENNEDY 2003).

Date	Legal or administrative action
May 1994	Petition filed to list the Queen Charlotte Goshawk (<i>A. g. laingi</i>) as endangered. The petition was based largely upon potential present and impending impacts to the Queen Charlotte Goshawk caused by timber harvest in the Tongass National Forest.
August 1994	USFWS published a positive 90-d finding (59 FR 44124) stating substantial information was presented in the petition indicating the requested action may be warranted.
May 1995	After a 12-mo status review, USFWS decided listing was not warranted (60 FR 33784). In the 12-mo finding, the USFWS acknowledged that continued large-scale removal of old-growth forest in the Tongass National Forest would result in significant adverse effects on the Queen Charlotte goshawk in southeast Alaska; however, at that time the USFS was revising land use strategies to ensure goshawk habitat conservation. The USFWS believed the proposed actions to protect goshawks would preclude the need for listing.
November 1995	Suit filed against the Department of the Interior and the USFWS for their refusal to list the Queen Charlotte goshawk or designate critical habitat [U.S. District Court, District of Columbia (95-cv-02138-SS)].
September 1996	The U.S. District Court remanded the 12-mo finding to the Secretary of Interior, instructing him to reconsider the determination "on the basis of the current forest plan, and status of the goshawk and its habitat, as they stand today." [Southwest Center for Biological Diversity v. Babbitt, 939 F. Supp. 49, 50 (D.D.C. 1996)]
December 1996	USFWS reopens comment period (61 FR 64497) to gather all new information for review. It was extended until 4 April 1997 through three subsequent notices (61 FR 69065, 62 FR 6930, and 62 FR 14662). The USFWS has reevaluated the petition and the literature cited in the petition, reviewed the Tongass Land Management Plan and other available literature and information, and consulted with biologists and researchers knowledgeable of northern goshawks in general, and the Queen Charlotte Goshawk in particular. The 1979 Tongass National Forest Land Management Plan, as amended, formed the basis for evaluating the status of the goshawk on the Tongass National Forest.
May 1997	The USFS issued a revised Tongass Land Management Plan. Consequently, the review of the 1979 Tongass Land Management Plan no longer represented the current plan as specified by the court ruling. The USFWS was, therefore, granted a 90-d extension to reevaluate the status of the goshawk under the provisions of the 1997 Tongass Land Management Plan
June 1997	USFWS re-extends comment period.
September 1997	USFWS again finds that a listing of the subspecies is not warranted (62 FR 46710)
April 1998	Suit filed to overturn the USFWS's refusal to list the Queen Charlotte Goshawk as an endangered species [U.S. District Court, District of Columbia (No. 98cv934)].
July 1999	U.S. District Court for the District of Columbia ordered the USFWS to conduct an actual on-site population count. This decision was appealed by the USFWS and a decision was rendered in June 2000 overturning the District Court's decision (Southwest Center for Biological Diversity v. Babbitt 215 F. 3d85). The Court of Appeals sent the case back to District Court.
July 2000	A magistrate of the U.S. District Court for the District of Columbia found that the USFWS failed to make a specific finding as to conservation of the subspecies on Vancouver Island, which constitutes a third of the subspecies' geographic range.
May 2004	U.S. District Court, District of Columbia rejected the magistrate's finding but ordered the USFWS to determine if Vancouver Island is a significant portion of the range and to determine whether or not the Queen Charlotte Goshawk is endangered or threatened on Queen Charlotte Island.
December 2005	USFWS seeks public comment as to the status of the Queen Charlotte Goshawk throughout its range, for the purpose of determining the significance of the Vancouver Island population in relation to the taxon as a whole (70 FR 4284). Comment period closed February 2006.

Southwestern United States (Reynolds et al. 1992). Reynolds et al. (1992) developed these guidelines for southwestern goshawk habitat (ponderosa pine [*Pinus ponderosa*], mixed conifer, and spruce-fir forests). They assessed information available on goshawk ecology, with particular attention on goshawk prey and the ecology of key prey species in

the region, as well as ecology of the forests used by goshawks and local silvicultural practices. The recommendations are designed to provide breeding season habitat for the goshawk and 14 of its key prey species (Fuller 1996).

Reynolds et al. (1992) has the following primary components: (1) no timber harvest in three nest

areas (12.1 ha each) per home range, (2) provide three additional nest areas within each home range for future use by goshawks which can receive intermediate treatment or prescribed burning, (3) timber harvest rotation in the post-fledging family area (PFA, 170 ha) and foraging area (2,185 ha) to maintain always a minimum of 60% in late-successional forests (tree classes: 31–46 cm, 46–62 cm, and 62+ cm), (4) restricted management season in nest areas and PFA during the winter season (October through February), (5) openings of 0.4–1.6 ha depending on forest type, and (6) maintenance of reserve trees (1.2–2.4/ha), canopy cover, snag densities (0.8–1.2/ha), downed logs (1.2–2/ha), and woody debris (11.2–13.6 metric tons/ha) in all harvest areas with amount depending upon forest type (Bosakowski 1999).

These recommendations were designed to return current forest conditions (which have been impacted by grazing, fire suppression, and timber management) to relatively open forests dominated by mature trees interspersed with patches of various successional stages. The applicability of this approach to managing goshawk landscapes may not be limited to southwestern forests. As noted by Fuller (1996), the recommendations made by Reynolds et al. (1992) could be used as a model for assessments and strategies in other areas and for other species. However, similar to many wildlife management plans, these recommendations (Reynolds et al. 1992) still remain as an untested hypothesis. Although these guidelines have been adopted by the USFS in Arizona and New Mexico (USDA Forest Service 1995, 1996), their effectiveness at enhancing goshawk population persistence in this landscape has not been evaluated and has been questioned (Greenwald et al. 2005). Braun et al. (1996) and Drennan and Beier (2003) have expressed concerns about the single-species focus of these guidelines and question the practice of managing landscapes for goshawks. According to Bosakowski (1999), some national forests in the Pacific Northwest are providing similar management to that prescribed by Reynolds et al. (1992) for nest sites and PFAs, but no management is being conducted on the foraging areas. Graham et al. (1994) extended the ideas of Reynolds et al. (1992) stressing that forest conditions are temporally and spatially dynamic. Instead of managing individual home ranges, they suggested goshawk management should focus on managing large forest tracts as sustainable ecological units.

For the Olympic Peninsula in Washington, Finn et al. (2002a) developed goshawk habitat-management

recommendations based on their analysis of local goshawk nesting habitat at multiple spatial scales. Their results suggest goshawk use of the landscape on the Olympic Peninsula as nesting habitat will be maximized when at least 54% of the home range is late-seral stage forest (defined as >70% coniferous canopy closure with >10% of canopy from trees >53 cm diameter at breast height (dbh) and <75% hardwood/shrub) and no more than 17% is stand initiation (regenerating clearcuts; conifers <7 yr old, <10% coniferous canopy closure). Finn et al. (2002a) also suggest reducing the amount of landscape contrast and edge density (indices of spatial heterogeneity) within home ranges may increase occupancy and maintain potential nest areas.

Goshawk biologists generally agree that goshawk management requires providing suitable nest stands and a large landscape for foraging. However, the need for managing intermediate scales (e.g., PFA) and very small scales (the nest site) is still open to debate.

FOOD HABITS AND ECOLOGICAL RELATIONSHIPS WITH PREY

FOOD HABITS DURING NESTING

Goshawks are opportunistic predators that kill a wide assortment of prey varying by region, season, vulnerability, and availability. Main foods include small mammals, ground and tree squirrels, rabbits and hares, large passerines, woodpeckers, game birds, and corvids (Squires and Reynolds 1997). Goshawks are classified as prey generalists (Squires and Reynolds 1997) and typically forage on a suite of 8–15 species (Reynolds et al. 1992). As with other raptors, the food habits of goshawks have been determined by examination of stomach contents and food removed from crops of nestlings, or more commonly, direct observation of nests, prey remains, and regurgitated pellets (Lewis 2001). Potential biases exist in most of these raptor food habits methods and these biases in *Accipiter* diets are well summarized by Bielefeldt et al. (1992), Younk and Bechard (1994a), Watson et al. (1998), and Rutz (2003a).

Goshawks forage long distances for relatively large-bodied birds and mammals. In Oregon, average prey mass was 307 g (SD = 364, range = 17.6–1,505 g, Reynolds and Meslow 1984); avian prey averaged 195.5 g (SD = 207, range = 17.6–1,505.0 g) and mammalian prey averaged 445.2 g (SD = 415, range = 36.8–1,118.6 g). Males can kill prey 2.2 times their mass (approximately 1,600 g),

which is proportionally similar to the largest hares (2,700–3,670 g) killed by females (2.4 x female mass, Kenward et al. 1981).

Although potential prey species are extensive (Appendix 1, Squires and Reynolds 1997), a few taxons are prevalent in most diets. Sciurids occur in most goshawk diets due to their high abundance and broad distribution (USDI Fish and Wildlife Service 1998a). Several studies have documented Douglas squirrels (*Tamiasciurus douglasii*) and red squirrels (*Tamiasciurus hudsonicus*) as important prey (Mendall 1944, Meng 1959, Reynolds et al. 1994, Watson et al. 1998, Clough 2000, Squires 2000,) and they may be especially important during the winter when other prey are unavailable (Widén 1987). Rabbits and hares are also used extensively by goshawks (Reynolds and Meslow 1984, Kennedy 1991, USDI Fish and Wildlife Service 1998a, Clough 2000). Cottontail rabbits (*Sylvilagus* spp.) are abundant in a variety of habitats and are distributed throughout the goshawk's range (USDI Fish and Wildlife Service 1998a) and snowshoe hares (*Lepus americanus*) are also important prey, particularly in northern forests (Mendall 1944, McGowan 1975, Doyle and Smith 1994). In the Yukon, Doyle and Smith (1994) found a positive correlation between goshawk breeding success and a snowshoe hare population peak.

Gallinaceous birds (primarily grouse and pheasants) are particularly important prey for North American (Mendall 1944, McGowan 1975, Gullion 1981a, b; Gullion and Alm 1983, Apfelbaum and Haney 1984) and European Goshawks (Kenward 1979, Sollien 1979 in USDI Fish and Wildlife Service 1998a, Kenward et al. 1981, Lindén and Wikman 1983, Tornberg 2001) at northern latitudes. Fluctuations in grouse populations have been shown to affect goshawk productivity, including number of nesting pairs, and number of young per active nest (Lindén and Wikman 1983, Sollien 1979 in USDI Fish and Wildlife Service 1998a). Tornberg et al. (1999) analyzed skin and skeletal measurements collected from 258 museum specimens of Finnish Goshawks dated between 1961 and 1997. They reported that as grouse decreased in abundance over this 36-yr period, they were replaced by smaller prey in the goshawk breeding season diet. They also observed morphological shifts in both males and females probably as a result of selective pressures due to changes in prey size.

American Robins (*Turdus migratorius*; Grzybowski and Eaton 1976, Reynolds and Meslow 1984, Kennedy 1991, Squires 2000), corvids (*Corvus* spp.; Meng 1959, Eng and Gullion 1962,

Gullion 1981b), jays (Beebe 1974, Bloom et al. 1986, Kennedy 1991, Bosakowski et al. 1992, Boal and Mannan 1994), and woodpeckers (Schnell 1958, Eng and Gullion 1962, Erickson 1987, Allen 1978, Reynolds and Meslow 1984, Reynolds et al. 1994) are also common prey items found in many parts of the goshawk's range. Northern Flickers (*Colaptes auratus*) are particularly important in many goshawk diets (Grzybowski and Eaton 1976, Reynolds and Meslow 1984, Bloom et al. 1986, Kennedy 1991, Boal and Mannan 1994, Squires 2000).

Goshawks occasionally feed on carrion (Sutton 1925, Squires 1995). Sutton (1925) reported that a goshawk was shot while feeding on a dead bear. Squires (1995) described that goshawks fed on gut piles of mule deer (*Odocoileus hemionus*) left by hunters, and on a bison (*Bos bison*) skull in Montana. It is unclear if goshawks feed on carrion whenever available, or only during periods of low prey availability.

HABITAT NEEDS OF PREY SPECIES

The habitat requirements of important prey species include early seral to mature forests and forest openings. Interspersion (the degree of intermixing of vegetation structural stages) and canopy cover have varying effects on different goshawk prey species (Reynolds et al. 1992). For example, red squirrels respond negatively to a high level of interspersion of structural stages and select closed older forests to attain high-density populations (Klenner and Krebs 1991, Larsen and Boutin 1995). Grouse, on the other hand, respond positively to high interspersion of openings and older forests. Other prey species, such as American Robins, are habitat generalists and are abundant in most structural stages (Reynolds et al. 1992). Although goshawks hunt species with diverse habitat requirements (and a detailed analysis of these requirements is beyond the scope of this paper), several habitat features appear to be important to a variety of species (Reynolds et al. 1992, USDI Fish and Wildlife Service 1998a). These features include snags, downed logs (>30 cm in diameter and 2.4 m long), large trees (>46 cm in diameter), openings and associated herbaceous and shrubby vegetation, interspersion, and canopy cover. Reynolds et al. (1992) stressed the need for large trees scattered throughout the foraging area because this component often occurs in clumps with interlocking crowns that provide unique hiding, feeding, den, and nesting areas for many prey species (USDI Fish and Wildlife Service 1998a). Reynolds et al. (1992) emphasized that foraging areas used by goshawks should include a variety of habitat types and structural classes. In

southwestern pine forests, they recommended foraging habitat include a mosaic of vegetation structural stages interspersed throughout the area and consist approximately of 20% each of old, mature, middle-aged, and young forests, 10% in the seedling-sapling stage, and 10% in the grass-forb-shrub stage. The 60% of the stands that consist of older age classes should have relatively open understories with a minimum of 40–60% canopy cover (Reynolds et al. 1992).

Reynolds et al. (1992) speculated that small to medium openings (<1.6 ha) and various seral stages scattered throughout goshawk foraging habitat enhances availability of food and habitat resources for prey and limits negative effects of large openings and fragmentation on distribution and abundance of prey species that use interior forests. Forests that provide adequate populations of major prey are predicted to have well-developed herbaceous and shrubby understories associated with small to medium openings that provide cover and food for many small mammals and birds in the form of seeds, berries, and foliage.

WINTER FOOD HABITS AND SEASONAL DIETARY SHIFTS

Little is known regarding the winter diets of goshawks in North America. In northern Arizona, Drennan and Beier (2003) found winter diets were dissimilar to those in summer, in part because of the absence of hibernating species, and this reduction in prey diversity may result in individual goshawks specializing on specific species in the winter. Wintering goshawks from this population appeared to specialize on only two species of large-bodied prey—cottontails and Abert's squirrels (*Sciurus aberti*).

Given that most dietary information is limited to the nesting season, we poorly understand seasonal changes in diet selection. The limited available data indicate diet composition may change considerably from breeding to non-breeding seasons. For example, in Swedish boreal forests, birds dominated the diet during nesting, accounting for 86% of prey number and 91% of biomass (Widén 1987). However, the European red squirrel (*Sciurus vulgaris*) was the dominant prey both in terms of numbers (79%) and biomass (56%) during the winter. The proportion of European red squirrels in goshawk diets was high during winters of both high and low squirrel numbers. Seasonal dietary shifts are at least partially due to different migration, estivation, and hibernation behaviors among suites of locally available prey.

During nesting, goshawks may shift their diets to include more fledgling passerines (Zachel 1985,

Lindén and Wikman 1983, Widén 1987, Tornberg and Sulkava 1990), and overall prey diversity may peak as juvenile passerines and other birds become available (Wikman and Tarsa 1980, Marquiss and Newton 1982). In Nevada, goshawks ate more birds such as American Robins and Northern Flickers as Belding's ground squirrels (*Spermophilus beldingi*) began estivation in mid-summer (Younk and Bechard 1994a). In Arizona, no significant difference was found in proportions of mammals and avian prey taken throughout the nesting season (Boal and Mannan 1994).

COMMUNITY ECOLOGY

Goshawks exist within ecological communities composed of interacting species. Thus, goshawk populations are affected by various predatory, competitive, symbiotic, and mutualistic interactions. The importance that community relationships play in structuring goshawk populations is mostly unknown. For example, many anecdotal observations have been made of predatory interactions between goshawks and other raptors, but we do not know how predatory interactions may structure goshawk demography or habitat-use patterns. The lack of knowledge concerning community relationships in North America is an important information need. Only through improved understandings of basic ecological relationships, can we hope to predict how the human-induced changes to the environment may help or hinder goshawk populations.

FUNCTIONAL AND NUMERIC RESPONSES WITH PREY

A study quantifying numerical and functional responses of breeding goshawks to their prey was conducted by Tornberg (2001) in northern boreal forests of Finland. His objective was to evaluate the impact of goshawk predation on grouse numbers and multiannual cycling patterns. Four grouse species constituted >40% of the goshawk diet during the breeding season in this area from 1988–1998. The numerical response of goshawks to grouse was relatively weak. Goshawk breeding density and site occupancy fluctuated negligibly, but the production of young tended to lag one year behind Black Grouse (*Tetrao tetrix*) density. A functional response of goshawks to changes in grouse numbers was found only in spring when all four grouse species were combined. No patterns were found for individual species, which probably is due to goshawks switching between grouse species. Tornberg suggested the weak response is due to goshawks treating different

grouse species as one. Numerical and functional responses of goshawks to prey warrants further investigation particularly in areas where goshawk predation may be interfering with conservation efforts of its prey species.

DO GOSHAWKS LIMIT PREY?

The role of raptors in limiting or regulating prey populations has recently become a hot topic in research, particularly in Europe where raptors are still persecuted (albeit illegally) for their predation on galliformes, a popular harvested taxa (Korpimäki and Krebs 1996, Krebs 1996, Redpath and Thirgood 1999, Thirgood et al. 2000, Tornberg 2001). As noted in earlier sections, goshawks are a significant predator of forest-dwelling birds and small mammals. In areas where they are abundant, they could potentially regulate populations of their prey, particularly in areas where they specialize on a few prey species, e.g., boreal forests (Tornberg 2001).

Goshawk predation plays a major role in grouse demography in Europe (Angelstam 1984, Wegge et al. 1990, Swenson 1991, Valkeajärvi and Ijäs 1994). Two studies have estimated goshawks remove roughly between 15–25% of grouse populations during the breeding season (Lindén and Wikman 1983, Widén 1987). Tornberg (2001) found the impact of goshawk predation on grouse varied by species. Losses were highest for Willow Grouse (*Lagopus lagopus*) and lowest for Capercaillie (*Tetrao urogallus*). On average goshawks took 6% of grouse chicks. On an annual basis breeding goshawks took 2–31% of the August grouse population. The most reliable estimates of the goshawk's share of grouse total mortality were for Black Grouse and Hazel Grouse (*Bonasa bonasia*) of which 35% and 40% were removed, respectively.

The contribution of goshawk predation to limiting Eurasian Kestrel (*Falco tinnunculus*) and European red squirrel populations in coniferous forests in northern England has been reported by Petty et al. (2003a, b). Goshawks were extirpated from this area toward the end of the 19th century as a result of deforestation and intense persecution. They were reintroduced in the early 1970s and increased in numbers until 1989, after which their numbers stabilized. This area also contains the largest remaining population of European red squirrels in England and a declining population of Eurasian Kestrels.

Petty et al. (2003a, b) used a number of correlative approaches to explore the role of goshawk predation on both species from 1973–1996. They found no evidence that goshawk predation is a major factor

limiting densities of European red squirrels and concluded that conservation management for sympatric populations of red squirrels and goshawks are compatible (Petty et al. 2003b). However, Petty et al. (2003a) did find a significant negative relationship between Eurasian Kestrel and goshawk numbers. Goshawks killed many adult Eurasian Kestrels in the early spring, prior to breeding, when predation would have the most impact on breeding population levels, and there was a temporal trend for this predation to be inversely density-dependent. Petty et al. (2003a) also estimated that goshawks removed more Eurasian Kestrels than were recorded each spring in the study area and concluded the decline of the Eurasian Kestrel was mainly due to goshawk predation.

These correlative studies suggest that goshawk predation may limit prey abundance and productivity in some cases, but without experimental tests of this phenomenon it is difficult to infer cause and effect. The role of goshawk prey regulation in southern latitudes where they are more prey generalists is unknown. Also, information on goshawk impacts on North American prey populations is nonexistent.

GOSHAWKS AS PREY

Although goshawks are formidable predators, they are occasionally killed by other predators, and predatory interactions may regulate some populations. The literature describing predation on goshawks mostly consists of anecdotal observations, with little information regarding population responses. For example, we know that Great Horned Owls (*Bubo virginianus*) kill adults and nestlings (Moore and Henny 1983, Rohner and Doyle 1992, Boal and Mannan 1994, Woodbridge and Detrich 1994). Erdman et al. (1998) reported a Great Horned Owl feeding a female goshawk to its young. Several studies have indicated that predation on goshawk nestlings may increase during periods of low goshawk food availability because female goshawks may be required to spend more time away from the nest foraging instead of protecting young (Zachel 1985, Rohner and Doyle 1992, Ward and Kennedy 1996, Dewey and Kennedy 2001). In Europe, Eurasian Eagle Owls (*Bubo bubo*) eat nestlings between 13–38 d, and often eat the entire brood over several consecutive nights (Tella and Mañosa 1993). Squires and Ruggiero (1995) documented that eagles (Golden Eagles [*Aquila chrysaetos*], and Bald Eagles [*Haliaeetus leucocephalus*] were abundant in the area) killed goshawks in wintering areas. Mammalian predators include pine martens

(*Martes americana*; Paragi and Wholecheese 1994) fishers (*Martes pennanti*; Erdman et al. 1998), wolverine (*Gulo gulo*, Doyle 1995), and raccoons (*Procyon lotor*, Duncan and Kirk 1995). One-half of nestling mortalities ($N = 12$) in New Mexico were attributed to predation (Ward and Kennedy 1996). In Minnesota, Boal et al. (2005a) reported that out of five adult goshawks depredated during the 1998–2000 breeding seasons (four females, one male), two deaths were caused by mammalian predation, two were caused by Great Horned Owls, and one was caused by a diurnal raptor.

We speculate that Great Horned Owls are the dominant predator of goshawks in North America due to their wide distribution, abundance, and capacity to prey on large raptors (Orians and Kuhlman 1956, Luttich et al. 1971, McInville and Keith 1974, Houston 1975). Goshawks aggressively defend their nests against predators during the day. However, they are less capable of doing so at night and most reports of predation by Great Horned Owls are losses of nestlings, although adults are occasionally taken (Rohner and Doyle 1992). The effect of Great Horned Owl predation on goshawk populations is unknown (USDI Fish and Wildlife Service 1998a), but predation rates as high as 49% have been reported for Red-tailed Hawks (*Buteo jamaicensis*; Luttich et al. 1971). The ability of Great Horned Owls to kill large raptors indicates they can potentially have an impact on goshawk populations, especially by reducing nestling survival. Great Horned Owls begin nesting earlier than goshawks and occasionally lay eggs in goshawk nests, forcing goshawks to construct or use alternative nest areas (Reynolds et al. 1994, Woodbridge and Detrich 1994). Alternative nest sites are often in close proximity, which may increase the potential for reciprocal predation between the goshawk, the owl, and their progeny (Gilmer et al. 1983, Rohner and Doyle 1992).

Erdman et al. (1998) suggested fisher predation is a major cause of nest failure and incubating female mortality in northeastern Wisconsin, with annual turnover rates of nesting females exceeding 40%. Metal baffles have been used on nest tree trunks in this area since 1988 to reduce predation by mammals (Erdman et al. 1998), but the effectiveness of this technique has not been tested. Duncan and Kirk (1995) reported that Great Horned Owls, raccoons and fishers are the most significant predators of goshawks in Canada.

Predation is a natural mortality factor in raptor populations. It is unknown if predation of goshawks is increasing due to forest management or even if predation rates are significantly reducing

survival. However, studies on passerines suggest that predation rates increase in forested communities with increased fragmentation and/or a reduction of canopy cover (Manolis et al. 2000, Zanette and Jenkins 2000).

COMPETITION

Intra-specific competition

In territorial species, interference competition from conspecifics could give rise to an inverse relationship between density and population growth rate. Krüger and Lindström (2001) analyzed a 25-yr data set (1975–1999) of a German goshawk breeding population to evaluate the site-dependent population regulation and the interference competition hypotheses. The site-dependent population regulation hypothesis was first proposed by Rodenhouse et al. (1997) and it integrates habitat heterogeneity, despotic settlement patterns of territories, and density-dependent reproduction. Under this hypothesis, the productivity of high quality territories is independent of population density because they are always settled first, while the progressive addition of lower quality territories at higher densities will lead to a decline in mean per-capita productivity, leading potentially to density-dependent population regulation. Site-dependent population regulation (Rodenhouse et al. 1997) calls for a territory settlement pattern that follows the ideal pre-emptive distribution (a form of the ideal free distribution that accounts for territorial behavior [Fretwell and Lucas 1970, Pulliam and Danielson 1991]), where high quality territories are inhabited first, and these occupied territories are not available for settlement by other birds. Territory settlement patterns in goshawks likely follow this pattern.

Krüger and Lindström (2001) analyzed territory settlement patterns and breeding performance and modeled per capita growth rate using standard time-series analyses and model-selection procedures. In their study area, territories that were occupied earlier and more often had a higher mean brood size; fecundity did not change with increasing density in these territories. A strong negative relationship occurred between mean number of young per breeding pair and its coefficient of variation, suggesting that site-dependent population regulation was more likely regulating this population than interference competition. Although the evidence is correlative, site-dependent population regulation may be a key process structuring goshawk nesting populations in Europe. Based on population modeling, Krüger and Lindström also concluded the most important factors affecting

population growth were habitat quality, weather conditions during the late breeding period, and density. This study is an important step toward understanding population regulation of goshawks. However, we still do not understand what other factors may regulate goshawk populations, or if these results are applicable to North American populations.

In Arizona, Reich et al. (2004) used a Gibbsian pair-wise potential model to describe and predict the spatial dependency of goshawk nests based on territoriality and forest structure. Nest locations were regularly distributed at a minimum distance of 1.6 km between active nests. Spatial analysis based on nest spacing and habitat variables indicated that potential goshawk nests locations were abundant and randomly distributed throughout the landscape. This result supported the notion that the number of high quality nest locations did not limit this goshawk population. Rather, territoriality in the form of non-compressible goshawk territories appeared to limit the local nest density. Thus, goshawks must choose potential high-quality sites within an area delineated by neighboring territories. At a broader scale, the overall territory density may reflect characteristics of prey populations throughout the area.

Inter-specific competition

The extent to which inter-specific competition for habitat as well as prey by potential competitors, such as the Red-tailed Hawk and Great Horned Owl, affect goshawk habitat use is not well understood. In addition, these potential competitors also function as potential predators making the effect of their presence difficult to interpret. Goshawks may be excluded from nest areas by other raptors, although it is common for goshawks and other raptors to nest close to one another (Reynolds and Wight 1978). Great Horned Owls, Spotted Owls (*Strix occidentalis*), and Great Gray Owls (*Strix nebulosa*) often breed in nests previously built by goshawks (Forsman et al. 1984, Bryan and Forsman 1987, Buchanan et al. 1993). In Minnesota, Great Gray Owls have been observed using nests previously used by goshawks with the goshawk pair building a new nest or using an alternative nest nearby (N = 3; A. Roberson, pers. obs.). Although Cooper's Hawks (*Accipiter cooperi*) and goshawks have a similar preference for nest habitat (Reynolds et al. 1982, Moore and Henney 1983, Siders and Kennedy 1996), and nest in the same stands (P. L. Kennedy, unpubl. data), Cooper's Hawks are smaller than goshawks and begin nesting later (Reynolds and Wight 1978); thus, they are unlikely to be effective nest site competitors.

This size effect on potential inter-specific competition has also been demonstrated for the Common Buzzard (*Buteo buteo*) which is a smaller-bodied raptor nesting sympatrically with the European goshawk. Krüger (2002a) recently did a multivariate discriminant analysis of nest site characteristics of the Common Buzzard (hereafter referred to as buzzard) and European Goshawk (392 nests of both species combined). His results showed substantial overlap between the two species and he concluded that this is good evidence for competition for optimal nest sites. The utility of niche overlap data for evaluating competition is debatable, but it suggests the buzzard might be constrained by the larger-bodied European goshawk in its nest site selection. Krüger (2002b) then experimentally examined the behavioral interactions between buzzards and European Goshawks and their effects on buzzard breeding success and brood defense using dummies and playback calls. Buzzards had significantly lower breeding success when presented with a goshawk dummy compared to control broods but there was no effect of buzzard dummies on buzzard reproductive success. European Goshawks were far more aggressive against an intra-specific dummy than buzzards. Krüger concluded that buzzards perceive a goshawk more as a potential predator than a competitor.

In addition to nest site competitors, several species of hawks and owls, and numerous mammalian predators, can potentially compete with goshawks for prey (USDI Fish and Wildlife Service 1998a). The Red-tailed Hawk and Great Horned Owl prey on many of the same species as goshawks (Fitch et al. 1946, Luttich et al. 1970, Janes 1984, Bosakowski and Smith 1992, La Sorte et al. 2004), although neither has the same degree of dietary overlap with goshawks as does the Cooper's Hawk, which also forages in the same habitat (Storer 1966, Reynolds and Meslow 1984, Bosakowski et al. 1992). Because both the Red-tailed Hawk and Great Horned Owl are more abundant in open habitats, such as meadows, edge, forest openings, and woodlands (Spieser and Bosakowski 1988, Johnson 1992), "the extent to which they coexist and compete for food with goshawks probably varies by the openness of forest types and extent of natural and anthropogenic fragmentation of a forest" (USDI Fish and Wildlife Service 1998a).

Determining whether fragmentation has altered inter-specific relationships between generalist avian predators and goshawks has received little research attention. Changes to forested habitats may render habitat more accessible and attractive to competing species such as Red-tailed Hawks and Great Horned

Owls, thereby potentially decreasing habitat available to goshawks (USDI Fish and Wildlife Service 1998a). However, we do not know whether this is a linear relationship or if some threshold level of fragmentation exists where these species may have a negative impact on populations of goshawks via increased predation and/or competition. Johnson (1992) surveyed 469 calling stations for Spotted Owls and Great Horned Owls along 28 roadside routes (total surveyed = 536 km). Landscapes (500-ha plot) surrounding Great Horned Owl detections contained more shrub-forb and shelterwood, less mature-old growth and mature habitat, had a higher ratio of linear edge to mature and old growth area, and were higher in elevation than landscapes surrounding Spotted Owls. The responses of Great Horned Owl declined with increasing amounts of old forests; the greatest number of detections was associated with landscapes containing only 10–20% old growth. Few Great Horned Owls were detected in landscapes containing >70% old growth. Johnson's results are consistent with the prevailing notion that Great Horned Owls are habitat generalists that are most abundant in fragmented landscapes (Houston et al. 1998). It would be very fruitful to both goshawk and Spotted Owl management if current research efforts on the effects of forest fragmentation on Barred Owl (*Strix varia*) expansion into Spotted Owl habitat (Dark et al. 1998, Kelly et al. 2003) were expanded to include Great Horned Owls.

Red-tailed Hawks and goshawks are sympatric on the Kaibab Plateau in northern Arizona. La Sorte et al. (2004) compared habitat differences of Red-tailed Hawk (N = 41) and goshawk (N = 41) nests at two spatial scales—fine scale (0.08 ha) and mid-scale (1,367 ha). At both scales, Red-tailed Hawks were more variable in their habitat-use compared to goshawks. At the fine scale, Red-tailed Hawks selected steep, north-facing slopes with dense understories, while goshawks consistently chose moderate slopes, tall trees, and open understories. The fine-scale differences at nests were attributed to the approaches each species uses to enter nest sites. Red-tailed hawks enter their nest from above the canopy, whereas goshawks enter the nest from below the canopy. Typically, Red-tailed Hawks also nested in areas with commanding views of the surrounding country compared to goshawks that consistently nested in the canopy of mature forests where views are more limited. At the mid-scale, forest fragmentation was greater around Red-tailed Hawk nests, whereas goshawks consistently associated with patches of continuous forests and level terrain. Thus, goshawk habitat would be reduced at both

scales with increased fragmentation and Red-tailed Hawk habitat would increase. Results from both Johnson (1992) and La Sorte et al. (2004) indicated that habitat fragmentation can increase the potential for increased abundance of potential competitors and avian predators, like Great Horned Owls and Red-tailed Hawks, but empirical data that demonstrates whether competition is truly affecting the viability of goshawk populations are lacking.

A variety of mammalian carnivores, including foxes (*Vulpes* spp.), coyotes (*Canis latrans*), bobcats (*Lynx rufus*), Canada lynx (*Lynx canadensis*), weasels (*Mustela frenata*), and pine martens, are also sympatric with goshawks in most North American forests and feed on some of the same prey species as goshawks, such as rabbits and hares, tree and ground squirrels, grouse, and other birds (USDI Fish and Wildlife Service 1998a). Erlinge et al. (1984) demonstrated the combined consumption of large numbers of small vertebrates by numerous sympatric species of carnivores, owls, and hawks in Sweden resulted in food limitations to the suite of predators.

SPATIAL USE AND HABITAT PREFERENCES

Goshawks use broad landscapes that incorporate multiple spatial scales to meet their life requisites. This requires that we understand the spatial-use patterns of goshawks as use of habitat types may vary across multiple scales. This is an ambitious goal, given our imperfect understanding of the spatial-use patterns of goshawks. We recognize at least three-levels of habitat scale during the breeding season—the nest area, post-fledging area (PFA), and foraging area (Reynolds et al. 1992, Kennedy et al. 1994; Fig. 2).

Goshawks nest in most forest types found throughout their geographic range (Squires and Reynolds 1997). In eastern deciduous forests, goshawks nest in mixed hardwood-hemlock stands of aspen (*Populus* spp.), birch (*Betula* spp.), beech (*Fagus* spp.), maple (*Acer* spp.), and eastern hemlock (*Tsuga canadensis*; Speiser and Bosakowski 1987, Kimmel and Yahner 1994, Boal et al. 2005b). In western North America, goshawks nest in forests that include Douglas-fir (*Pseudotsuga menziesii*), various species of pines, and aspen (Reynolds et al. 1982, Hayward and Escano 1989, Bull and Hohmann 1994, Younk and Bechard 1994a, Siders and Kennedy 1996, Squires and Ruggiero 1996, Daw and DeStefano 2001, McGrath et al. 2003). In the Black Hills of South Dakota, and throughout the Southwest, goshawks nest primarily in ponderosa pine and mixed conifer forests (Erickson 1987, Crocker-Bedford and

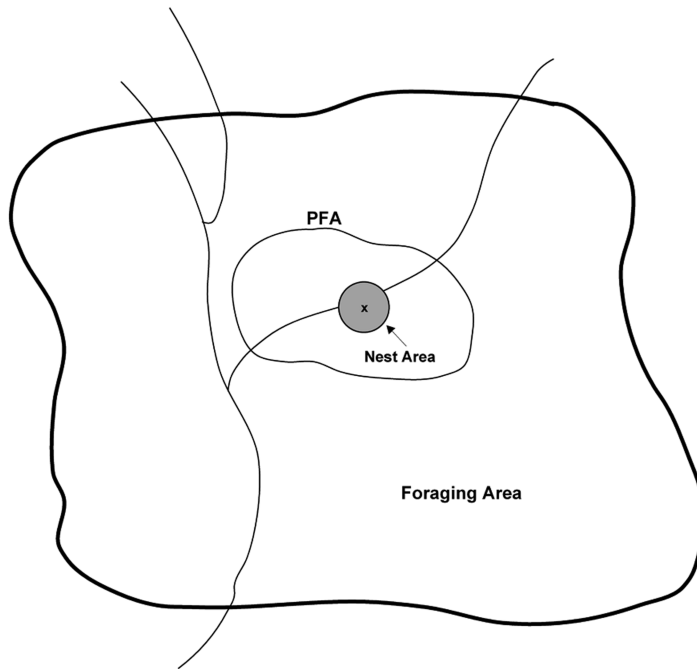


FIGURE 2. Three levels of spatial organization at Northern Goshawk nest sites, including the nest area, post-fledging area (PFA), and foraging area.

Chaney 1988, Kennedy 1988, Reynolds et al. 1994, Siders and Kennedy 1996). Paper birch (*Betula papyrifera*) is a dominant nest stand for goshawks in interior Alaska (McGowan 1975). Goshawks also occasionally nest in tall willow communities along arctic rivers (Swem and Adams 1992).

Nest-site habitat for the goshawk has been described throughout much of its range in North America and Europe (Shuster 1980, Reynolds et al. 1982, Moore and Henny 1983, Hayward and Escano 1989, Bull and Hohmann 1994, Lilieholm et al. 1994, Squires and Ruggiero 1995, Siders and Kennedy 1996, Patla 1997, Squires and Reynolds 1997, Rosenfield et al. 1998, Daw and DeStefano 2001, McGrath et al. 2003). Several studies in the US and Europe have compared habitat characteristics at nest areas to those available habitats within home ranges or landscapes and can be used to draw some conclusions about goshawk nesting habitat preferences (Speiser and Bosakowski 1987, Kennedy 1988, Bosakowski and Speiser 1994, Hargis et al. 1994, Squires and Ruggiero 1996, Penteriani and Faivre 1997, Selås 1997b, Clough 2000, Daw and DeStefano 2001, McGrath et al. 2003). A few breeding foraging habitat preference studies (Widén 1989, Bright-

Smith and Mannan 1994, Beier and Drennan 1997, Lapinski 2000, Boal et al. 2005a) and three post-fledging habitat preference studies have been conducted (Clough 2000, Daw and DeStefano 2001, McGrath et al. 2003). Comparisons among studies are difficult and may not be meaningful due to differences in methodology.

Goshawk winter habitat preferences are unclear due to a paucity of studies on this topic. Winter habitat studies have been conducted primarily in Europe (Kenward et al. 1981, Tornberg and Colpaert 2001) but three studies (Iverson et al. 1996, Stephens 2001, Drennan and Beier 2003) have been conducted in North America. Winter habitat used by the goshawk is likely more variable than breeding habitat and is likely influenced by its local migratory status. In areas where goshawks are residents, breeding pairs can remain on their breeding season home ranges during the non-breeding season (Boal et al. 2003). However, migratory populations may overwinter in very different habitats from their breeding season home ranges such as low-elevation shrub-steppe. Currently, it is unknown how changes in landscape pattern affect seasonal changes in habitat selection; additional research is needed at larger spatial scales (USDI Fish and Wildlife Service 1998a).

HOME RANGE

In North America, home ranges during nesting vary between 570–5,300 ha, depending on sex, habitat characteristics, and choice of home range estimator (Squires and Reynolds 1997, Boal et al. 2003); extremely large home ranges up to 19,500 ha were documented in southeast Alaska (Iverson et al. 1996). The male's home range is usually larger than the female's (Hargis et al. 1994, Kennedy et al. 1994, but see Boal et al. 2003). Home ranges, excluding nest areas, appear not to be defended and may overlap adjacent pairs. Birds usually have one to several core-use areas within a home range that include nest and primary foraging sites. Core areas have been estimated to be approximately 32% of home range area in one population in New Mexico (Kennedy et al. 1994). Shapes of home ranges vary from circular to almost linear and may be disjunct depending on habitat configuration (Hargis et al. 1994). In Minnesota, home range overlap between members of breeding pairs was typically $\leq 50\%$ suggesting that home range size of individual hawks used in management plans may substantially underestimate the area actually used by a nesting pair (Boal et al. 2003).

The correlation of home range size to habitat use and preference of foraging goshawks is poorly understood for North American populations (Squires and Reynolds 1997). Although comparison of home range sizes may be useful, particularly on a local scale, it is also important to consider prey and foraging habitat abundance and availability, which likely influence home range size (Keane and Morrison 1994, Keane 1999). For example, T. Bloxton and J. Marzluff, (unpubl. data) recently studied the influence of an unusually strong La Niña event (occurred in late 1998 and early 1999 and caused unusually high levels of winter precipitation followed by a cold spring) on prey abundance, space use and demography of goshawks breeding in western Washington from 1996–2000. They noted a decline in abundance indices unadjusted for detectability of nine prey species following the La Niña event. Home range sizes more than doubled during this time period suggesting that weather can also have a major influence on home range size via modification of prey abundance.

Goshawks may shift home ranges after breeding (Keane and Morrison 1994, Hargis et al. 1994). In California, females ($N = 7$) expanded home ranges after the nestling stage from 520 ha ($sd = 390$ ha) to 1,020 ha ($sd = 820$ ha); two males expanded their ranges from 340–1,620 ha and from 950–2,840 ha (Hargis et al. 1994). A female from this population

shifted its home range 9 km after young fledged. In northern California, home ranges of males ($N = 5$, 95% minimum convex polygon) increased from 1,880 ha during nesting (June–15 August; range = 1,140–2,950 ha) to 8,360 ha (range = 1,340–15,400 ha) during the non-breeding season (15 August 1992–March 1993); home ranges of females increased from 1,280 ha (range = 690–3,280, $N = 5$) to 3,180 ha (range = 1,220–4,010 ha) during the same period (Keane and Morrison 1994).

In the few studies that have estimated winter ranges, they were larger on average than breeding season ranges. In northern Finland, winter range size was 3,283–9,894 ha for males ($N = 4$) and 2,753–6,282 ha for females ($N = 11$). The variation in range size was due to different estimators. The average size of core use areas of 12 goshawks wintering in Utah was $2,580 \text{ ha} \pm 2,530 \text{ ha}$ (Stephens 2001), but winter range size was highly variable (range = 1,000–7,950 ha). Stephens attributed the large variance to three of the goshawks that wintered in landscapes fragmented by agriculture, where home ranges were very large (2,610–7,950 ha).

A study of goshawks in Sweden reported that goshawk winter range size was an inverse function of prey availability (Kenward et al. 1981). At Fortuna, Sweden where pheasants are regularly released, the average goshawk winter home range was 2,000 ha while at Segersjö, where only wild pheasants were present, the average winter range was 5,400 ha (Kenward et al. 1981).

NEST AREA

The area immediately surrounding the nest tree, referred to as the nest site or nest area (Steenhof 1987, Fig. 2), often contains alternative nests and may be reused in consecutive years (Palmer 1988). The nest area includes the forest stand containing the nest tree(s) although definitions beyond the nest stand have varied by location and study. Reynolds et al. (1992) defined a nest area as approximately 12 ha in size that is the center of movements and behaviors associated with breeding from courtship through fledging. Nest stands of goshawks can be delineated based on unique vegetative characteristics (Reynolds et al. 1982, Hall 1984, Kennedy 1988) or homogeneous forest structure (Squires and Ruggiero 1996).

Nests and nest trees

Goshawks nest in both deciduous and coniferous trees (Palmer 1988, Squires and Reynolds 1997) and appear to choose nest trees based on size and

structure more than species of tree (Squires and Reynolds 1997). Goshawks often nest in one of the largest trees in the stand (Reynolds et al. 1982, Saunders 1982, Erickson 1987, Hargis et al. 1994, Squires and Ruggiero 1996), with height and diameter of nest trees varying geographically and with forest type. In Wyoming (Squires and Ruggiero 1996) and California (Saunders 1982), goshawks chose nest trees that had larger diameters than other trees in the nest stand. However, in the eastern forests along the New York-New Jersey border only four of 32 nests were built in the largest tree of the nest area (Speiser and Bosakowski 1989).

Nests are large, often conspicuous structures, that average about 90–120 cm in length, 50–70 cm in width, and 60 cm in depth (McGowan 1975, Allen 1978, Bull and Hohmann 1994). Nests are constructed from thin sticks (<2.5 cm diameter) with a bowl lined with tree bark and greenery. Nests are typically built on large horizontal limbs against the trunk, or occasionally on large limbs away from the bole (Saunders 1982). In eastern forests, nests were usually constructed in primary crotches, with the remainder in secondary crotches or limb axils (Speiser and Bosakowski 1989). Trees with the preferred triple or quadruple crotch branch structures were uncommon in eastern forests suggesting that goshawks actively selected this characteristic when choosing nest trees. In the west, nests are constructed in the primary crotches in aspens or on whorled branching in conifers (Squires and Ruggiero 1996), usually with a southerly exposure relative to the nest-tree bole (Moore and Henny 1983, Squires and Ruggiero 1996). Occasionally, nests are also built on mistletoe clumps (Shuster 1980, Reynolds et al. 1982) or rarely in dead trees (McGrath et al. 2003). Shuster (1980) reported goshawks deserted nest trees ($N = 3$) that died of beetle infestation, but there are other instances where beetle-killed trees have been used as nest trees for several seasons (T. Dick and D. Plumpton, unpubl. data). Successful nests have been recorded in dead white pines (*Pinus strobus*) in Minnesota (M. Martell and T. Dick, unpubl. data) and Porter and Wilcox (1941) reported a successful nest in a dead aspen tree in Michigan. Snag nesting is a common practice for goshawks nesting in northeastern Utah (S. R. Dewey and P. L. Kennedy, unpubl. data).

The height that goshawks build nests is significantly correlated with nest-tree height (Kennedy 1988, McGrath et al. 2003). Thus, nest heights vary according to tree species and regional tree-height characteristics. Mean nest heights from select populations include 9 m (range = 4.5–16.2 m, $N =$

41), Alaska (McGowan 1975); 16.8 m (range = 13.4–23.8 m, $N = 13$), California (Saunders 1982); 16.9 m ($SD = 4.5$ m, $N = 12$), New Mexico (Kennedy 1988); 16.2 m ($SD = 5.5$, range = 4.6–27.4 m, $N = 62$), Oregon (Reynolds et al. 1982); 13.0 m ($SE = 0.48$, range = 4.4–30 m, $N = 82$) Oregon and Washington (McGrath et al. 2003); 11.9 m ($SE = 0.4$ m, range = 5.1–15.8, $N = 39$), Wyoming (Squires and Ruggiero 1996); and 7.4 m ($SE = 0.7$, $N = 10$) in spruce (*Picea* spp.), 5.8 m ($SE = 0.4$, $N = 6$) in aspen, Yukon, Canada (Doyle and Smith 1994). The average height of North American nests was reported by Apfelbaum and Seelbach (1983) as 11.8 m (range = 6.1–25.7 m).

Alternative nests

Typical goshawk breeding areas contain several alternative nests that are used over several years (Reynolds and Wight 1978, Speiser and Bosakowski 1987, Reynolds et al. 1994, Woodbridge and Detrich 1994, Reynolds and Joy 1998). The reason for using alternative nests is unknown, but may reduce exposure to disease and parasites. Although goshawks may use the same nest in consecutive years, nest areas may include from one–eight alternative nests that are usually located within 0.4 km of each other (Reynolds and Wight 1978, Speiser and Bosakowski 1987, Reynolds et al. 1994, Woodbridge and Detrich 1994, Reynolds and Joy 1998, Dewey et al. 2003). Alternative nests can be clumped in one–three nest stands or widely distributed throughout the bird's home range. In northern California, an average of 2.6 nests was used per pair, and only 44% of nest attempts were in the previous year's nest. The mean distance between nests for this California population was 273 m ($SE = 68.6$ m, range = 30–2,066 m, $N = 65$ nests, Woodbridge and Detrich 1994). In Oregon, alternative nests were 15–150 m apart, most 60–90 m (Reynolds and Wight 1978). In Arizona, average distance moved from 1991 nests to 1992 alternative nests was 266 m ($SD = 157$ m, range = 100–635 m, $N = 17$, Reynolds et al. 1994).

Nest stands

Although the goshawk is considered a habitat generalist at large spatial scales and uses a wide variety of forest types, it nests in a relatively narrow range of structural conditions (Reynolds et al. 1992, Squires and Reynolds 1997). Goshawks prefer mature forests with large trees, relatively closed canopies (50–90%), and open understories (Moore and Henny 1983, Speiser and Bosakowski 1987, Crocker-Bedford and Chaney 1988, Kennedy 1988,

Hayward and Escano 1989, Reynolds et al. 1992, Squires and Ruggiero 1996, Penteriani and Faivre 1997, Selås 1997b, Squires and Reynolds 1997, Daw et al. 1998, Daw and DeStefano 2001, Finn et al. 2002b, La Sorte et al. 2004). McGrath et al. (2003) stated that canopy-cover values of goshawk nest stands may vary due to methodological and site differences. McGrath et al. also compared tree basal area among North American goshawk studies and found that basal area at nest sites ranged from 28.5–50.8 m² ha⁻¹ compared to 20.7–42.4 m² ha⁻¹ at random sites; McGrath et al. believed that basal area metrics might better capture site conditions at nest sites compared to canopy cover. Due to frequent bias in goshawk nest detection methods, however, goshawk selection of mature forests over other forest stages has been demonstrated in only a few studies (Squires and Ruggiero 1996, Clough 2000). Squires and Reynolds (1997) state that nests are frequently found near the lower portion of moderate slopes, close to water, and often adjacent to a canopy break. Nesting in stands more dense than surrounding forests may reduce predation and, in combination with north slopes, may provide relatively mild and stable micro-climates (Reynolds et al. 1992). Daw et al. (1998) summarized data from goshawk habitat studies in the West and concluded goshawks tend to select nest stands that are characterized by relatively large trees and relatively high canopy closure (>50–60%), regardless of region or forest type.

Reynolds et al. (1982) reported goshawks in Oregon nesting in dense, mature or old-growth conifers with a mean tree density of 482 trees (>6 cm)/ha and a range of 273–750 trees/ha. Nest areas included forests with few mature trees and dense understory trees to forests with closed mature canopies and sparse understory trees. Most nest areas were in old forests, with only 5% in second growth forests and 4% in mature lodgepole pine (*Pinus contorta*) or mixed stands of mature lodgepole and ponderosa pine. The lodgepole nest areas had relatively open, single-layered canopies (166 trees/ha, 38% canopy closure). In their Oregon study area, Daw et al. (1998) found nests that were located systematically were in areas with an average of 16.4 large trees (>53 cm dbh/ha) and a mean canopy closure of 72.4%. Daw and DeStefano (2001) compared goshawk nest stands to stands with random points in Oregon and found goshawks nested more frequently in stands with dense canopy and late forest structure (i.e., trees >53 cm dbh, canopy cover >50%), but rarely in stands with mid-aged forest structure. They also found nests were positively associated with small dry openings. They reported that average nest-

stand size in older forests was about 100 ha (range = 3–375 ha), but emphasized that stand quality is more important than stand size.

Siders and Kennedy (1996) described the range of stand conditions used by goshawks in northern New Mexico. They reported goshawks used nest trees ranging from 25–31 m in height and 43.3–56.7 cm dbh. Canopy closure at the nest tree was 58–74% and 60–70 % at nest areas. Nest areas had 31–40 m²/ha basal area, with an overall area density of 800–1,400 trees/ha and overstory trees were spaced 4.8–6.8 m apart. Nest areas were composed of 2.8–8.0% mature, 2.1–11.1% large, 5.2–32.8% pole, and 16.8–85.6% sapling trees. Tree densities by age class were 460–970 sapling trees/ha, 130–370 pole trees/ha, 55–115 large trees/ha, and 53–90 mature trees/ha.

Nest stands of south-central Wyoming goshawks ranged from 0.4–13.0 ha (Squires and Ruggiero 1996). Slopes were more moderate (~11%) than available topography but there was no preference for aspect. Tree densities at nest sites were lower than at random sites but densities of large trees were higher than at random sites. Nest stands were not old-growth in the classic sense of being multi-storied stands with large diameter trees, high canopy closure and abundant woody debris. Rather nest stands were in even-aged, single-storied, mature forests stands of lodgepole pine with high canopy closure (65%), similar to what has been documented in other regions.

In northern California, canopy closure at nests ranged from 53–92% (Saunders 1982), and in northern Arizona, goshawks preferred nest areas that had the greatest canopy closure available, averaging 76%, which was 18% greater than in 360 reference areas (Crocker-Bedford and Chaney 1988). In eastern California, Hargis et al. (1994) reported home range locations used by goshawks were similar to nest areas, and both had greater canopy cover, greater basal area, and more trees/ha than a random sample from the study area.

Despite differences in some habitat characteristics, high canopy closure and tree basal area at nest areas were the most uniform habitat characteristic between study areas in northern Idaho and western Montana (Hayward and Escano 1989). Tree basal area ranged from 29–54 m²/ha, with most (60%) nest stands between 39 and 46 m²/ha.

Although goshawks appear to select relatively closed-canopy forests for nesting (Daw et al. 1998), exceptionally they will nest in more open forests (USDI Fish and Wildlife Service 1998a). Goshawks nest in tall willow communities along major drainages in arctic tundra (Swem and Adams

1992), riparian cottonwood (*Populus* spp.) stands (White et al. 1965) and in small stands of aspen in shrub-steppe habitat (Younk and Bechard 1994a). In Oregon, Reynolds et al. (1982) reported seven nest areas had an average canopy closure of 59.8%, although three nests were located in stands of mature lodge-pole pine that were relatively open (38% canopy coverage). Also, Hargis et al. (1994) reported 31% as the average canopy closure of goshawks nest stands in eastern California which was low compared to other studies.

Aspect and slope in nest areas may influence microclimate and goshawk habitat selection but the data are equivocal. Studies conducted in Oregon (Reynolds et al. 1982, McGrath et al. 2003), Idaho, and Montana (Hayward and Escano 1989, Clough 2000) found a significant number (40–60%) of goshawk nest locations on slopes with northwest to northeast-facing aspects. Bosakowski and Speiser (1994) compared goshawk nest sites to random points throughout their study area in New York and New Jersey and found goshawks avoided nesting on slopes with southerly aspects. Average slopes in nest areas were 9% (range = 0–75%) in Oregon (Reynolds et al. 1982) 14% in northeastern Oregon (Moore and Henny 1983), and between 15–35% slope in Idaho and Montana (Hayward and Escano 1989). Although goshawks nesting in New Mexico (Siders and Kennedy 1996) and Wyoming (Squires and Ruggiero 1996) did not exhibit a preference for aspect, most nests were found on moderate slopes. Alternatively, goshawks nesting in the Kaibab Plateau of northern Arizona selected nest sites on gentle slopes (9.6°) with no aspect directionality. Goshawks nesting in northwestern California used slopes averaging 42%, which are some of the steepest slopes recorded (Hall 1984). In contrast, 64% of goshawk nest sites in interior Alaska were on southern aspects with 16% of nests on the upper portion of the slope, 46% on the middle slope, and 38% on the lower slope (McGowan 1975). Clear topographic patterns at goshawk nest sites do not appear to exist.

Penteriani et al. (2001) described goshawk nest site preferences in France by using a multi-scale analysis: nest tree, nest stand (1 ha) and landscape to compare 50 goshawk nest sites with random plots. The landscape was defined as a circular plot with a 2-km diameter centered on each of the 50 active nest trees and random points. Plot diameter was equal to the minimum nearest-neighbor distance. Avian abundance was estimated in each landscape plot as an index of prey availability. Their stepwise logistic regression showed that four nest stand structural variables (larger average dbh, larger crown volume,

higher flight space and shorter distance to trails) and two landscape variables (low avian prey richness for both 100–500 g and 501–2,000 g prey size classes) were significant predictors of goshawk nest sites as compared to random sites. Their results support the results of Beier and Drennan (1997) who argue that goshawks apparently select habitat based on forest structural characteristics and not prey abundance.

Several authors have noted that goshawks often nest near water (Bond 1942, Squires and Reynolds 1997, Shuster 1980, Reynolds et al. 1982, Hargis et al. 1994). Shuster (1980) found all nests in aspen stands were near running water and those nests in pine stands were 10–450 m from water sources. Most South Dakota nests were found within 0.84 km of water although several nests were not within 1 km of a water source (Bartelt 1977). Conversely, some studies have shown that nests are not associated with water (Speiser and Bosakowski 1987, Crocker-Bedford and Chaney 1988) and the potential functional significance of water to goshawk nest sites has not been investigated.

Goshawks commonly nest close to forest openings such as meadows, forest clearings, logging trails, dirt roads, and fallen trees (Gromme 1935, Reynolds et al. 1982, Hall 1984, Erickson 1987, Hayward and Escano 1989). Although the function of forest openings near nests is unclear, openings may help goshawks access or locate their nests (USDI Fish and Wildlife Service 1998a, Boal et al. 2005b).

POST-FLEDGING AREA

Post-fledging areas (PFA) may represent defended portions of the territory (Reynolds et al. 1992; Fig. 2). The PFA surrounds the nest area and is defined as the area used by the family group from the time the young fledge until they are no longer dependent on the adults for food (Reynolds et al. 1992, Kennedy et al. 1994). Reynolds et al. (1992) also assumed that all alternative nests were within the PFA. During the fledgling-dependency period the activities of young are centered near their nests, but they move farther from the nest over time (Zachel 1985, Kenward et al. 1993a, Kennedy et al. 1994, Kennedy and Ward 2003). Post-fledging areas may be important to fledglings by providing prey items on which to develop hunting skills, as well as cover from predators and prey. The PFA (originally described as the post-fledging family area) was conceptualized by Reynolds et al. (1992) and empirically supported by studies of family movement patterns (Kenward et al. 1993a, Kennedy et al. 1994, and Kennedy and Ward

2003). Kennedy et al. (1994) estimated PFA size to be approximately 170 ha in New Mexico. However, PFA size and the functional significance of this spatial scale to goshawk management needs further evaluation because it may vary based on local conditions (McClaren et al. 2005).

The first evaluation of PFA habitat was conducted by Daw and DeStefano (2001). They compared forest structure around 22 nests with forest structure around random points. Comparisons were made at six spatial scales from the nest stand up to a 170-ha PFA. They found that within circles of 12-ha and 24-ha plots around nests, late forest structure was more abundant than around random points. They also reported forest structure at the PFA-scale was dominated by dense-canopied forest and always contained wet meadows.

Reynolds et al. (1992) hypothesized the PFA would be intermediate in heterogeneity between the nest area and home range. This concept was recently supported by a study conducted by Finn et al. (2002a). Finn et al. (2002a) compared occupancy patterns of goshawks (during 1996–1998, $N = 30$) nesting on the Olympic Peninsula, Washington to habitat structure, composition, and configuration measured at three spatial scales (39 ha nest area, 177 ha PFA; and 1,886 ha home range). Occupied historical sites tended to have a high proportion of late-seral forest (>70% canopy closure of conifer species with >10% of the canopy trees >53 cm dbh), reduced stand initiation cover, and reduced landscape heterogeneity at all three scales, but only the two larger scale models predicted occupancy successfully. Habitat conditions at the nest-area scale were more similar between occupied and unoccupied sites than were habitat conditions in PFAs or home ranges. Also, goshawks occupied areas with more heterogeneity and more early stand initiation forest within their home range than within the PFA.

McGrath et al. (2003) further evaluated this question of goshawk habitat at various spatial scales in an intensive field and modeling study. They compared nesting habitat on four study areas in eastern Oregon and Washington during 1992–1995. Eight habitat scales ranging from 1–170 ha (PFA scale) surrounding 82 nests and 95 random sites were analyzed to describe goshawk nesting habitat at biologically relevant scales and to develop models that could be used to assess the effects of forest management on habitat suitability. At the 1-ha scale, the stage of stand development, low topographic position, and high stand basal area reliably discriminated between nests and random sites. At this small scale, the stem exclusion phase of stand

development was preferred, whereas understory re-initiation and old-growth phases were used in proportion to their availability. At larger scales, the middle stages of stand development consisting of stem exclusion and understory re-initiation (both with canopy closure >50% and greater habitat heterogeneity), were more common around nests than random sites. These effects were prevalent up to 83 ha. They provide convincing evidence that in their study area, a core area around goshawk nests where the forest is characterized by large trees with high canopy closure and this core is surrounded by a heterogeneous landscape with forest cover types that are equally abundant. Although the functional significance of this 83-ha area has not been demonstrated, they speculate the habitat conditions within 500 m (approximately 80 ha) may provide the PFA-like conditions described by Reynolds et al. (1992) and Kennedy et al. (1994) in this area. Recently, La Sorte et al. (2004) found that goshawk nests in northern Arizona were consistently associated with regions of continuous forest and gentle terrain out to 645 m from the nest site. They concluded that this non-fragmented, forested area represents the PFA which Kennedy et al. (1994) estimated as a circle centered at the nest with a radius of 732 m. This literature suggests that PFAs likely exist and occur at the scale of 80–200 ha, but vary in size depending on local environmental conditions (i.e., availability of vulnerable prey and predation risk).

FORAGING AREAS

Goshawk nesting habitat is well described at the nest-tree and nest-stand levels, but how goshawks use habitats away from their nests during the nesting season is poorly understood. A few studies have been conducted in North America that describe breeding season foraging habitat (Austin 1993, Bright-Smith and Mannan 1994, Beier and Drennan 1997, Good 1998, Lapinski 2000, Finn et al. 2002a, Boal et al. 2005b). These studies have defined foraging habitat in a variety of ways, which limits our ability to make cross-study comparisons. These definitions include: (1) all habitat within a home range not included in the nest area, (2) habitat at locations of goshawks obtained by radio tracking tagged birds, and (3) habitat at known kill sites located by detailed tracking of radio-tagged birds. Home range analyses estimate home range size based on locations of radio-tagged birds or assume the home range can be represented by a circular area centered on the nest.

Results from some studies suggest goshawks forage in all forest types, but appear to select forests

with a high density of large trees, greater canopy cover and high canopy closure, high basal area and relatively open understories in which to hunt (Beier and Drennan 1997, Finn et al. 2002a, Greenwald et al. 2005). However, other studies report a tolerance for a broad range of forest structures (Kenward 1982, Widén 1989, Austin 1993, Bright-Smith and Mannan 1994, Hargis et al. 1994, Beier and Drennan 1997). Beier and Drennan (1997) suggested goshawks in their northern Arizona study area forage in all types of forest stands. It is also important to note that while some habitats may be avoided by foraging goshawks, they may actually be important in terms of prey production (Boal et al. 2005b).

In southwestern Yukon, Canada, 33% of goshawk kills were in dense forest cover although only 18% of the area contained this cover type (Doyle and Smith 1994). Hargis et al. (1994) found goshawks foraging in forest stands with higher basal area, more canopy cover, and more trees in large diameter classes than were randomly available.

Goshawks can also hunt openings and along edges. Shuster (1980) observed goshawks hunting in openings and clear-cuts in Colorado. In Nevada, three males foraged in open sagebrush away from trees (based on 13 visual locations) and along the edge of aspen groves to hunt Belding's ground squirrels in sagebrush (Younk and Bechard 1994a). In Europe, Kenward (1982) collected detailed movement data on four radio-tagged goshawks. These birds spent a substantial amount of time hunting along edges and crossing openings between woodlands. These studies indicate that goshawks hunt in open and edge habitats; however, the degree to which they rely on these edges for prey is unclear.

Reynolds and Meslow (1984) assigned bird and mammal prey species in forested habitat to four height zones (ground-shrub, shrub-canopy, canopy, and aerial) based on where each species spends most of its time. They found 40% of prey species in goshawk diets were zone generalists, 35% were most often in the ground-shrub layer, and the remaining prey was evenly distributed between shrub-canopy and canopy layers. Reynolds et al. (1992) indicated large-bodied prey might be more important to breeding goshawks than smaller prey. In the Reynolds and Meslow (1984) study, large-bodied mammals and avian prey were primarily associated with lower forest strata or were zone generalists. In Arizona, 62% of prey were captured from the ground-shrub zone, 25% were zone generalists, and 13% were from the shrub-canopy and canopy zones with highly aerial prey, such as swallows, rarely present in the diet (Boal and Mannan 1994).

DeStefano and McCloskey (1997) reported that in the coast ranges of Oregon, goshawks are rare even though goshawk prey species are varied and abundant. Forests in this area contain high understory stem densities and dense undergrowth, which may make prey species difficult to capture. DeStefano and McCloskey (1997) suggested that if a relationship between vegetation structure and prey availability does exist, these forest conditions might limit prey availability to goshawks.

In southcentral Wyoming, Good (1998) described foraging habitat of five male goshawks at nest sites. He examined four factors at each kill site: prey abundance, habitat characteristics, landscape patterns, and habitat needs of prey species. Similar to Beier and Drennan's (1997) study, Good (1998) found the relative use of kill areas correlated with habitat characteristics rather than prey abundance. The majority of goshawks ($N = 3$) in his sample returned most often to sites with more mature forests, gentler slopes (6–60%), lower ground coverage of woody plants (1–30%) and greater densities of large conifers (23–37.5 cm dbh, range = 0–11 stems/0.04 ha). Goshawk kill areas were often associated with small natural openings, as were many prey species. Good also suggested that goshawks may return to areas more often where large numbers of prey are present because two individuals in his sample regularly returned to kill sites with high prey abundance.

In western Washington, Bloxton (2002) identified 52 kill sites of 13 goshawks (seven adult males, one juvenile male and five adult females). Goshawks killed prey in stands that ranged from 13-yr-old regeneration stands to 200-yr-old stands; all forest types were hunted except recent clearcuts and shrub-sapling states. Although much variation was associated with kill sites, goshawks made kills in mature forests more than expected based on availability. Goshawks tended to hunt in stands with larger diameter trees and avoid areas composed primarily of small trees (saplings-pole). Kill sites also had greater overall basal area, greater total snag density, and greater small snag density, but the number of large snags did not differ between use and random sites. The forest understory characteristics seemed to have little effect where goshawks killed prey, except that kill sites had 35% less tall understory cover compared to random sites.

WINTERING AREAS

The European studies suggest that prey abundance and not habitat per se may be an important factor affecting habitat use by goshawks during

the winter, particularly at northern latitudes (Sunde 2002). However, a recent study of forest structure and prey abundance at goshawk winter kill sites by Drennan and Beier (2003) suggested that goshawks select winter foraging sites in northern Arizona based on forest structure rather than prey abundance. In their northern Arizona study area, kill sites of 13 radio-tagged adult goshawks (six males and seven females) had more medium-sized trees and denser canopies than nearby paired sites that lacked evidence of goshawk use. Prey abundance indices were nearly equal at used and reference plots. This pattern is consistent with their results for breeding season foraging habitat in the same study area (Beier and Drennan 1997). However, the results of both Arizona studies need to be interpreted cautiously because they used prey abundance indices that do not account for detection probabilities which has been demonstrated to be difficult to interpret by numerous authors (Buckland et al. 2001).

In the winter, goshawks have been reported to use a variety of vegetation types, such as forests, woodlands, shrub lands, and forested riparian strips in search of prey (Squires and Ruggiero 1995, Drennan and Beier 2003). In northern Arizona, adult goshawks continued to use their breeding season home ranges in ponderosa pine and most males moved into lower elevation, pinyon-juniper woodlands during the winter (Drennan and Beier 2003). Squires and Ruggiero (1995) documented that four goshawks, which nested in south-central Wyoming, were short-distance migrants (range = 65–185 km from nesting area). These four goshawks wintered in aspen with mixed conifer stands, large stands of spruce-fir, lodgepole pine, and cottonwood groves surrounded by sagebrush.

Stephens (2001) analyzed landscapes of winter home ranges of 12 goshawks breeding in the Uinta Mountains in Utah. This is the largest sample size of winter birds observed in North America. The four core range habitat types were: (1) mixed-conifer forests at higher elevations composed primarily of lodgepole pine, subalpine fir (*Abies lasiocarpa*), and/or Douglas fir, (2) woodlands composed primarily of pinyon-juniper and agricultural areas adjacent to the woodland, (3) a combination of the first two habitat types, and (4) lowland riparian areas adjacent to salt-desert scrub. The birds demonstrated a preference for habitats 1, 3 and 4. These data indicate this sample of goshawks had winter home ranges with a higher diversity of vegetation types and more patches than the rest of the study area. Stephens (2001) speculated these areas may have supported a more diverse prey base. His data also support the observations of

Drennan and Beier (2003) that birds will winter in habitats not used for nesting, i.e., pinyon-juniper woodland.

Widén (1989) tracked radio-tagged goshawks (N = 23 males; 20 females) in Sweden that wintered in highly fragmented forests interspersed with clear cuts, wetlands and agricultural lands. In this study, goshawks killed more than half of their prey in large (>40 ha) patches of mature forests (70 yr old) and used these areas significantly more than what was proportionately available. Young and middle-aged forests were used by goshawks in proportion to abundance. Mature forests allowed goshawks to hunt while remaining undetected by prey, but were also open enough for birds to maneuver when attacking prey (Widén 1989).

In England, Kenward (1982) tracked four goshawks that spent 50% of their time in and took 70% of their prey from the 12% of woodland contained within their home ranges. Another study conducted in agricultural areas of England (Kenward and Widén 1989) reported wintering goshawks used edge habitats for foraging. Differences in habitat use may be attributed to different prey distributions (Kenward and Widén 1989). Kenward and Widén (1989) reported that in boreal forests, goshawks prey primarily on squirrels found distributed throughout the forest, whereas in agricultural areas goshawks hunt near forest edges where prey are more abundant. Goshawk home ranges in agricultural areas were smallest where prey densities were greatest, and were largest in areas that contained the least woodland edge, suggesting that prey distribution and availability was the factor that determined the distribution of goshawks during winter (Kenward and Widén 1989).

A recent study by Tornberg and Colpaert (2001) monitored winter habitat use of 26 radio-marked goshawks in northern Finland. These were birds that were trapped in the winter so their residency status was unknown. However, the species is a resident in the northern boreal forest of Finland. Harmonic mean centers of their winter ranges were concentrated near human settlements where they preyed upon human commensals, e.g., brown rats (*Rattus norvegicus*). Goshawks preferred deciduous and mature coniferous forests and avoided open areas such as large fields and bogs. They also avoided very heterogeneous sites, which the authors attribute to avoidance of areas of dense vegetation and not edges as was noted in Sweden by Widén (1989). In Finland, they preferred small to medium-sized patches (<30 ha) of forests and avoided large patches (>30 ha). The results of this study differ from that of Widén (1989)

in Sweden where goshawks showed a strong preference for large patches of mature forest. Tornberg and Colpaert (2001) suggested these differences were due to differences in prey preferences. Goshawks in Sweden mostly took squirrels, which reached their peak densities in old spruce forests. In Finland, wintering goshawks preyed mostly on species associated with deciduous forests (Black Grouse) and early seral stages (mountain hares [*Lepus timidus*]), or urban areas (brown rats).

SEASONAL MOVEMENTS AND DISPERSAL

Movements of goshawks beyond home range boundaries include migration, natal dispersal, and breeding dispersal. Migration is seasonal movement between breeding and non-breeding home ranges. Natal dispersal is defined as movement between a bird's natal area and its first breeding area, whereas breeding dispersal is defined as movements by adults between years among breeding areas (Greenwood 1980, Greenwood and Harvey 1982). Migration and dispersal are important components of population dynamics, yet are poorly understood for most bird populations (Lebreton and Clobert 1991, Newton 1998) including goshawks in North America.

FALL MIGRATION

Goshawks are partial migrants (Squires and Reynolds 1997) meaning that some individuals maintain year-round occupancy of nest territories while other individuals in the population undergo seasonal movements to wintering areas (Berthold 1993). Sonsthagen (2002) used satellite telemetry to monitor migratory movements of 34 female goshawks breeding throughout the state of Utah. She found the goshawks moved throughout Utah and inconsistently used existing forest corridors when they left their nesting territories. The 34 female goshawks exhibited a variety of movement patterns. However, her data support previously reported patterns based on band returns (Reynolds et al. 1994, Hoffman et al. 2002) and radio telemetry (Squires and Ruggerio 1995, Stephens 2001) that goshawk migrations involve short-distance movements (<500 km). Of the 34 birds fitted with platform transmitter terminals (PTT), 19 wintered near their breeding area and 15 were migrants. The migrants moved 49–613 km to wintering areas and only two birds moved >500 km. Band return data from the European subspecies suggest short-distance movements or wandering during the non-breeding season occurs for birds that reside in southern latitudes (Bühler et

al. 1987) and longer-distance migrations are more common for populations from northern latitudes (Hoglund 1964a).

The degree to which populations are partially migratory may relate to food availability on breeding areas during winter. At Kluane, Yukon, goshawks were year-round residents during periods of high snowshoe hare abundance, but winter sightings sharply declined when hare densities were low (Doyle and Smith 1994). In southeast Alaska, males maintained loose association with their nesting home range throughout the non-breeding season (Alaska Department of Fish and Game 1993), but some females moved up to 56 km from nesting home ranges. In Minnesota, 27 of 28 radio-tagged goshawks were recorded within 12.4 km of their nest during three consecutive winters (Boal et al. 2003).

Approximately every 10 yr, large numbers of goshawks are observed migrating to southern wintering areas apparently in response to low prey abundance at northern latitudes (Mueller and Berger 1968, Mueller et al. 1977, Doyle and Smith 1994); incursions usually last at least 2 yr (Squires and Reynolds 1997). The periodic invasions of goshawks along the western shore of Lake Michigan from 1950–1974 were correlated with 10-yr population declines in Ruffed Grouse (*Bonasa umbellus*) and snowshoe hares (Mueller et al. 1977). Irruptive movements of goshawks are composed primarily of adults (Sutton 1931, Mueller et al. 1977); juvenile proportions are variable, probably dependent on reproductive success during the previous nesting season. Incursion years in North America summarized by Palmer (1988) and Squires and Reynolds (1997) include: winters 1859–1860, 1870–1871, 1905–1907, 1917–1918, 1926–1928, 1935–1936, 1952–1954, 1962–1963, 1972–1973, 1982–1983, and 1992–1993. In 1972–1973 near Duluth, Minnesota, observers counted 5,352 goshawks which dwarfed previous counts (Hofslund 1973). In other areas, migration counts indicate some populations irrupt on a 4-yr cycle (Nagy 1977). As noted by Boal et al. (2003), we do not understand the factors that influence goshawk residency patterns.

Fall migrations generally commence after young disperse from natal areas (Palmer 1988) and occur between mid-September and mid-December. Heintzelman (1976 in Bosakowski 1999) shows the fall migration season for goshawks extends from mid-September through November at Hawk Mountain, Pennsylvania. In New Jersey, the peak fall migration occurs mid to late October (Bosakowski 1999). From 1970–1994 counts of migrant goshawks

ranged from 27–347 for Hawk Mountain; 106–5,819 for Hawk Ridge, Minnesota; 9–75 for Cape May, New Jersey; and 63–252 for Goshute Mountain, Nevada. These numbers are difficult to interpret because they are a function of number of observers and observer detection probabilities.

Spring migration is far less pronounced and poorly understood (Squires and Reynolds 1997). In Wyoming, four radio-tagged goshawks exhibited short distance migration (range = 65–185 km) beginning in mid-September and returned to nest sites between 23 March and 12 April 1993 (Squires and Ruggiero 1995). Breeding birds in northeast Utah also returned to their nest sites in March but their winter locations were unknown (Dewey et al. 2003). Habitat used by goshawks during migration has never been documented.

WINTER MOVEMENTS

Winter movements are better understood for European populations. In Fennoscandia, wintering goshawks move in a northeast or southwest direction; the orientation of these movements may be due to geographical constraints or enhanced chances of recovery in certain directions (Marström and Kenward 1981a). Juveniles tended to move farther than adults, approximately 70% of movements were between 1–50 km, but 4% were >500 km. Juvenile males tended to move further than juvenile females, and adult males were more sedentary (approximately 80% of movements were <20 km) than adult females. However, the movements of females were highly variable with 46% of females moving <10 km and 9% >500 km. In the boreal forests of Sweden, banded goshawks moved from boreal forests to agricultural regions where prey was more abundant; juveniles moved greater distances than adults (Widén 1985b). In Sweden, the migratory movements of goshawks banded as nestlings varied from 50–200 km depending on region (Hoglund 1964a).

DISPERSAL

Information on dispersal is important for investigating issues of population isolation and demography (Johnson and Gaines 1990, Stenseth and Lidicker 1992). Dispersal and mortality may be more important than reproduction in governing population dynamics, but given these processes occur mainly outside of the nesting period, they are difficult to measure (Braun et al. 1996).

Natal dispersal

Given that natal dispersal involves a complex series of movements (Walls and Kenward 1995, 1998), the final natal-dispersal distance is a function of the cumulative history of movements during the dispersal process (Dufty and Belthoff 2001, Wiens 2001). Successful dispersal is critical to the genetic and demographic viability of populations (Greenwood 1980, Arcese 1989, Wiens 1996). Little is known about the habitats used by goshawks during dispersal, or their dispersal directions and distances. The limited information that is available comes from recapture of marked birds, band returns, radio telemetry, and satellite telemetry.

On the Kaibab Plateau, Reynolds et al. (unpubl. data) reported that 24 of 452 fledglings banded were recruited into the local breeding population. Mean natal dispersal distance was 14.7 km (SD = 8.2, range = 3.4–36.3 km) and did not differ among sexes for the recruits. Five banded juveniles found dead outside of the study area demonstrated a potential for long-distance natal dispersal (181 ± 137 km, range = 52–442 km). In addition, two band recoveries in the southwestern US of birds banded that year were 130 km (Kennedy and Ward 2003) and 176 km (Reynolds et al. 1994) from their natal nest. Distances from natal nest areas, for recoveries of juveniles radio-tagged in New Mexico, ranged from 5.5–130 km (N = 16; P. L. Kennedy and J. M. Ward, unpubl. data).

Kennedy and Ward (2003) experimental results suggest that natal dispersal in New Mexico was regulated by food availability for at least the first 4 mo post-fledging. After independence, radio-tagged control birds were never located in their natal areas and by the end of September in 1992 and 1993 they had all left the study area. However, treatment (provided with supplemental food at the natal area) birds remained on the study area for the duration of the experiment (late October in 1992 and late November in 1993). These results support the idea that juveniles monitor their environment at a local scale to make dispersal decisions. These results are corroborated by correlative studies conducted by Byholm et al. (2003) on factors influencing natal dispersal in the European subspecies. Byholm et al. (2003) analyzed 12 yr of band-return data for birds hatched over a wide area in Finland and found local prey availability (as indexed by grouse census data) influenced dispersal distances; juvenile European goshawks remained nearer to the natal area when local grouse density was high than when grouse were scarce.

Breeding dispersal

Goshawk breeding dispersal includes movements between alternative nests within a breeding area, and movements of individuals from one breeding area to another. Although movements of a pair between alternative nests are not important demographically, they may confound detection and interpretation of movement by pairs or individuals to a different breeding area and these two types of movement can only be distinguished when individuals are marked (USDI Fish and Wildlife Service 1998a). Breeding dispersal could result from death of a mate, or may represent an attempt to acquire a better mate or breeding area (USDI Fish and Wildlife Service 1998a), and may be induced by low productivity (Reynolds et al. 1994). The factors influencing breeding dispersal may differ from those influencing natal dispersal, but the probability of remaining close to the natal area is positively related to survival and/or reproductive success (Byholm et al. 2003).

Reynolds et al. (1994) reported that in northern Arizona, three birds that moved from one breeding area to another in consecutive years all produced more young after the move. Reynolds et al. (unpubl. data) reported results of a study of 259 banded adult goshawks breeding in the same study area. Mean breeding dispersal distance for males was 2.4 ± 0.6 km (range = 1.9–3.5 km, $N = 6$) and for females was 5.0 ± 2.3 km (range = 2.4–9.0 km, $N = 11$). Both male and female mean breeding dispersal distances were close to the nearest-neighbor distance ($\bar{x} = 3.8$ km, $sd = 3.2$, $N = 97$), indicating that dispersers moved to neighboring territories. In northern California, Detrich and Woodbridge (1994) reported higher rates of breeding dispersal. Over 9 yr, 18.2% of females ($N = 22$) and 23.1% of males ($N = 13$) were found breeding in more than one breeding area. Breeding dispersal distances for females averaged 9.8 km (range = 5.5–12.9 km) and for males averaged 6.5 km (range = 4.2–10.3 km). Similar to natal dispersal, detection of maximum breeding dispersal distances is likely constrained by size of study areas and resighting technique (Koenig et al. 1996).

DEMOGRAPHY AND POPULATION ECOLOGY

Goshawk populations fluctuate in response to changes in survival, reproduction, immigration, and emigration. Population ecology is concerned with determining how factors such as genetics, population density, distribution, age structure, resource abundance and availability, habitat distribution,

competition, and climate influence these population parameters. Understanding a species' population biology is also mandated by the NFMA that requires the USFS to maintain viable populations of native vertebrates. The ESA reinforces the NFMA by identifying distinct population segments as an appropriate level of protection. These laws, coupled with life-history attributes of goshawks, underscore the pressing need to determine how population vital rates may vary relative to forest management and other human-induced changes to landscapes.

POPULATION VITAL RATES

Longevity

Goshawk longevity is poorly documented because few studies are long term and inherent difficulties exist for following individual birds over time. Age records for wild birds include a 6-yr-old bird in Alaska (McGowan 1975), 6- and 7-yr-old birds in northern California (Detrich and Woodbridge 1994), a 9-yr-old bird in New Mexico (P. L. Kennedy, unpubl. data), an 11-yr-old male in Minnesota (Boal et al. 2002), and a 12-yr-old female in Wisconsin (Evans 1981). Bailey and Niedrach (1965) reported a captive bird living 19 yr.

Survivorship

Survival estimates are poorly documented. We do not understand how seasonal, temporal, spatial, or environmental factors affect goshawk survival, nor do we understand how survival patterns vary by sex and age class. Annual juvenile survival can vary from 0.16–1.00 with most estimates occurring between 0.37–0.57 (Table 3). Average annual adult survival varies from 0.70–0.87 independent of estimation technique and geography (Table 4). However the standard errors of these estimates vary from 0.05–0.1; this low precision limits their utility for estimating annual trends in survival.

Estimated age-specific mortality rates of Finnish and Swedish birds based on banding recoveries ($N = 552$, years 1950–1966) assuming a 60% reporting rate were: 66% year 1, 33% year 2, 19% year 3, 19% year 4, and 11% for years 5+ (Haukioja and Haukioja 1970). Survivorship between banding and recovery was 287 d for birds banded in Sweden and 221 d for those in Finland (Hoglund 1964a). Winter survival favors birds of higher body mass; males appear to be more vulnerable to food shortage than females (Marcström and Kenward 1981b).

TABLE 3. ESTIMATED POST-FLEDGING SURVIVORSHIP CALCULATED FOR JUVENILE (0–1 YR OF AGE) NORTHERN GOSHAWKS.

		Time monitored survivorship (SE)	Annualized survivorship	N	Months post- fledging ^a	
Location	Year(s)					Source
North America						
Alaska	1992–1993	0.50 (NA)	0.16	14	4.5	Titus et al., unpubl. data
Northern New Mexico	1992	0.91 (0.09) ^b	0.81	12	5.5	Ward and Kennedy 1996
	1992	0.93 (0.06) ^c	0.85	15	5.5	
	1993	1.00 (0.0) ^b	1.00	9	7	
Northeastern Utah	1993	0.67 (0.27) ^c	0.50	3	7	Dewey and Kennedy 2001
	1996	0.87 (0.1) ^b	0.56	15	3	
	1996	0.89 (0.07) ^c	0.57	18	3	
	1997	1.00 (0) ^b	1.00	19	3	
	1997	0.56 (0.12) ^c	0.43	18	3	
Europe						
Sweden	1980–1987	0.86 (NA)	0.55	22	3	Kenward et al. 1999
	1980–1987	0.69 (NA)	0.48	22	6	
	1980–1987	0.52 (NA)	0.52	22	12	
Fennoscandia	1950–1966	0.37 (NA) ^d	0.37	55	12	Haukioja and Haukioja 1970
Northern Finland	1991–1995	0.50 (NA)	0.37	7	5	Tornberg and Colpaert 2001

^aThe number of months monitored after fledging.^bTreatment in supplemental feeding experiment.^cControl in supplemental feeding experiment.^dEstimated from banding.TABLE 4. ESTIMATED MEAN SURVIVORSHIP RATES FOR ADULT FEMALE^a NORTHERN GOSHAWKS.

Location	Year(s)	Survivorship (SE)	N	Source	Method
North America					
Alaska	1992–1996	0.72 (NA) ^b	39	Iverson et al. 1996	Radio tracking
Northern Arizona	1991–1996	0.87 (0.05)	99	Reynolds and Joy 1998	Mark-resight
Northern California	1983–1992	0.70 (0.10)	40	DeStefano et al. 1994b	Mark-resight
Northern New Mexico	1984–1995	0.86 (0.09) ^b	45	Kennedy 1997	Mark-resight
Europe					
Sweden	1980–1985	0.79 (NA)	132	Kenward et al. 1999	Radio tracking
Fennoscandia	1950–1966	0.86 (NA) ^b	552	Haukioja and Haukioja 1970	Mark-resight
Northern Finland	1991–1995	0.75 (NA) ^b	19	Tornberg and Colpaert 2001	Radio tracking

^aInsufficient data available to estimate male survival rates in all studies.^bAnnual survivorship reported for adults (male and female combined).

Age at first breeding

During the breeding season, goshawks can be categorized as: subadults (1–2 yr) with primarily juvenile feathers, young adults (2–3 yr) with primarily adult plumage and some juvenile feathers, and adults (>3 yr) with full adult plumage (Bond and Stabler 1941, Mueller and Berger 1968, Henny et al. 1985, Reynolds et al. 1994). Although females occasionally nest as subadults, this has not been documented

for males (USDI Fish and Wildlife Service 1998a). Hoglund (1964a) examined testicular development of 10 subadult males and found the size was variable and only one contained viable sperm suggesting juvenile males may not be physiologically capable of breeding.

Proportion of subadults and juveniles varies geographically from <5% in Oregon (Reynolds and Wight 1978, Henny et al. 1985) and New Mexico (P. L. Kennedy, unpubl. data) to 50% in Nevada (Young

and Bechard 1994a). In New York and New Jersey, only two females ($N = 35$ nesting attempts) were in immature plumage and all males ($N = 18$) were in adult plumage (Speiser and Bosakowski 1991). In Alaska, subadult females occupied 33% ($N = 16$) of active nests during the only year that subadults nested (McGowan 1975). Reynolds et al., (unpubl. data) reported the mean age of first breeding for 24 young goshawks recruited into their natal breeding population in Arizona as $3.2 \text{ yr} \pm 1.1$ (range = 2–5 yr) for males and 4.3 ± 1.9 (range = 2–8 yr) for females. They suggested that low recruitment rates and delayed age of first breeding could indicate a stationary, saturated population of breeders on the study area.

Clutch size

Goshawks usually lay one clutch per year. Renesting appears to be rare but does occur following egg loss, especially if loss is during early incubation (Zirrer 1947, Squires and Reynolds 1997). Clutch sizes are usually two–four eggs, rarely one and five. In North America, the mean clutch size was 2.7 eggs ($SD = 0.88$, $N = 44$; Apfelbaum and Seelbach 1983). The average clutch size was 3.2 eggs ($SD = 0.45$, $N = 5$; Reynolds and Wight 1978) in Oregon, and 3.2 (range = 1–4, $N = 33$) in Alaska (McGowan 1975). In Nova Scotia ($N = 47$), 34 % of nests contained two eggs; 49 %, three eggs; and 17%, four eggs (Tufts 1961). In Great Britain, average clutch size was 4.0 ($SE = 0.11$, range = 2–5, $N = 47$); of these clutches, 2% contained two eggs; 21%, three eggs; 55%, four eggs, and 21%, five eggs (Anonymous 1990).

REPRODUCTIVE SUCCESS

Goshawk fecundity is difficult to estimate, but clearly there is considerable spatial and temporal variation across the species' range (Squires and Reynolds 1997). Given the inherent difficulties of directly measuring fecundity, indices of reproductive success are used that require specific terminology (Steenhof 1987). An occupied breeding area is an area with evidence of fidelity or regular use by goshawks that may be exhibiting courtship behavior and may attempt to breed. An active breeding area or nest is an area or nest in which eggs are laid. A successful breeding area or nest is one in which at least one young is fledged. Nesting success is the proportion of active nests that fledge at least one young, or occasionally the proportion of occupied breeding areas that fledge at least one young. Productivity is the mean number of young

fledged per successful nest, the mean number of young produced per active nest, or the mean number of young per occupied breeding area. Estimates of these parameters are often overestimated due to the greater probability of detecting breeding versus non-breeding pairs and successful versus unsuccessful nests (Mayfield 1961, Miller and Johnson 1978, Johnson 1979, Hensler and Nichols 1981, Steenhof and Kochert 1982, Reynolds and Joy 1998, Manolis et al. 2000).

Nesting success and productivity

Estimates of annual nesting success range from 8–94% (Squires and Reynolds 1997, Lapinski 2000, Boal et al. 2005a). Mean nest success ranges from 76–95% in western North America (Table 5). Productivity, defined as the number of young fledged per nest where eggs were laid, is the most commonly used statistic quantifying raptor reproduction (Newton 1979a). It is also common to consider young observed at 80–90% of fledging age as surviving to fledge (Steenhof 1987). Productivity ranges from 1.2–2.0 young per active nest and 1.4–2.7 young per successful nest in western North America (Table 5). Most populations produce between 2.0–2.8 fledglings per successful nest (Squires and Reynolds 1997). In Arizona ($N = 98$ nests), 85% of nests successfully fledged young, 3% either did not lay eggs or clutches were lost during early incubation, 6% of clutches were lost during incubation, and 6% failed during the nestling period (Reynolds et al. 1994). The highest estimates of productivity in North America are from the northern portion of the goshawk's range in Yukon, Canada, and interior Alaska (McGowan 1975, Doyle and Smith 1994). Although productivity is high for northern populations, it can be highly variable. In the Yukon, the number of fledglings/successful nest varied from zero in 1992 to 3.9 in 1990 (Doyle and Smith 1994).

In long-lived raptors, research suggests some nest areas consistently fledge more young than others, with the majority of young in the population being produced by a few females that are breeding in high quality nest areas. McClaren et al. (2002) evaluated whether or not number of young fledged varied spatially and temporally among goshawk nest areas within three study areas where long-term reproductive data from goshawks were available: Vancouver Island, British Columbia, Jemez Mountains, New Mexico, and Uinta Mountains, Utah. Their analysis indicated minimal spatial variation in nest productivity within the three study locations. Rather, nest areas exhibited high temporal variability in nest

TABLE 5. REPRODUCTION STATISTICS IN WESTERN NORTHERN GOSHAWK POPULATIONS IN NORTH AMERICA.

Location	Year(s)	N active nests ^a	N successful nests ^b	Mean N young / active nest	Mean N young / successful nest	Mean nest success (%) ^c	Source
Alaska	1971–1973	33	NA	2.00	2.70	NA	McGowan 1975
Arizona	1990–1992	22	20	1.90	2.20	91	Boal and Mannan 1994
Central Arizona	1990–1991	NA	23	NA	1.72	NA	Dargan 1991
Northern Arizona	1988–1990	NA	NA	1.68	2.00	82	Zinn and Tibbitts 1990
Northern Arizona	1991–1996	273 ^d	224 ^d	1.55 ^d	1.88 ^d	82 ^d	Reynolds and Joy 1998
Southeastern Arizona	1993–1994	14	11	1.50	1.90	79	Snyder 1995
California	1981–1983	181	164 ^d	1.71	1.89 ^d	91 ^d	Bloom et al. 1986
California	1987–1990	23	18	1.39	1.77	78	Austin 1993
California	1984–1992	84	73 ^d	1.93	2.22 ^d	87 ^d	Woodbridge and Detrich 1994
Idaho-Wyoming	1989–1994	68	62	1.96	2.11	91	Patla 1997 ^e
Northcentral New Mexico	1984–1995	80	NA	1.30	NA	NA	McClaren et al. 2002
Oregon-Washington	1994	81	73 ^d	1.64	1.82	90	McGrath et al. 2003
Oregon	1992	12	10	1.20	1.40	83	Bull and Hohmann 1994
Oregon	1992–1993	50	NA	1.28 ^d	NA	NA	DeStefano et al. 1994a
Oregon	1969–1974	48	NA	1.70	NA	90	Reynolds and Wight 1978
Northeastern Utah	1991–1999	118	NA	1.30	NA	NA	McClaren et al. 2002
South Dakota	1972–1976	17	13	1.35 ^d	1.77 ^d	76 ^d	Bartelt 1977
Vancouver Island, British Columbia	1991–2000	51	NA	1.59	NA	NA	McClaren et al. 2002
Mean ^f	---	---	---	1.59	1.95	86	---

^aAn active nest is one in which at least an egg is laid or is inferred to be laid by a female (e.g., a bird seen in incubation posture).

^bA successful nest is one that fledges at least one young.

^cNesting success is the proportion of active territories that successfully produce young.

^dEstimated from data presented.

^eStudy done in the Targhee National Forest and encompasses more than one state.

^fMean calculated for numeric entries only and not across all studies (i.e., NA entries were ignored).

productivity within each study area. These results suggest temporal patterns, such as local weather and fluctuating prey populations, influenced goshawk reproduction more than spatial patterns such as habitat characteristics. They concluded nest productivity may inadequately reflect spatial patterns in goshawk reproduction; spatial variability among nest areas in adult and juvenile survival rates may instead reflect variation in habitat quality.

The age of pair members also impacts productivity. In Arizona, young-adult to adult pairings produced fewer fledglings per active site (1.1 fledglings, $SD = 0.9$, $N = 9$) than adult-adult pairings (2.3 fledglings, $SD = 0.8$, $N = 21$, Reynolds et al. 1994); young-adult females and young-adult males were similarly productive. However, in Nevada, young females were as productive as older birds (2.54 vs. 3.0 young per nest, $N = 11$), but fledged young at a later date (Younk and Bechard 1994a).

Unsuccessful nests usually failed early in the breeding season, before or soon after laying (Widén 1985b). Dead nestlings, usually <10 d, are frequently found below nests with the cause of death unknown (Reynolds and Wight 1978). Pairs rarely fail after nestlings are 3-wk old. In New Mexico, nestling survival varied from 100% (six nests) at control nests (pairs not receiving supplemental-feeding) in 1992, to 37% at eight control nests in 1993 (Ward and Kennedy 1996). In Utah, nestling survival varied from 67% (6 nests) at control nests in 1996, to 57% at seven control nests in 1997 (Dewey and Kennedy 2001). In Alaska, nestling survival estimated at 98% (1971–1973, $N = 33$, McGowan 1975). On the Baltic island of Gotland, 3% ($N = 73$) of radio-tagged males and 8% of females that fledged died before dispersal (Kenward et al. 1993c).

Causes of nest failure include human disturbance, i.e., shooting of adults, recreational use of an area, and logging activities (Hoglund 1964a, Hennessy 1978, Bühler et al. 1987), disease (McGowan 1975, Ward and Kennedy 1996), inclement weather (Hennessy 1978, Boal et al. 2005a), avian predation (Hennessy 1978, Ward and Kennedy 1996, Boal et al. 2005a) and mammalian predation (McGowan 1975, Hennessy 1978, Doyle and Smith 1994, Erdman et al. 1998, Boal et al. 2005a). From 1998–2000 in northern Minnesota, 21% of all nesting attempts failed ($N = 43$) and 52% of these failures were a result of documented or possible depredation from a suite of predators and 35% of the failures were due to inclement weather. Food limitation can result in higher predation rates on nestlings because female goshawks must spend more time foraging and less time defending their young (Ward and Kennedy 1996, Dewey and Kennedy 2001).

Siblicide and cannibalism occurs, especially during periods of food deprivation (Kenward et al. 1993b, Boal and Bacorn 1994, Estes et al. 1999). Estes et al. (1999) presented evidence supporting the hypothesis that siblicide is a mechanism for brood reduction during periods of low food availability. Kenward et al. (1993b) documented that at hatching, nestling sex ratio was 1:1 but females predominated in broods that lost most offspring suggesting siblicidal interactions favor the larger females.

Proportion of pairs breeding

The proportion of goshawks that nest in a given population is difficult to determine, and poorly understood. Widén (1985b) reported 67% of adults radio-tagged ($N = 12$) during winter in Sweden were later found breeding. In northern Arizona, Reynolds and Joy (1998) found the proportion of pairs ($N = 478$ breeding area-years) annually laying eggs declined from 77–87% in 1991–1993 to 22–49% in 1994–1996 with low rates likely occurring during periods of low prey abundance.

ENVIRONMENTAL FACTORS AFFECTING PRODUCTIVITY AND POPULATION DYNAMICS

Weather

Cold spring temperatures and exposure to cold and rain can cause egg (Hoglund 1964a) and nestling mortality (Zachel 1985). Yearly variation in climatic conditions can impact productivity and other demographic parameters (Elkins 1983). Bloxton (2002) demonstrated a profound pattern of reduced survival rates of adult goshawks (with most mortalities occurring during winter) and an almost complete cessation of reproduction after an unusually strong La Niña event. This period (late 1998–early 1999) had unusually high levels of winter precipitation followed by a cold spring. Abundance indices of nine prey species (unadjusted for detection probabilities thus limiting their interpretation) declined following the La Niña winter, and goshawks generally abandoned reproductive attempts during the pre-laying period or failed during incubation. Abandoning reproductive efforts presumably helped goshawks improve their body condition throughout the summer. Bloxton's (2002) results suggest the indirect effects of weather (reducing prey abundance) are more important than direct effects (hypothermia, freezing eggs, and reduced foraging caused by precipitation interference) in influencing goshawk populations.

In Germany (Kostrzewa and Kostrzewa 1990, 1991), Italy (Penteriani 1997), and the US (Idaho; Patla 1997) high levels of spring precipitation negatively impacted goshawk reproduction whereas warm spring temperatures favored goshawk reproduction. Nestlings had retarded development during cold, wet springs (Kostrzewa and Kostrzewa 1990). Conversely, in British Columbia, high rainfall in May was associated with increased goshawk reproduction (Doyle 2000). In Germany and British Columbia, winter weather and breeding success the following season were not related.

Food availability

Prey abundance and availability are important habitat attributes that elicit demographic and population responses of goshawks (Lindén and Wikman 1983, Doyle and Smith 1994, Ward and Kennedy 1996, Squires and Reynolds 1997, Dewey and Kennedy 2001). In their literature review, Squires and Reynolds (1997) reported prey abundance strongly affects breeding area occupancy and productivity. However, Ward and Kennedy (1996) in New Mexico and Dewey and Kennedy (2001) in Utah experimentally determined that goshawks have a demographic response to a super-abundance of available food during some years, but not other years suggesting that food is not always limiting during the breeding season. These results imply that regional-goshawk populations may only be food-limited during periods when cyclic prey species populations are at low densities (Kennedy and Andersen 1999).

Correlative evidence from North America and Europe suggests goshawk reproduction at northern latitudes may be related to cyclic snowshoe hare and grouse (various species) populations (southern coast of Finland, Lindén and Wikman 1983; southwestern Yukon, Doyle and Smith 1994, Doyle 2000; northeastern Wisconsin, Erdman et al. 1998). The most dramatic example of this relationship occurred in the Yukon where goshawks breeding in peak snowshoe hare years fledged 2.8 young/active nest and 3.9 young/successful nest, compared to years when hare populations were at their lows, and no active goshawk nests were located (Doyle and Smith 1994). In Finland, the proportion of nonbreeding pairs increased from 35–52% in an apparent response to declining grouse populations (Lindén and Wikman 1983). In northeastern Wisconsin, Erdman et al. (1998) monitored the productivity of goshawks from 1968–1992; this is the longest dataset published on reproduction for any goshawk population. Fledglings per nesting attempt ranged from a high of 3.2 in 1978

to lows of 0.8 in 1983 and 1989. They found annual productivity was directly related to an index of prey they developed based on prey remains and pellets containing snowshoe hare and Ruffed Grouse, but the mathematical calculations were not reported. Overall, it appears that certain prey items are particularly important for goshawk reproduction and the abundance of these prey may strongly influence reproductive success (Tomberg and Sulkava 1991).

In addition to prey abundance, it is also important to consider whether prey items are *available* to goshawks. For example, even a high abundance of hares may have low availability to goshawks in a dense aspen regeneration or other habitats where goshawks are unable to effectively hunt (T. Dick and D. Plumptre, unpubl. data, Drennan and Beier 2003). Thus, preferences in goshawk foraging habitat are likely determined, in part, by habitat characteristics that influence their ability to access prey as well as prey abundance (Reynolds et al. 1992, Drennan and Beier 2003).

Based on the assumption that goshawk populations are regulated by food availability, Reynolds et al. (1992), emphasizes that forest management practices may strongly influence the availability of prey items for the goshawk, thus being a determining factor in the long-term persistence of the species (Kennedy and Andersen 1999). Beier and Drennan (1997) and Drennan and Beier (2003) concluded that goshawks did not select foraging areas based on prey abundance, but rather selected areas with higher canopy closure, greater tree density, and greater density of trees >41 cm dbh than on contrast plots. They suggest that goshawk morphology and behavior are adapted for hunting in moderately dense, mature forests, and that prey availability is more important than prey density in habitat selection. Drennan and Beier (2003) also hypothesize that goshawk habitat selection may be a two-tiered process. First, goshawks select broad landscapes that support abundant populations of large-bodied prey, before selecting moderately dense stands of mature forests where they can use their maneuverability to capture prey.

Reynolds et al. (1992) emphasized that goshawk prey species depend on a variety of habitats distributed in a mosaic across the landscape, because many important prey such as sciurids (Carey et al. 1992, Carey 1995) and birds (Schwab and Sinclair 1994) are more abundant in old-growth and mature forests compared to young or regenerating forests. Arthropods, the prey base for many forest-dwelling insectivores, which may in turn be prey for goshawks, are significantly less abundant along edges and in small woodlots (Burke and Nol 1998, Zanette

et al. 2000) suggesting food supplies may be reduced by forest fragmentation. Carey et al. (1992) and Carey (1995) demonstrated that scuirid populations were more abundant and remained at relatively constant levels in old-growth forests in comparison to managed second-growth stands. Similarly, Schwab and Sinclair (1994) reported avian populations were more abundant and diverse in mature forests than in younger forests. However, Sallabanks et al. (2001) found little evidence of structural-class specializations by breeding birds in grand fir (*Abies grandis*) forests in northeastern Oregon.

Clearly, a pressing need exists to understand how prey species are influenced by changes in forest structure and pattern resulting from forest management. This information is needed before we can develop sound conservation plans for goshawks (Kennedy and Andersen 1999).

POPULATION DENSITY

Breeding density

Given their large home ranges, nesting goshawks are distributed across broad landscapes at low breeding densities. Determining breeding density of goshawks requires extensive nest searches over large areas (Kennedy and Stahlecker 1993, Joy et al. 1994). This technique relies on several assumptions, including that surveys are complete (i.e., a census) and accurate. This assumption is problematic because non-breeding birds often go undetected (USDI Fish and Wildlife Service 1998a). Nest surveys that attempt to census breeding density require intensive, systematic searches of large areas, and need to be repeated over several years to detect pairs that do not breed every year (Reynolds and Joy 1998). Nest searches are often conducted only in suitable habitat; thus, many studies actually report ecological density (birds per unit of suitable habitat) rather than crude density (birds per unit area; USDI Fish and Wildlife Service 1998a); this may bias our understanding regarding the habitat-use patterns and density of nesting goshawks (Squires and Reynolds 1997).

Densities of nesting goshawks are low, but highly variable seasonally and spatially among and within populations (Kennedy 1997, Squires and Reynolds 1997). The density of mid-latitude populations in the western half of North America, ranges from 3.6–10.7 pairs/100 km² (Squires and Reynolds 1997). In Pennsylvania, the density was 1.2 pairs/100 km², but the density of this and other eastern populations may increase as populations recover (Kimmel and Yahner 1994). Densities in the range of 10–11

occupied nests per 100 km² were reported for three study areas: Arizona (Crocker-Bedford and Chaney 1988), California (Woodbridge and Detrich 1994), and the Yukon (Doyle and Smith 1994). In Montana, the estimated density was 4.6 nests/100 km² during 1998 (Clough 2000). Kenward et al. (1991) reported broad-scale density estimates based on various European studies as 3,000 or more breeding pairs in France, Germany and Spain, and at least 14,000 pairs in Scandinavia.

Density varied from 33–270% during 2 yr in Oregon (DeStefano et al. 1994a). The Bly study area censused by DeStefano et al. (1994a) in 1993 was the same study area censused by Reynolds and Wight (1978) in 1974. The number of occupied nest sites located on this study area (N = 4) did not change over the 21-yr period and thus, densities were equivalent (3.6 birds/100 km² in 1974 and 3.8 birds/100 km² in 1993; variation due to slightly more area censused in 1974).

Density of non-breeders

Currently, no effective survey methods are available for detecting non-breeders. Non-breeding individuals may play significant roles in goshawk demography as they do in other species (Newton 1991, Hunt 1998). Nonbreeding individuals may buffer populations during stress, stabilize breeding population abundance by quickly filling in when breeders die, or serve to quickly increase the breeding density during periods of prey abundance (Iverson et al. 1996, Hunt 1998). Although it is difficult to estimate the proportion of the adult population made up of nonbreeders, several studies in Europe have indicated a substantial portion of the population does not breed (Kenward et al. 1990). Widén (1985b) estimated one third of the adult, sedentary population in his Swedish study area was non-breeding. In Finland, Lindén and Wikman (1983) estimated 35–52% of the goshawks were non-breeders, with higher proportions occurring during periods of low grouse populations.

Winter density

Winter densities are also difficult to estimate and are currently unavailable. The only index of winter abundance for North American goshawks was estimated by Doerr and Enderson (1965) for the foothills of the Front Range near Colorado Springs, Colorado. They operated six–eight traps in this area from 14 November 1963 to 14 April 1964. All traps traversed a 1,000-m section within the upper sonoran and montane life zones. They caught 13 goshawks between

November and January. No birds were caught after 4 February. The un-calibrated index of abundance ranged from 0.24–0.78 goshawks per trap day during this period. The authors concluded goshawks were relatively common in this area until February, after which no birds were present. However, they could have been present but not trappable.

METAPOPULATION STRUCTURE

Metapopulation structure is the degree that individual populations interact with one another throughout broad landscapes (Levins 1969, 1970; Hanski 1982). Knowing the connectivity among populations has conservation ramifications because it affects population persistence from genetic, demographic, and environmental perturbations (Shaffer 1981, Gilpin 1991). We are unaware of literature discussing goshawk population dynamics within a metapopulation framework. We speculate that metapopulation structure is poorly defined given that goshawk are continuously distributed across the western US and are highly mobile. However, clinal differences exhibited across western populations, plus distinct subspeciation suggests some degree of population structuring. Additional genetic sampling and movement studies are needed to address this important information need.

MORTALITY FACTORS

Goshawks die from a wide variety of causes including accidents, starvation, predation, and disease. The degree to which these factors contribute to total mortality found in North American populations has only been evaluated quantitatively for juveniles in New Mexico (Ward and Kennedy 1996) and Utah (Dewey and Kennedy 2001). The cause of death for 12 juveniles in New Mexico was predation (50%), accident (8.3%), spinal injury (8.3%), disease (8.3%), and unknown causes (25%; Ward and Kennedy 1996). In Utah, 12 necropsied juveniles died of starvation (25%), siblicide (16.7%), accident (8.3%), predation (8.3%), blood loss (8.3%), and unknown causes (33.3%; Dewey and Kennedy 2001). Bloxton et al. (2002) reported that two adult females on separate occasions died from apparent choking on mammalian prey. Boal et al. (2005a) monitored the survival of 33 adult goshawk territory holders over a 3-yr period in northern Minnesota (32 were radio tagged). Nine goshawks, eight of which were radio tagged, died during this study. Five (56%; four females and one male) of these nine mortalities occurred during the breeding seasons and were from

predation. The remaining mortalities (one female and three males) occurred during the winter months. The female that died during the winter had been shot and the mortality of one male appeared to also be due to human actions. Causes of death could not be verified for the other two male goshawks.

On the Baltic island of Gotland, natural mortality agents included starvation (37%), disease (7%), a combination of starvation and disease (22%), and trauma (33%, including two birds killed by other goshawks). Trauma induced mortalities include shooting, trapping, injuries (Jälefors 1981), and roadkills (Keran 1981); shooting, trapping and poisoning are especially common mortality factors for European populations but human persecution also occurs in North America (Boal et al. 2005a). Of 11 adult recoveries in Britain, two were killed on roads, eight were shot, trapped, or poisoned, and the cause of remaining death was unknown (Marquiss and Newton 1982).

DISEASE AND PARASITES

Although disease has been documented in wild goshawks (Redig et al. 1980, Ward and Kennedy 1996, Lierz et al. 2002a, b), disease has not been shown to significantly affect the long-term persistence of goshawk populations (USDI Fish and Wildlife Service 1998a). However, disease ecology is poorly understood and mortality by disease is difficult to identify without a detailed necropsy on fresh mortality samples. Traditional ecological analyses have largely ignored the importance of disease in mediating ecosystem function and biodiversity (Real 1996) and numerous emerging infectious diseases are developing that pose a substantial threat to wild animal populations (Daszak et al. 2000). For example, the potential impact of West Nile virus on goshawks is unknown. Given our poor state of knowledge, we must assume that disease could play a role in regulating some goshawk populations.

Bacterial diseases include tuberculosis (*Mycobacterium avium* infection; Lumeij et al. 1981) and erysipelas (*Erysipelas insidiosus* infection; Schröder 1981). Symptoms for tuberculosis included loss of balance, leg weakness, trembling and convulsions, necrotic lesions under tongue, necrotic mass in lung, air sacs, and base of heart, and millet-size to walnut-size yellow-white foci in major organs, especially liver and spleen (Lumeij et al. 1981, Schröder 1981). Ward and Kennedy (1996) reported the cause of death of a nestling in New Mexico as heart failure due to severe fibrinous pericarditis on the heart caused by *Chlamydia tsittaci* and *Escherichia coli*.

Mortality from diseases may be exacerbated by changes in other limiting factors such as food shortage (Newton 1979a). The fungal disease from the genus *Aspergillus* can produce granulomas throughout lungs and air sacs when chronic. Of migrants captured at Hawk Ridge in Minnesota, 53% (N = 49) had *Aspergillus* in 1972 (an invasion year) compared to only 7% (N = 45) in 1973 (a non-invasion year; Redig et al. 1980). Redig et al. (1980) suggested trapped goshawks were birds emigrating from northern forests due to low prey abundance, and the epizootic was the result of increased stress from reduced prey availability or migration (Redig et al. 1980).

Internal parasites are common and heavy infestations of ectoparasites, like lice (*Degeeriella nisus vagrans*), may occur in weakened birds (Keymer 1972, Lierz et al. 2002b). Greiner et al. (1975 in USDI Fish and Wildlife Service 1998b) estimated 56% of North American birds had blood parasites, including *Leucocytozoon*, *Haemoproteus*, *Trypanosoma*, and microfilariae. *Trichomoniasis* can be transmitted to accipiters that ingest infected prey, usually columbids, which are hosts to *Trichomonas gallinae*, a parasitic protozoan (Boal et al. 1998). This parasite may cause severe lesions, usually a stomatitis that obstructs the buccal cavity and pharynx and causes the disease known as frounce, a disease of the crop that may be contracted by feeding on fresh pigeons. Beebe (1974) speculated that some goshawk populations may be threatened by ingesting *Trichomonas* spp. from pigeons, however, data are lacking. In Alaska, 71% of goshawks (N = 31) had parasites (45% had cestods, 32% trematodes, and 7% had both; McGowan 1975). *Sarcocystis* parasites can cause encephalitis (Aguilar et al. 1991).

POPULATION TRENDS

No long-term indices of population trends are available for goshawks derived from standardized, widespread surveys in North America (Braun et al. 1996, Kennedy 1997). In addition, insufficient data are available to make a status determination throughout the entire breeding range (Andersen et al. 2005). Breeding Bird Survey (BBS) and CBC data are potential sources of information for estimating rangewide goshawk population trends, but they are inadequate because of low number of routes (25 during 1997–2001 with goshawk detections) and low detection rates on routes (from 1997–2001 no goshawks were observed in Kansas and Nebraska, and an average of 2.6, 2.8, and 1.4 sightings/year were observed across all routes in Colorado, Wyoming, and South Dakota, respectively). CBC data are also inadequate

to estimate goshawk population trends because of low encounter rates.

Some authors have speculated that goshawk populations and reproduction may be declining in the western US (Bloom et al. 1986, Crocker-Bedford 1990, Zinn and Tibbitts 1990). However, Kennedy (1997, 1998) concluded that current sampling techniques may be insufficient to detect population trends and that data are lacking to indicate whether goshawk populations are declining, increasing, or stationary. Andersen et al. (2005) concurred with these conclusions. The difficulty in accurately measuring goshawk population trends is due to multiple factors: (1) goshawks are secretive in nature and difficult to survey, (2) many studies have small sample sizes and are temporally and spatially limited in scope, (3) potential biases exist in nest detection methods used in some studies, and (4) research methods, data analyses and interpretation are not consistent among studies, making comparisons across studies difficult (Andersen et al. 2005, Boyce et al. 2005). The development of a reliable population model is further complicated by the spatial and temporal variation in goshawk populations (Kennedy 1997, McClaren et al. 2002).

In response to Kennedy (1997), Crocker-Bedford (1998) stated the rate of population change for goshawk populations in the US may be impossible to calculate because the species is sparsely distributed, measurements of population parameters vary with prey cycles and weather, and immigration, emigration, and survival are difficult to estimate. Crocker-Bedford (1998) suggested that instead of trying to demonstrate a decline in goshawk populations, habitat relationships of goshawks should be examined to evaluate the amount of habitat destruction or modification that has or is occurring. Kennedy (1998) responded that habitat monitoring should augment demographic studies, not replace them, and suggested that once goshawk habitat is well-defined and demographic data are available from several study areas, a model (or models) that predicts the relationship between nesting and winter habitat and population trends and/or performance could be developed. Andersen et al. (2005) concluded in their recent review of the goshawk literature that assessing the status of goshawks based solely on the distribution of late-successional forests is not appropriate based on the current understanding of goshawk-habitat relationships.

Extensive cutting of eastern forests earlier this century may have reduced populations, but goshawk numbers may be recovering as reforested areas mature (Speiser and Bosakowski 1984). Expanding

distributions of goshawks in Connecticut (Bevier 1994), New York (Andrle and Carroll 1988), Pennsylvania (Brauning 1992), and Michigan (Brewer et al. 1991) suggest regional increases. During the mid-1950s, goshawks only nested in western Massachusetts, but now have expanded throughout the state (Veit and Petersen 1993). Similarly, in Minnesota, goshawks formerly nested only in the southeastern region of the state, but their breeding distribution has expanded northward and westward into east-central, central, north-east and north-central regions of the state (Janssen 1987). The breeding distribution of known goshawk nests in Wisconsin (northern two-thirds of the state) is more extensive currently than what was documented in the 1960s (Rosenfield et al. 1998). However, we do not know to what extent the apparent increase in these Great Lakes populations is due to increased search effort.

At Hawk Ridge in Duluth, Minnesota, more goshawks are banded than anywhere else in North America (Palmer 1988). Data from Hawk Ridge indicate that 1972 and 1982 were years of heavy goshawk migration (Evans 1983). Annual totals for the peak migration in the early 1990s (>2,200) were less than those of 1982 (5,819) or 1972 (>5,100; Evans 1981). Do these migration count data suggest anything about goshawk population trends? Smallwood (1998) and others have suggested that goshawk abundance should be evaluated based on changes in migratory counts. The utility of migration counts for monitoring population trends has been much debated (Bildstein 1998). To track population change, a constant proportion of the index (e.g., numbers of goshawk seen per day) to the true population size must be maintained. If this does not occur, then the proportion must be estimated. These validation studies have not been conducted on the goshawk for a local area or range wide, so the trends in the current migration count data are difficult to interpret (Kennedy 1998, Andersen et al. 2005), especially given the periodic incursions from northern populations.

Trends in migration counts could reflect distributional changes or changes in residency patterns rather than changes in population size. For example, CBC data suggest that numbers of the closely related Sharp-shinned Hawk (*Accipiter striatus*) are increasing. However, more Sharp-shinned Hawks, may over winter in North America because of warmer winter climates and/or the abundance of bird feeders that provide a stable over-winter food source (see review in Bildstein 1998). This could account for the recent lower counts of Sharp-shinned Hawks at northern migration stations. Since goshawk migrations are

characterized by irruptive invasions, migration counts of this species are more likely to reflect changes in residency patterns than changes in abundance (Bednarz et al. 1990, Titus and Fuller 1990).

Recently, Hoffman et al. (2002) analyzed goshawk band encounter locations accumulated between 1980 and 2001, from birds banded or recaptured at four western migration stations. Their results (although limited by sample size) suggest that migration counts of goshawks generally reflect relatively localized movements (i.e., 400–500 km or less). They hypothesize counts of hatching-year birds, except in invasion years, may therefore serve as an indicator of regional productivity. This hypothesis requires further testing to determine if counting hatching-year birds at regional migration stations could be used to monitor regional productivity.

Three European studies have monitored population trends and one review of regional data in Fennoscandia has been published. Thissen et al. (1982) did a coarse-grain analysis of trends in the number of breeding pairs in the Netherlands for 1950–1981. Based on a review of the literature for the Netherlands and their own data, they concluded that Dutch goshawk populations have increased considerably during the 20th century (180–200 pairs in 1955 to >400 pairs in 1981). They also hypothesized that the steady upward trend from 1900 was interrupted by a population crash during the 1960s, presumably caused by pesticide contamination. After pesticides were banned population growth continued. They further speculated that the major factors contributing to this increase are: the extension of suitable habitat by reforestation, the increase of food abundance (Wood Pigeon [*Columba palumbus*] and Rock Dove [*Columba livia*]), and declines in persecution by humans.

Kenward et al. (1999) estimated the finite rate of population change (λ) for a population of goshawks in Sweden. They estimated age-specific survival and productivity based on both radio-tagged birds and banded birds and used these estimates in a deterministic, staggered-entry population model. Their demographic estimates are based on the largest sample size reported for goshawks and one of the largest ever reported for any diurnal raptor (318 radio-tagged goshawks, 446 banded birds, and 39 nest territories; data collected for 8 yr from 1980–1987). λ was estimated to be 1.0 for males and 0.98 for females, which would be a 2%/year decline for females. However, if the demographic estimates were modified to reflect the estimated range of variation in these values, (e.g., 8% standard error of female survival rate estimates and productivity),

$\lambda = 0.98$ for females would not likely differ from $\lambda = 1$. Because Kenward et al. (1999) did not run a stochastic population model, the effects of demographic variance on the precision of λ are not known.

Krüger and Lindström (2001) monitored occupancy and productivity of all known nests in two 125-km² study areas in Germany. They assumed an annual census of all pairs in each study area. The number of breeding pairs fluctuated between six and 18 during the 25 yr of study (1975–1999). Highest densities in the study area were found at the end of the 1970s, after which the sample of nests decreased sharply during the 1980's. During the last decade, the number of nests returned, albeit with fluctuations, to the level at the study onset.

GENETICS

Goshawks exhibit clinal variation in size and coloration (Squires and Ruggiero 1996). The largest goshawks are in the southwestern US and they decrease in size north to the Pacific Northwest; however, the smallest individuals are on the Queen Charlotte Islands, British Columbia. Size then increases from the Pacific Northwest northward through Canada to Alaska (Whaley and White 1994). In British Columbia, wing and culmen length of individuals measured from coastal islands are 2–3% smaller than those of birds from the adjacent mainland (Johnson 1989). Both *A. g. apache* and *A. g. laingi* have darker coloration compared to other populations (van Rossem 1938, Taverner 1940, Johnson 1989) suggesting genetic differences among populations.

Sonsthagen et al. (2004) and Bayard de Volo (2005) characterized genetic structure and gene flow of breeding populations in Utah and northern Arizona, respectively. The Utah population had moderate heterozygosity (50%) similar to levels found in other medium-sized, highly mobile birds. Sonsthagen et al.'s analyses suggested the functional breeding population in Utah extends beyond their sampled area; gene flow is likely maintained by natal dispersal. De Volo et al. (2005) reported high levels of heterozygosity (81%) in the northern Arizona population and also concluded that this high genetic variability occurred because this population was connected to other populations via migration and gene flow from natal dispersal. Sonsthagen et al. observed differences in the haplotype distribution between northern and southern forests in Utah. They speculated that these differences may be caused by clinal variation in haplotype frequencies across western North America. Alternatively, this subdivision

may reflect a contact zone occurring at the southern forests between *A. g. atricapillus* and goshawks of southern Arizona and the Mexican Plateau.

BREEDING BIOLOGY AND DEVELOPMENT OF YOUNG

PARENTAL ROLES

Typical of most raptors, male goshawks primarily provision the nest while the larger female defends the site from intruders. However, the degree to which females depend on males for food may depend on prey abundance and thus, delivery rates. Males mostly provision females during pre-laying and early nestling stages, but there is considerable variability. Some females begin hunting during the mid-nestling period while others depend on the male for food until fledging (Younk and Bechard 1994a, Dewey and Kennedy 2001). In Wyoming, males delivered 71% of prey items and females 29% (Good et al. 2001). This relatively high level of female foraging may be attributed to the fact that intensive telemetry was combined with nest observations to accurately assign deliveries to a particular bird. In Alaska, two females provided 12.1% and 8.8% of food delivered to nest during the nestling period (11–28 d; Zachel 1985). These females delivered prey even though the males had already delivered prey. In California, the male provided 85% of food items and the female 15% (Schnell 1958).

FIDELITY TO MATES AND NEST SITES

Pair fidelity has been estimated in birds using genetic analysis to measure the prevalence of extra-pair fertilizations (EPF) or by observing banded birds. Goshawks are monogamous, territorial birds that build nests within large home ranges. Thus, we expect that EPF would be low, but few data are available. Based on genetic analyses of 103 adults and 122 nestlings from 64 nests in northern Arizona, Gavin et al. (1998) found that EPFs were infrequent for this population (9.4% in 1991, 0% in 1992 and 1993). This result is consistent with the species' life history and densities, which probably limits EPFs.

Determining pair fidelity to mates is difficult because the fate of pair members is usually unknown, and mate fidelity can be confounded with mortality. It is also difficult to determine site fidelity given the difficulty of locating alternative nest areas and the goshawk's ability to nest many kilometers from the site used the previous year (J. Squires, unpubl. data). Nonrandom, non-systematic, or incomplete searches

would bias results, especially when based on birds without telemetry.

In California, mates were retained in 18 of 25 pairs where mates were identified in consecutive years (Detrich and Woodbridge 1994); an unknown number of the 28% of remaining birds that found new mates may be due to mortality of the previous mate. Detrich and Woodbridge (1994) observed three pairs for 5 yr and documented that two males and two females bred in three different combinations. Another male bred with three different females in the same territory over a 6-yr period. In northern California, males occupied the same nest area in consecutive years 76.5% ($N = 17$) of the time, compared to 71.4% for females ($N = 49$; Detrich and Woodbridge 1994).

In northern Arizona out of 259 adult goshawks banded between 1991 and 2003, six instances of breeding dispersal by males occurred for a rate of 4.9/100 opportunities, and 11 instances by females (6.3/100 opportunities). Only 16% ($N = 17$) of breeding dispersals had a failed nesting attempt the previous year, whereas mates that failed to return preceded 88% of dispersals. However, most goshawks remained on their territories in subsequent years despite a mate that failed to return (R. Reynolds et al., unpubl. data).

PRE-LAYING PERIOD

Copulation

Goshawk copulations are short (9.3 ± 0.7 sec [S.E.], $N = 10$) and among the most frequent among birds (518 copulations/clutch, Møller 1987, Palmer 1988). High copulation frequency may help ensure paternity, since the male is often away foraging during egg-laying. In Denmark, Møller (1987) reported two major peaks in copulation frequency. The first was 31–40 d before laying, and the other immediately before and during egg laying. Copulations are most frequent in the morning when egg laying occurs with a minor activity peak in afternoon.

Nest construction

Observations of nest building are few. In Alaska, nest construction begins soon after birds return to territories, even with snow still present on nest bowls (McGowan 1975). Females begin repairing old nests or build new structures during courtship by gathering sticks from the forest floor or breaking them from trees (Zirrer 1947). Additional nesting material is added throughout incubation. Males

occasionally assist with nest construction (Schnell 1958, Lee 1981a).

It is unclear why goshawks often add greenery, usually conifer sprigs, to the nest structure. Possibly there is a hygienic function or it communicates occupancy to neighboring birds. Females place greenery in nests throughout the nestling stage by pulling at the base of live sprigs until they break off (Schnell 1958). Sprigs are then dropped on the nest, but usually not incorporated into the structure.

INCUBATION

Egg laying

Timing of clutch completion ranges from early April–early June, varying among pairs, geographic areas, and years, but completed on average between late April and mid-May (Reynolds and Wight 1978, Henny et al. 1985, Speiser and Boskowski 1991, Bull and Hohmann 1994, Reynolds et al. 1994, Younk and Bechard 1994a, Dewey et al. 2003). Cold, wet springs may delay incubation (Younk and Bechard 1994), as does high elevation (Henny et al. 1985; but see McGown 1975, Reynolds and Wight 1978).

Female goshawks become sedentary as egg laying approaches, presumably to sequester the energy reserves necessary for egg formation (Reynolds 1972, Newton 1979a, Lee 1981a, Speiser and Bosakowski 1991); the male delivers prey directly to the female during this time, but may occasionally help with incubation (Boal et al. 1994). Eggs are laid at 2–3 d intervals (Beebe 1974, Cramp and Simmons 1980); a clutch of four eggs may take 8–9 d to complete (Anonymous 1990). In Denmark, eggs were laid early in the morning (05:28, $SD = 9$ min, $N = 4$; Møller 1987).

Females occasionally lay replacement clutches 15–30 d after initial egg loss (Cramp and Simmons 1980), but this appears to be rare (Marquiss and Newton 1982). In Oregon, a bird that failed 24 April completed a second clutch on 15 May (Henny et al. 1985). Although renesting attempts are uncommon, Zirrer (1947) observed a pair that repeatedly attempted to renest.

Incubation length

Females are primarily responsible for incubating eggs (Zirrer 1947), but males may assist for short periods after a food delivery (Lee 1981a, P. L. Kennedy, unpubl. data). Females remain on eggs up to 244 min continuously with short breaks not over

10 min in length (Allen 1978). The incubation period has been estimated at 30–44 d (Brown and Amadon 1968, Snyder and Wiley 1976, Reynolds and Wight 1978, Cramp and Simmons 1980). Differences among estimates may be attributed to individual, geographic, or annual variation, to measurement error (USDI Fish and Wildlife Service 1998a), or prolonged pipping (Palmer 1988). Incubation usually begins with the first or second egg laid, resulting in partial asynchronous hatching. Pipping of eggs may take up to 50 h (Palmer 1988).

NESTLING PHASE

Goshawks hatch from late May through June (Reynolds and Wight 1978, Dewey et al. 2003) but dates vary considerably. The nestling period varies from 37–45 d (Dixon and Dixon 1938, Reynolds and Wight 1978, Newton 1979a, Kenward et al. 1993a, Boal 1994, Kennedy and Ward 2003) and young generally fledge between late June and late July (Reynolds and Wight 1978, Reynolds et al. 1994, Kennedy and Ward 2003). Males develop faster and fledge sooner than females (Reynolds and Wight 1978, Kenward et al. 1993b, Boal 1994).

The size of goshawk broods typically varies from one–three nestlings. In Arizona 28% of 224 successful broods had one young, 50% had two young and 22% had three young (Reynolds and Joy 1998). However, there may be considerable seasonal and geographic variation in brood size. Nestlings are born semi-altricial and nidicolous, requiring much parental care. Females brood nestlings almost continually for 9–14 d following hatch (Schnell 1958, Boal 1994, Dewey and Kennedy 2001). Brooding at night ceases by 24 d of age except during wet, cold weather (Boal 1994). Females do most of the brooding, but males may occasionally brood young while the female feeds (Schnell 1958, Lee 1981a). Females continue to feed and protect young throughout the nestling stage, whereas the males primarily hunt for the brood (Squires and Reynolds 1997, Dewey and Kennedy 2001).

Nestlings grow rapidly while in the nest; see Schnell (1958), Boal (1994), and Squires and Reynolds (1997) for descriptions of growth and development. Females generally feed nestlings until they are approximately 25 d of age (Schnell 1958, Lee 1981a); males also occasionally feed nestlings, especially when the female is not present (Allen 1978, Zachel 1985). By 32–34 d of age, nestlings are 90% feathered and their tail is approximately two-thirds of adult length (Boal 1994). Nestlings of this age can feed themselves and beat their wings

vigorously as they run and hop or momentarily lift from the nest. Nestlings start leaving the nest to perch nearby at 34–35 d (Boal 1994).

Ward and Kennedy (1996) hypothesized that food supplementation during the nestling and fledgling dependency periods affected young goshawk survival not by limiting starvation, but by causing the adult female goshawk to modify her behavior and spend increasing time in the nest stand, allowing more constant protection from predators. Dewey and Kennedy (2001) experimentally tested their hypothesis and found female nest attentiveness is a function of food availability in the nest stand.

Goshawks will aggressively defend their nest stand from human intruders. However, considerable individual, geographic, and seasonal variation occurs in nest-defense behavior. Adult females are particularly defensive toward human intruders later in the nestling period (Boal and Mannan 1994). In New York and New Jersey, females brooded the young for a few days following hatching, and only rarely attacked intruders entering the nest stand during this period (Speiser and Bosakowski 1991).

FLEDGLING DEPENDENCY PHASE

The fledgling dependency period is an important period of transition during which the young learn to hunt and protect themselves (Reynolds et al. 1992). Feather growth is not yet complete at fledging (Bond 1942, Kenward et al. 1993a), so young are initially incapable of sustained flight and may have special habitat requirements. Fledglings may delay departing from nest areas when they are fed additional food by researchers suggesting that early dispersal may be in response to food shortages (Kenward et al. 1993a; Kennedy and Ward 2003). Sibling groups of both sexes continue to associate in cohesive units until flight feathers harden (Kenward et al. 1993a). Recent fledglings depend on their parents for food while their feathers harden and they learn to hunt. The distance that fledglings move from the nest gradually increases as they gain independence (Kennedy et al. 1994; Kennedy and Ward 2003). For the first 3 wk after fledging, juveniles in New Mexico remained within 300 m of the nest, and ranged to a mean distance from the nest of 1,955 m by 8 wk after fledging (Kennedy et al. 1994). In Arizona, dispersal from nest areas began in mid August and was completed by late August (Reynolds et al. 1994). On the Baltic island of Gotland, dispersal was often abrupt with approximately 90% of fledglings dispersing from their nest areas between 65–90 d of age (Kenward et al.

1993a). By day 95, 98% of the fledglings dispersed with females moving significantly later than males.

COURTSHIP AND FORAGING BEHAVIOR

COURTSHIP AND PRELAYING BEHAVIOR

Little is known regarding the timing of courtship behavior, but it appears to vary. Most pairs return to nesting territories by March (Zirrer 1947, Beebe 1974, Reynolds and Wight 1978, Roberson 2001, Dewey et al. 2003) through early April (McGowan 1975, Dewey et al. 2003). However, pairs in some regions may return as early as February (Lee 1981a, Speiser and Bosakowski 1991) or remain near their nest year-round (Boal et al. 2003). In Wyoming, migratory adults equipped with transmitters returned to nest areas from 23 March–12 April (Squires and Ruggiero 1995). The phenology of courtship may vary by residency patterns; resident birds may initiate courtship earlier in the season compared to migrants (Dewey et al. 2003).

Courtship behavior may include sky-dance displays when from brief soaring flights, the male dives at the female with closed wings well above the forest canopy, or initiates a direct aerial chase below tree canopy (Beebe 1974, Palmer 1988). Both birds then fly slowly about 1 m apart, with deep, slow wing beats, holding their wings above the body dihedral. The bird's flight undulations may be shallow or they can consist of spectacular dives. Zirrer (1947) describes this flight as wavy gliding approximately 3–6 m above the canopy; at times pair members are close together and then far apart. Pair members may be silent during the display or may be highly vocal, uttering wails and chatters. White under-tail coverts may also be flared 10 cm on either side of the tail (Beebe 1974). Prey plucking (Schnell 1958), frequent copulations (Møller 1987), pre-laying vocal activity (Penteriani 2001, Penteriani et al. 2002a), and conspicuous perching (Lee 1981a) may also serve courtship functions.

FORAGING BEHAVIOR

Hunting methods

Goshawks exhibit behavioral and morphological adaptations for hunting in forests (Squires and Reynolds 1997). Goshawks have been described as sit-and-wait predators that perch briefly while searching for prey before changing perches (Pianka 1983, and Schoener 1971, 1984). Radio-telemetry studies in Sweden (Kenward 1982, Widén 1984) and

in Utah (Fischer 1986) demonstrate that goshawks forage by perching for a few minutes to search for prey, before flying to a new hunting site. Kennedy (1991) confirmed similar results, but she defined the search strategy used by goshawks as saltatory searching. Evans and O'Brien (1988) originally defined saltatory searching as hunting using a stop-and-go pattern where the animal frequently shifts locations when searching for food. The main difference between ambush, i.e., sit-and-wait search, and saltatory searching is the frequency of repositioning moves (O'Brien et al. 1989, 1990). In Sweden, flights between perches averaged 84 s for males and 96 s for females (median flight time is 24 s for males and females, Widén 1984). Males when foraging then remained perched for an average of 8 min, 36 s compared to 10 min, 24 s for females (median perch time 3 min for both). The search method used by foraging goshawks is very different from cruise foragers that hunt prey while moving. Only 3% of prey was attacked from goshawks in flight (Kenward 1982). Attacks on winged quarry rarely last >1 km before the hawk overtakes its prey. In Washington, Bloxton (2002) noted that goshawks may vary their foraging methods by habitat type. Goshawks used saltatory searching 72% of the time overall; this foraging method was used 96% of the time in forest stands >30 yr old. However, goshawks were observed using low soaring foraging on 13% of foraging bouts, generally when hunting young, dense stages of sapling-pole forests.

Goshawks also hunt by flying rapidly along forest edges, across openings, and through dense vegetation to surprise prey (Johnsgard 1990). Goshawks have short, powerful wings and long tails that are highly adapted for rapid acceleration and maneuverability in trees. Most goshawk prey occupies the ground-shrub zone so attacks are usually directed at that zone (Reynolds and Meslow 1984). If the hawk is undetected by prey, the attack may consist of a smooth, silent, accelerating glide that ends in a capture strike without a wing beat (Beebe 1974). However, if detected, the hawk rapidly pumps its wings to capture its intended quarry. Goshawks kill prey by driving their talons into the quarry using a kneading action immediately after impact; their strong feet and bill are capable of killing a wide variety of large-bodied prey.

Foraging success and prey delivery rates

Goshawks deliver prey to the nest one item at a time throughout the day, but peak delivery periods include early morning (0600–0700 H) mid-morning

(0900–1100 H), and late afternoon and evening, (1600–2000 H; Schnell 1958, Allen 1978, P. L. Kennedy, unpubl. data). Foraging success and prey delivery rates vary according to brood size, stage of nestling development, habitat type and prey species, but these relationships have not been thoroughly studied. In Wyoming, the average prey delivery rate from eight females was 0.23 items/hr (Good et al. 2001). This was similar to the average delivery rate for goshawks in Arizona (0.25 items/hr, $N = 381$ deliveries; Boal and Mannan 1994) and Nevada (0.31 items/hr, $N = 51$ deliveries; Younk and Bechard 1994a). In California, Schnell (1958) reported 3.9 prey deliveries/day for a single nest. A pair supporting three nestlings brought 34.8 kg of prey during the first 53 d after hatch, or approximately 11.5 kg per nestling (Zachel 1985). In Washington, male goshawks returned to their nests with prey every 4.8 ± 0.6 hr ($N = 126$ visits by nine birds; Bloxton 2002). He found small prey were generally returned to the nest immediately following capture, whereas larger prey, such as pigeons (360 g), were decapitated and plucked before delivery. Grouse (500–1,000 g) were decapitated, plucked and parceled into two pieces for separate deliveries.

Foraging distance from nest

Male goshawks generally forage away from the immediate nest site (Kennedy 1991, Good 1998). In New Mexico, males hunted between 0.8 and 8 km from the nest (Kennedy 1991). In south-central Wyoming, the average kill distance from the nest was 1,885 m ($sd = 1,181$ m), but was highly variable and could be up to 5,456 m from the nest (Good 1998). Of 37 Ruffed Grouse banded in Minnesota, nine were killed by goshawks within 1,097–2,515 m of the nest, and 26 were killed within a 1.6 km radius of the nest (Eng and Gullion 1962). Large goshawk home ranges coupled with long foraging distances indicate these hunters forage over large areas surrounding their nests. However, female goshawks will attack prey from their nest or within the nest stand. Schnell (1958) observed a female hunting ducklings from her nest.

From central-place-foraging theory, we expected a relationship between prey size and distance that goshawks are willing to forage from their nests (Orians and Pearson 1979), and that this relationship would be influenced by habitat use (Rosenberg and McKelvey 1999). In Washington, Bloxton (2002) used radio telemetry ($N =$ nine males, five females) to determine that goshawks traveled an average of 2.2 km from their nests; the average maximum distances was 5.0 km, and 10.2 km was the farthest

a breeding goshawk traveled from the nest during the breeding season. Consistent with central-place-foraging theory, the further they foraged the larger the prey item returned to the nest ($N = 28$ deliveries pooled across eight hawks, $r = 0.42$, $P = 0.02$). Generally, if the birds traveled over 4 km from the nests, they did not return with small prey.

Caching

Caching surplus prey when nestlings are present or for future use has been observed for many species of raptors (Newton 1979a). Goshawks cache prey on branches near the tree trunks, or wedge the item in a crotch between branches (Zachel 1985). Caching rates have not been quantified for this species. Schnell (1958) observed a single nest in California and noted that a female cached food primarily when nestlings were <1 mo old and needed frequent feedings. Most cached items were fed to nestlings the same day, but some were fed at least 32 h after a kill (Schnell 1958).

Plucking perches

Goshawks may repeatedly use particular perches near their nests for plucking prey. Plucking perches may be downed logs, stumps, or old nests, but preferred perches are usually low (<1 m), bent-over trees or saplings (Schnell 1958, Reynolds and Meslow 1984, Bull and Hohmann 1994). Plucking perches are often located in denser portions of the secondary canopy and are often up-slope and fairly close to the nest (Hall 1984). Distances of plucking perches from nests averaged: Oregon, 45 m (range = 27–74 m; Reynolds et al. 1982); north-eastern Oregon, 42 m (range = 7–200 m; Bull and Hohmann 1994); California, 69 m (range = 30–130 m; Schnell 1958). However, these distances may be underestimates because distant perches are difficult to locate.

SOCIAL BEHAVIOR

Goshawks are solitary outside the breeding season. During migration, they may be observed with other raptors but these interactions are not considered social. Pair members have few interactions during winter as they often use separate wintering areas (J. Squires, unpubl. data). After fledging, siblings of both sexes often remain together in cohesive groups near the nest until dispersal (Reynolds and Wight 1978, Kenward et al. 1993b). Fledglings will also visit adjacent nests where they can be fed by the resident adults (Kenward et al. 1993b).

GOSHAWK CONSERVATION AND MANAGEMENT

THREATS

A number of factors are cited by researchers and managers as potentially detrimental to current and future goshawk viability. These include, but may not be limited to, habitat alteration, direct human disturbance, pesticides and other contaminants, and harvest for falconry. However, the primary concern throughout the range of the goshawk is habitat alteration due to timber and fire management practices. The issues cited by researchers, agency personnel, and others as potential threats to habitat caused by various silvicultural treatments include forest fragmentation, creation of even-aged and monotypic stands, potential increases in area of younger age classes, and loss of tree species diversity.

Habitat alteration due to timber and fire management practices

A number of studies describe structural characteristics of goshawk nest stands and goshawk landscapes but few data are available on the effects of logging within the nest stand on demographic performance, particularly in an experimental or quasi-experimental framework. Although only a few studies have been conducted on the responses of goshawks to forest management practices, clearly some level of habitat change will render a landscape unsuitable for goshawks (USDI Fish and Wildlife Service 1998b). This level or threshold may vary spatially or temporally across the range of the goshawk. Effects analysis of forest management on goshawk populations should consider the spatial relationships among different functional levels of habitat use by goshawks, including nesting habitat, foraging habitat, winter habitat, and important prey species and their habitat requirements.

Forest management can impact structure, function, and quality of both nesting and foraging habitat by removing nests and nest trees, modifying or removing entire nest stands, and removing canopy and mature trees, snags, and downed wood (Reynolds 1989, Crocker-Bedford 1990, Bright-Smith and Mannan 1994, Woodbridge and Detrich 1994, Beier and Drennan 1997, Desimone 1997, USDI Fish and Wildlife Service 1998a). Reduction and fragmentation of habitat may also favor early successional competitors and predators such as Red-tailed Hawks and Great Horned Owls (Woodbridge and Detrich 1994).

Forest-management practices, such as the use of controlled fire and thinning, may improve habitat for goshawks by opening up dense understory vegetation, creating snags, downed logs, woody debris, and other conditions that may benefit goshawks and their prey (Reynolds et al. 1992, Graham et al. 1999b). To determine the effect of silvicultural prescriptions on potential nest habitat, expected post-harvest stand density and canopy closure should be compared to local definitions of mean structural attributes of nest area habitat (USDI Fish and Wildlife Service 1998a). For example, in the temperate rainforests of southeastern Alaska, forest management would need to account for long fire-return intervals that produce old growth forests. These prescriptions could differ markedly from those for managing goshawks in the Southwest where frequent fires are assumed to affect the structure of ponderosa pine communities (but see Baker and Ehle 2001, Schoennagel et al. 2004). McGrath et al. (2003) provides a good example of modeling the putative effects of forest management. For central Washington, they simulated the effects of three silvicultural prescriptions (no harvest, commercial thin, and implementation of Spotted Owl guidelines) on goshawk nesting habitat over a 100-yr interval. All three management scenarios failed to maintain a modeled nesting population over a 100-yr period, until habitat heterogeneity was increased by simulated thinning. Although this study provides a good example of predicting how forest management may be used to enhance nesting populations, it also illustrates how important it is to understand basic ecological relationships. For example, it has not been well established that habitat homogeneity, per se, reduces population persistence. Thus, the underlying assumptions of models need to be clearly articulated and validated, including the extent that model predictions can be generalized to the diverse habitats used by nesting goshawks.

Negative effects of timber harvest on goshawk nest habitat can be described as the area of potentially suitable forest that meets local definitions of suitable habitat from nest habitat studies, and that is modified to a condition no longer meeting the definition (USDI Fish and Wildlife Service 1998a). Desimone (1997) prescribed little or no habitat alteration within aggregate nest stands and Bright-Smith and Mannan (1994) stated that tree harvest methods that create large areas with reduced canopy cover of less than 35–40% may be particularly detrimental to potential goshawk foraging habitat. Reynolds (1989) stated that practices such as selective overstory removal or patch and clearcut harvesting, resulting in either a complete removal of trees or a reduction of the stem

density and canopy cover throughout management units, lower the quality of goshawk nesting habitat. Reduction of canopy closure may result in increased solar radiation and heat stress, reduced buffering from adverse weather, and increased visibility to predators, all of which may singly, or in combination, affect goshawk nesting success (USDI Fish and Wildlife Service 1998b).

Using a quasi-experiment, Penteriani and Faivre (2001) tested some of these assumptions within nest-stand harvest. They examined the effects of shelterwood harvest within nesting stands on European goshawk occupancy and productivity. During this long-term study (1984–1995 in Italy and 1993–1999 in France) they compared trends in occupancy and productivity in logged and unlogged stands and also assessed the logging effects on the same nesting stand ($N =$ nine stands) before and after timber harvest. They found no difference in productivity of goshawk pairs reproducing in unlogged vs. logged stands. When considering the same nesting stand, before and after timber harvest, they noted no short-term differences in productivity. However, they observed that 87.5% of goshawk pairs nesting in logged stands moved away only when the original stand structure was altered by $>30\%$ and then the birds moved only to the nearest neighboring mature stand. Although sample sizes were small, the results of this study suggest goshawks can tolerate some levels of timber harvesting within the nesting stand (if harvest is avoided from February through August), as long as cover reduction does not exceed approximately 30%. The applicability of this study to other timber management practices and other portions of the goshawk range is unknown.

The duration to which forest-management impacts goshawks has not been formally studied across the species' range. In areas that support populations that depend on old and/or complex forest structures, the duration of management impacts could be much longer compared to populations that occupy forests that are primarily structured by frequent natural disturbances. However, efforts to determine the duration of impacts need to account for specific habitat needs, the spatial context of the surrounding landscape, and the structure of important micro-sites. We do not always assume that pristine or non-managed forests provide optimal habitat. For example, nest stands in ponderosa pine may be improved by thinning from below to prevent infilling with other tree species (Reynolds et al. 1992) or to promote habitat heterogeneity (McGrath et al. 2003).

Relatively few studies have addressed the size of forest patches selected by goshawks for nesting

(USDI Fish and Wildlife Service 1998a). Based on observations of feathers, whitewash, and prey remains, Reynolds (1983) defined the nest area as approximately 12 ha of intensified use surrounding the nest. Woodbridge and Detrich (1994) suggested that although small (12–24 ha) stands were used successfully for nesting, goshawks preferred larger (34–80 ha) stands for nesting because occupancy rates of forest stands used for nesting decreased with decreasing stand size. The larger (60 ha) core area reported by McGrath et al. (2003) further supports the hypothesis that larger patches of mature forest surrounding goshawk nests may be important (USDI Fish and Wildlife Service 1998a).

Although assessment of habitat condition for goshawk nest areas is often made at broad scales, evidence suggests that landscape features such as slope, aspect, riparian vegetation, meadows, drainages, water, and other features affect location of goshawk nest areas (Allison 1996). Timber harvests associated with these physiographic features may have a disproportionate effect on habitat suitability if selection of nest areas by goshawks is at least partially dependant on them (USDI Fish and Wildlife Service 1998a) and nesting habitat is limiting.

One of the limitations of studies investigating the effects of timber harvest on goshawk nesting habitat is that few studies have investigated goshawk habitat in forests not managed for timber harvest. Studies of goshawk habitat relations conducted on timberland may reflect the history of timber harvest in those areas. Studies of goshawk habitat in protected areas, would provide baseline data that could be used to compare with habitat data from forest lands to determine the degree to which timber management influences goshawk habitat preferences. Finn et al. (2002a, b) included nest sites within Olympic National Park as well as on managed forest lands. They used the park to document that loss of mature forest in managed landscapes was detrimental to goshawk site occupancy and productivity on the Olympic Peninsula.

Habitats used for foraging by goshawks in North America have been documented in a small number of telemetry studies (Austin 1993, Bright-Smith and Mannan 1994, Hargis et al. 1994, Beier and Drennan 1997, Boal et al. 2005b). These studies suggest goshawks select foraging areas with specific structural attributes, including old or mature forest stands with open understories, relatively high canopy closure, large trees, and high stem densities. It is possible; however, that actual foraging habitat selection occurs at spatial and temporal scales difficult to investigate using radio telemetry (USDI Fish and

Wildlife Service 1998a). Small openings, tree fall gaps, edges, riparian zones, and rock outcrops are examples of small-scale landscape elements that may be important to foraging goshawks (Squires and Reynolds 1997). It cannot be assumed, however, that adequate prey will necessarily be available in openings created by timber harvests, which often result in dense re-growth where goshawks would be unlikely to detect or capture prey (USDI Fish and Wildlife Service 1998a). Also, populations of many prey species are linked to structural attributes such as snags, large logs, large trees, soil organic horizon depth for fungi, and hardwoods for mast, and these may not be maintained under silvicultural prescriptions, unless specifically designed to maintain them (Reynolds et al. 1992, USDI Fish and Wildlife Service 1998a).

Goshawk foraging habitat can be maintained or restored through means such as protection of specific areas, control of tree spacing and canopy layering, and management strategies that sustain the structure, function, and ecological processes of forests that are important to goshawks (Reynolds et al. 1992, USDI Fish and Wildlife Service 1998a). Widén (1997) claims goshawk declines in Fennoscandia from the 1950s to the 1980s are a result of changes in forest management practices that have altered goshawk foraging areas in this region. In the 1950s, forest management practices changed from selective cutting to clear cutting, replanting, and thinning. As a result of this intensive management, the boreal forest landscape of Fennoscandia is a highly fragmented patchwork of clearcuts and forest stands in different successional stages and the proportion of old-growth forest has declined dramatically (<5% of Swedish forests are old growth). Widén develops a cogent argument that suggests this landscape change has caused goshawk declines by reducing the availability of foraging habitat not nesting habitat. Goshawks can successfully nest in patches of mature or old-growth forest as small as 0.4 ha, but their foraging ranges cover 2,000–6,000 ha, and in boreal forests in Europe they prefer large patches of mature forest for hunting. He suggests changes in the boreal landscape have resulted in a deterioration of goshawk hunting ranges, making it more difficult for them to secure adequate food for breeding. This factor is probably more important than a shortage of nest sites. He also notes declining prey densities may be associated with forestry which would affect goshawk numbers.

Although we know goshawk demography is strongly influenced by prey availability, the degree to which forest management positively or negatively influences prey availability is not well documented. This is because most investigations of the effects

of forest management on goshawk prey typically correlate avian or mammalian abundance—usually not both—with timber management using one–three replicates studied over 1–2 yr. They are also generally conducted on too small of a spatial scale to be relevant to the goshawk (Marzluff et al. 2000). Marzluff et al. (2000) and Sallabanks et al. (2000) suggest some on-going avian studies are correcting these limitations by expanding their scale of investigation, using sound experimental design and relating forest management to avian demography. Such studies will increase our understanding of how forestry affects goshawk prey, particularly if they successfully identify the mechanisms that relate silviculture to prey population processes.

Fire suppression

Goshawks from most populations occupy forests that are structured by fire. Understanding the extent and duration of how fire effects goshawk habitat may become even more pressing in light of changing climates relative to global warming (Dale et al. 2001). The effects of fire suppression on goshawk populations have not been formally researched. Thus, our assessment of how fire suppression may structure goshawk habitat is conjectural at this point based on our understanding of goshawks and fire ecology.

We think the effects of fire suppression on goshawk habitat will vary due to the complex fire regimes found across the species' distribution. To assess the effects of fire suppression, it is important to distinguish between natural understory and stand-replacing fire regimes (Brown 2000). Historically, natural understory fire regimes dominated ponderosa pine communities, with fire-return intervals of 2–15 yr in many stands (Covington and Moore 1994a, but see Baker and Ehle 2002, Schoennagel et al. 2004). These low-intensity fires were readily suppressed resulting in increased fuel loads that increased the risk of stand-replacing fires in ponderosa pine communities (Covington and Moore 1994a, Allen et al. 2002). The impacts are clear—the density of ponderosa pine forests has increased, the herbaceous layer has almost disappeared and stream flow has been reduced significantly. The shift in community structure of ponderosa pine has also been exacerbated by grazing, logging, and invasive exotics (Allen et al. 2002). Fires now burn over larger areas and are more intense compared to earlier times, and crown fires are becoming common because dense stands of saplings provide ladders that carry fire from the forest floor to the tree canopy (Covington and Moore 1994a). Thus, we speculate that fire suppression may

have significantly altered goshawk habitat in ponderosa pine communities.

However, goshawks nesting in northern boreal forests occupy stands that support high-severity, stand-replacing fires that kill most of the canopy either through intense ground fires or flames in the tree crowns (Agee 2000, Turner et al. 2003). The behavior of fires in these habitats can be extreme with daily spread rates of 100 m/min and 13–18 m flame lengths (Kiil and Grigel 1969). The fire-return intervals in subalpine forests tend to be long, ranging from 60 yr in jack pine (*Pinus banksiana*) to 300–350 yr in western boreal stands of spruce (Turner et al. 2003, Agee 2000). Although fires in subalpine forests are often infrequent, they can burn large areas when severe droughts govern regional weather (Turner and Romme 1994, Turner et al. 2003). Thus, infrequent but large-scale fires account for most of the total burned area (Agee 2000, Turner et al. 2003). For example, of over 200 fires between 1972 and 1988 in primarily lodgepole pine forests of Yellowstone National Park, 83% went out by themselves after burning only 0.5 ha (Renkin and Despain 1992). However, the extreme drought and high winds in 1988 produced conditions that burned over 250,000 ha in the Park (Renkin and Despain 1992). Under such extreme fire-weather conditions, variations in fuel structures are of little importance (Bessie and Johnson 1995), and fire suppression has little influence on recent fire behavior during big-fire years (Schullery 1989, Turner et al. 2003, Romme et al. 2004). Effective fire suppression may have been especially difficult in the past because subalpine forests are often in high, remote areas and fire-fighting aircraft have only been available since World War II (Schullery 1989). Thus, we believe that past fire suppression in northern and subalpine conifer forests may have had little effect on goshawk habitat.

On 21 November 2003, Congress passed HR 1904, the Healthy Forests Restoration Act of 2003 with the intent of reducing the threat of catastrophic wildfire to human communities and forest and range lands. New procedures provided under NEPA allow priority fuels reduction and forest restoration projects identified through collaboration with state, local and tribal governments to move forward more quickly. In 2002, federal land management agencies thinned a record 910,000 ha, an increase of 405,000 ha over FY 2000 levels (<http://www.USDA.gov> [2 Feb 2006]). In 2003, the agencies broke the previous record and treated an additional 1,050,000 ha. Nearly 65% of forest restoration dollars have been invested in the wildland-urban interface, including private lands that surround human communities most at risk from wildfire. From 2001–2003, agencies treated 2,800,000 ha,

and expect to treat 3,800,000 ha by the end of FY 2004 (<http://www.USDA.gov> [2 Feb 2006]). Thus, forest structures across broad landscapes are being altered as healthy forest initiatives are implemented across the western US. We are unaware of any broad-scale efforts to evaluate the potential effects of the healthy forest initiatives on goshawk populations. In ponderosa pine communities, forest management such as thinning from below may be a necessary first step in restoring goshawk habitat, before prescribed fire can be introduced (Reynolds et al. 1992). However, in other forest types where thinned trees are not consistent with natural forest pattern, there could be a significant negative effect based on reduction in canopy closure. Thus, the degree to which healthy forest initiatives affect goshawk populations will depend on the forest type, extent, spatial arrangement, prescription, and considerations to micro-site requirements (e.g., spatially distributed nest stands) relative to management actions.

Human disturbance

The USFWS (USDI Fish and Wildlife Service 1998a) reported that disturbance generally does not appear to be a significant factor effecting the long-term survival of any North American goshawk population. However, human disturbance such as timber harvesting near nests can cause failure, especially during incubation (Anonymous 1989, Boal and Mannan 1994). Logging activities such as tree cutting, loading, and skidding within 50–100 m of a nest can cause abandonment even with 20-d-old nestlings present (J. Squires, unpubl. data). Camping near nests has also caused failures (N = 2; Speiser 1992). Goshawks in Britain, central Europe, and Japan nest in close proximity to humans in rural landscapes suggesting that some populations are not especially prone to disturbance (Krüger and Lindström 2001, Krüger 2002a, P. L. Kennedy unpubl. data). Lee (1981b) documented that two pairs of goshawks nesting in a ski resort were able to fledge young successfully where they were subjected to daily disturbance in winter and summer due to skiers, snowmobilers, construction, hikers, and horseback riders.

Disturbances associated with research are usually short in duration and believed to have little impact on nesting birds (Squires and Reynolds 1997). Climbing nests for short periods after young have hatched does not cause desertion, nor does banding or attaching transmitters to the adults. The percentage of nesting pairs that successfully raised young with radios (83%, N = 8, 1988–1989) was similar to those without radios (82%, N = 10, 1987–1990; Austin 1993;

but see Reynolds et al. 2003 for effects of transmitter mounts on adult male survival).

Invasive species

The goshawk is not known to interact strongly with any exotic species. Rock Doves and European Starlings (*Sturnus vulgaris*) are consumed by goshawks, but are not documented as frequent prey in diet analyses. No information is available regarding the influence of exotic plant invasions on goshawk habitat and prey. However, the most important exotic plant invasions are occurring on unforested lands at lower elevations where changes in plant communities could influence winter goshawk habitat and prey populations (Stohlgren et al. 2003).

Shooting and trapping

In North America, shooting, trapping, and poisoning are generally illegal and not considered an important mortality factor. However, in the early to mid-1900s, some states like Pennsylvania paid bounties on goshawks, but the effects this had on populations is unknown. European populations were more actively persecuted in efforts to protect private game-bird farms. On the Baltic island of Gotland, 36% of mortalities of radio-tagged birds (N = 67) were killed by humans (Kenward et al. 1991); juveniles were more likely to be shot than adults.

Pesticides and other contaminants

In the early 1970s, pesticide levels were high in Peregrine Falcons (*Falco peregrinus*), Ospreys (*Pandion haliaetus*), Sharp-shinned Hawks, and other raptors in the US, but were low in goshawks (Snyder et al. 1973, Reynolds and Wight 1978). Goshawks, during the 1972–1973 invasion years, contained less organochlorine and polychlorinated biphenols (PCB) residues than other raptors (Havera and Duzan 1986), probably because these birds were from non-agricultural, northern forests. The primary prey species of goshawks tend to accumulate less pesticide in their tissues compared to other accipiters (Rosenfield et al. 1991). The USFWS concluded pesticides and other contaminants appear to have not significantly affected goshawks in the US (USDI Fish and Wildlife Service 1998a).

Kenntner et al. (2003) recently analyzed levels of organochlorine pesticides, PCBs and heavy metals in organ samples of 62 free-ranging goshawks found dead or injured in three regions of Germany from 1995–2001. The contaminant burdens varied

significantly among the three regions presumably due to differences in the legislative restrictions on the use of these chemicals in agriculture and forestry prior to German reunification. Extraordinarily high residues of PCBs and DDE, the main metabolite of DDT, were found in livers of goshawks inhabiting Berlin. However, these levels were not high enough to be indicative of acute poisoning and were far below suspected lethal levels in raptors. Levels of contamination were negatively correlated with goshawk age and body condition. Lead concentrations indicative of acute poisoning was detected in one bird and suggested in two other birds. All other heavy metal concentrations were low.

Falconry

Goshawks have been trained for falconry for at least 2,000 yr and were favored among Asian, Middle Eastern, and north European falconers (Cooper 1981). During the 18th century, falconry declined as guns became generally available and goshawks were then viewed as competitors for game. Since World War II, interest in falconry increased and spread to North America. Modern-day falconers value goshawks for their willingness to hunt a variety of prey and their aggressive dispositions (Beebe 1976). In an environmental assessment on falconry and raptor propagation regulations, the USFWS (USDI Fish and Wildlife Service 1988) concluded falconry is a small-scale activity that has no significant biological impact on raptor populations. Mosher (1997) examined data reported by Bohn (1986) and falconers' annual reports and concurred with the conclusions reached by the USFWS. Although falconry has been listed as a potential threat in the western Great Lakes Region (Noll West 1998), no evidence indicated that falconry has an impact on North American populations.

In Britain, Kenward et al. (1981d) determined that captive goshawks had relatively constant annual mortality of about 22% (N = 216 birds) from accidents, infectious diseases, and other clinical conditions. Approximately one-third of the goshawks were eventually lost or released resulting in 13% successfully re-entering the wild in Britain. Once released to the wild, captive goshawks did not require supplemental feeding after they had killed at least twice for themselves.

ECOLOGICAL RELATIONSHIPS WITHIN A MANAGEMENT CONTEXT

To illustrate the ecological linkages described above and how threats may affect these relationships,

we constructed an envirogram for the goshawk nesting in the northern Rocky Mountains (Fig. 3). Envirograms hypothesize the ecological linkages among direct and indirect factors and abundance of a species at a particular time and place (Andrewartha and Birch 1984). Envirograms help researchers and managers organize prior knowledge that spans multiple ecological levels while maintaining a focus on ecological factors and processes that directly or indirectly affect the size of a focal population (James et al. 1997). These ecological flow charts are developed using a standardized conceptual framework following the logic and terminology of Andrewartha and Birch (1984). We have used a modification of their approach developed by James et al. (1997) for the Red-cockaded Woodpecker (*Picoides borealis*).

Envirograms depict each organism within the context of a centrum and web. The centrum is comprised of factors that directly affect the organism's abundance such as resources, hazards, or mates. Resources are environmental components that enhance the organism's chance of survival and reproduction and are either negatively or not influenced by the abundance of the organism, e.g., the goshawk's prey. Hazards reduce survival and reproduction in the focal population, and in turn, benefit from increases in the organism's abundance. Mates convey a positive-positive relationship. Indirect factors comprise the web and include anything that can affect a species by modifying its centrum, including the effects of individuals of the focal species on their own populations. Flow in an envirogram tends from distal indirect influences in the web toward the most proximate direct effects on the organism's population as shown in the centrum (Ward 2001). Similar to James et al. (1997) this envirogram contains sub-models for limiting resources and hazards.

The number of factors and interactions depicted in an envirogram are limited only by the knowledge of the organism's ecology. We constructed the goshawk envirogram based on the information presented in this document and in Kennedy (2003). This envirogram is basically a hypothesis that could be used to develop models with goshawk abundance as the response variable and the factors influencing abundance as dependent variables. Figure 3 is not comprehensive, simply a schematic of possible interactions with an emphasis on the potential effects of forest management on the direct and indirect factors that could influence goshawk populations in the interior mountains of western North America. A wide variety of alternative envirograms could be developed with existing information and these models could be evaluated against empirical data

using a wide variety of techniques. Site-specific envirograms could be used in conjunction with the silvicultural concepts presented in Reynolds et al. (1992) to develop regional or local management plans to prevent goshawk population declines.

In Fig. 3, current management practices that might influence goshawk numbers are indicated by ovals. As indicated in earlier sections, timber-management practices can have a profound influence on all direct and indirect processes that influence goshawk numbers. Progressively more indirect effects appear in the columns of the web. For example, in the sub-model for nest-site availability, if the number of large trees available for nest sites is limiting, the rate of maturation of younger trees must be balanced by the number of older trees lost to harvest and death for population stability. However, nest sites in good condition can be usurped by competitors and the abundance of competitors may be influenced by habitat fragmentation from timber harvest and fire. The other sub-models reflect other management activities that we think influence goshawk abundance and have been discussed in more detail in earlier sections. The pathways could be made more specific if information was available on the types of management actions a management unit is conducting that might negatively impact or enhance goshawk populations.

INFORMATION NEEDS

Effective sensitive-species programs are firmly grounded in ecological knowledge that supports management recommendations (Squires et al. 1998). Understanding the ecological characteristics associated with a given ecosystem such as food webs, predatory relationships, disturbance patterns, and vegetative structure and landscape characteristics are essential for providing the specific habitat needs of sensitive species within the constraints of ecosystem function. To empirically evaluate the envirogram in Fig. 3 and ultimately determine the effects of forest management on goshawk abundance, we need additional information on many aspects of goshawk ecology. The winter ecology of goshawks is almost completely unknown. In addition, positive and negative effects of timber management on goshawk resources need to be rigorously evaluated, ideally with forest-management experiments. We do not know the thresholds above which forest fragmentation may alter competitive interactions, such as increasing Red-tailed Hawks and Great Horned Owls, which ultimately could affect population persistence. Finally, a pressing need exists to assess habitat needs at broader spatial scales, and to have

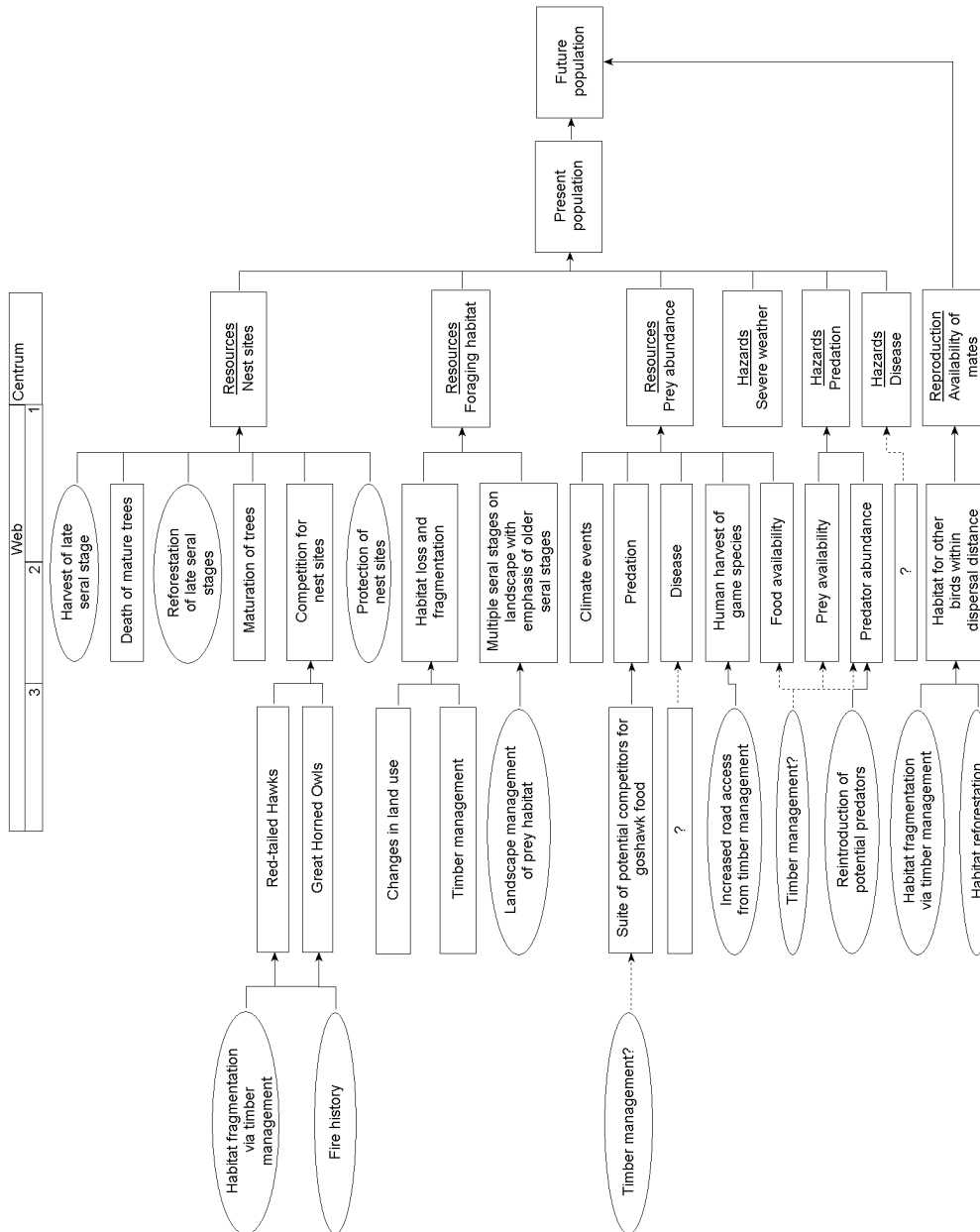


FIGURE 3. Envirogram for the Northern Goshawk in the interior mountain western North America (modified from Kennedy 2003).

the necessary spatial data to monitor changes in forest structure and composition from management across broad landscapes.

Information needs are easy to list, but are often ignored. In many cases, it is exceedingly difficult for agencies to fund the acquisition of new information, and in other cases, decision makers resist new understandings. Successful sensitive species programs depend on a strong commitment by line officers at all levels (Squires et al. 1998). To foster that commitment, researchers must communicate with line officers throughout the planning process; participation builds ownership.

Winter ecology

Given the goshawk's life-history strategy and our understanding of population regulation in similar long-lived avian species (Newton 1998), it is highly likely that over-winter survival of juveniles and adults and the condition of the female entering the breeding season has a stronger influence on goshawk population regulation than conditions that occur after breeding is initiated. However, as indicated earlier, our understanding of goshawk winter ecology is poor. In areas such as Minnesota where goshawks appear to be year-round residents (Boal et al. 2003) they may use similar habitats year-round (Boal et al. 2002). However, the limited evidence on goshawk populations in the inter-mountain west suggest these populations are migratory or partially migratory (Squires and Ruggerio 1995, Dewey et al. 2003) and during the winter are regularly found in open habitats or forest-shrubland ecotones (J. Kirkley, unpubl. data.). Therefore, unlike the Spotted Owl, goshawk habitat requirements may be dramatically different for different stages of its annual cycle. Do we manage the goshawk as a forested species during the breeding season and as a rangeland species during the winter? More information is needed on goshawk winter habitat selection patterns and winter diet before these types of basic management questions can be addressed.

Forest management experiments

As recommended by DeStefano (1998) and Kennedy (1998), on-site experiments are necessary to clearly understand how goshawks and their prey and competitors are affected by forest management. To date, Penteriani and Faivre (2001) have conducted the only experimental analysis of goshawk responses to silvicultural treatments. The absence of such studies in the literature is perplexing considering

these quasi-experiments are being implemented continuously in the form of timber harvests near goshawk nests. Most federal timber sales are identified years before the sale allowing for collection of adequate pre-treatment data. Monitoring pre- and post-treatment movements of even a limited sample could provide fascinating qualitative insights into goshawk responses to harvest and could be the basis for designing future experiments. Also, measurements of prey responses to experimental harvests could be conducted at the same time. We surmise that we would learn more and spend fewer resources about goshawk responses to forest management using this approach than we have learned from the many correlative studies conducted on this topic.

Management databases

Without a database that clearly summarizes past and future management activities conducted by each land management agency, it is impossible to evaluate threats to goshawk nesting habitat and develop potential conservation scenarios. GIS databases that summarize the location, date, and sizes of management activities are needed to assess how goshawk habitat is being enhanced or reduced as indicated in Fig. 3. Spatial databases that relate predicted immediate and long-term changes to forest composition and stand structure are most needed. Spatial databases could also be used to identify the stands that should be monitored to evaluate predicted changes. These spatial databases could be used as a part of the forest-plan development process. Spatial information would also streamline the environmental-assessment process where cumulative effects of forest management are evaluated at the forest and regional scale.

SURVEY AND MONITORING

Population monitoring

Information on goshawk populations is generally obtained by monitoring nesting activity at local scales (Roberson et al., unpubl. data; Kennedy 2003; Hargis and Woodbridge, *this volume*). Although goshawk demographic studies have significantly increased understanding of goshawk population dynamics, no studies to date have generated adequate empirical stage-specific estimates of survival and fecundity for estimating population growth rates (λ) using matrix projection models at the local scale, and demographic data are unavailable to estimate λ over broader spatial extents. In addition, nesting densities are difficult to estimate due to the bird's low

detectability and uncommon status, so trends in this parameter are not available (Kennedy 1997).

A viable alternative to monitoring goshawk demographics is estimating trends in site occupancy. Territory occupancy is a reliable index of habitat quality and productivity in breeding raptors (Sergio and Newton 2003). Although, goshawk site occupancy has been monitored in several populations across the species range (Kennedy 1997, 2003), these data have limited utility for monitoring goshawk population trends because standard protocols are not regularly used to determine site occupancy, and analytical techniques for estimating detection probabilities of site occupancy have not been available. Failing to account for imperfect detectability will result in underestimates of site occupancy (MacKenzie et al. 2003). MacKenzie et al. (2002, 2003) addressed this problem by developing analytical approaches to estimate site occupancy rates when detection probabilities are imperfect (<1.0). This is a likelihood-based method that allows for the incorporation of covariates, e.g., habitat type or patch size, into detection probability estimates. These new analytical approaches have considerable promise for monitoring goshawk population performance at large spatial scales. Hargis and Woodbridge (*this volume*) describe a bioregional monitoring program for northern goshawks that is based on this approach.

Habitat-based monitoring

Kennedy and Andersen (1999) suggested that if goshawk habitat can be well-defined and demographic data are available from several study areas for an analysis of population trends, a model or models that predict(s) relationships between preferred breeding season and winter habitat and population trends and/or performance could be developed. The rationale for switching to habitat-based monitoring has been clearly articulated by Roloff and Haufler (1997) and Lint et al. (1999) and includes cost-effectiveness in emphasizing the ecosystem rather than single species and the ability to develop a more proactive management program.

Preliminary habitat models based on available habitat information could be developed to predict goshawk habitat (Kennedy and Andersen 1999, McGrath et al. 2003). These models could be independently validated and modified based on validation results in an iterative process. Kennedy (1997, 1998) suggested the most efficient way to identify consistent patterns in data collected in multiple studies is to conduct meta-analyses of the

existing habitat literature. However, meta-analysis is only an approach for model parameterization; it is not a replacement for model testing and validation. The habitat models would require testing with demographic data before such an approach could be implemented. If models can be developed to predict goshawk population performance, then monitoring programs could switch emphasis from population-based to habitat-based monitoring.

Although goshawks may select habitat on the basis of structural characteristics and prey availability, they are also at the mercy of unpredictable factors such as drought, severe storms, or predation (Penteriani et al. 2002b). Habitat models would need to incorporate these stochastic processes to accurately predict population performance. If habitat models do not adequately predict population performance and it is determined that habitat features have little effect on goshawk population dynamics, a strictly habitat-based monitoring program may have limited ability to predict changes in goshawk demographic performance and population-based monitoring would need to be continued (Kennedy and Andersen 1999).

PROCEEDING IN THE FACE OF UNCERTAINTY

Based on our review of goshawk ecology, it is clear that many life-history attributes of this species are unknown. It is a daunting task to gain the complex ecological knowledge needed to manage top-level carnivores, like goshawks. Land managers are being forced to make land-use decisions based on limited information that varies in reliability. Thus, land managers are in the difficult position of having to use best available information while making a conscious decision regarding how to proceed in the face of uncertainty.

Science represents a rigorous, systematic approach by which humans gain understanding of nature. Competing ideas regarding how the world works are measured against observations. Research and reliability of knowledge gained from research depend on appropriate application of the scientific method. Unfortunately, not all research in wildlife ecology and management results in reliable knowledge. Unreliable knowledge can result from inappropriate application of the scientific method in the design and implementation of these studies (Romesburg 1981, Nudds and Morrison 1991) and/or confusing subjective, political values with objective, technical knowledge (Nudds and Morrison 1991, Kennedy 1997, 1998, White and Kiff 1998). Obtaining reliable knowledge on wide-ranging

predators, like goshawks, is expensive. Thus, the problem of how to make defensible decisions in the face of uncertainty is a problem that will persist for the foreseeable future.

Society could do much to reduce the uncertainties associated with managing species, but often does not provide the financial or political will. If limited data are available, formal modeling structures can account for uncertainty (Todd and Burgman 1998). Usually, however, few data are available and uncertainty is addressed using ad hoc methods that lack rigorous quantification.

The Delphi approach

The Delphi method is a way to address uncertainty by seeking a consensus of scientific opinion rather than to generate new knowledge (Ziglio 1996). It is common for agencies to assemble panels of experts and ask them their opinion regarding the potential impact of management decisions. For example, the forest ecosystem management assessment team (Forest Ecosystem Management Assessment Team 1993) involved over 70 experts that had special knowledge of species or species groups (Meslow et al. 1994, Ruggiero and McKelvey 2000). Delphi methods, in their various forms, are appealing because they are quick, require no new knowledge, and have been accepted by the courts (Ruggiero and McKelvey 2000). Delphi is also appealing in that it logically follows that species experts should better understand potential impacts compared to local biologists and managers. However, despite these strengths, the primary appeal of Delphi in conservation planning is its expedience (Ruggiero and McKelvey 2000).

Although Delphi methods are quick and require no new information, scientifically they are inappropriate for conservation decisions (Ruggiero and McKelvey 2000). The collective opinions of experts cannot be reproduced; they have an unknown error factor, and an unknown relationship to the species' ecology. In addition, expert opinions do not represent independent votes regarding potential effects. Species-experts often read the same scientific journals, attend the same conferences, and receive similar technical training. Science has many examples of commonly held beliefs that were later proved wrong. Although in the past, Delphi has been admissible the courts, this acceptance may change with new data-quality standards. Thus, in the future, Delphi methods may not provide a defensible method for addressing the uncertainties associated with goshawk conservation and management.

Inductive science

We believe that scientific investigation is the only defensible way for addressing the uncertainties associated with species management. Romesburg (1981) argued that much wildlife science was compromised with respect to providing the reliable knowledge required to make management decisions. He stated that good science based on the hypothetic-deductive (H-D) method is best able to provide reliable knowledge. This method employs three steps: (1) observation and induction (the use of repeated observations to discover laws of association), (2) hypothesis formulation, and (3) tests of these hypotheses, preferably with experimentation. It also includes a methodology for dealing with uncertainty. Romesburg (1981) pointed out that some accepted knowledge about wildlife is untested hypotheses about observations because many studies go through the first two steps but not the third. Induction can provide us with reliable knowledge about associations such as the association of goshawks with forests having certain structural characteristics. However, this method does not provide the mechanism for understanding the processes that underlie this association nor does it provide reliable knowledge about cause and effect. Thus, we can describe the structure of forests used by goshawks, but we cannot ascertain which characteristics are important or why, without application of the H-D method. We can describe patterns through induction but need the H-D method to understand why these patterns occur and which components of those patterns are important. In terms of management, understanding why a pattern has occurred and what caused it are important for predicting effects when observed patterns are changed via management or other processes (USDI Fish and Wildlife Service 1995b).

As Nudds and Morrison (1991) point out, resistance to using the H-D method in wildlife biology is common. The resistance includes claims that: (1) nothing is yet known about a system so hypotheses are not apparent, (2) funding agencies do not support tests of hypotheses, and (3) the H-D method is impossible if experiments are impractical. Nudds and Morrison address the first challenge by admitting there will always be a need for new data from which to generate testable hypotheses. This challenge just reflects the need for more research. The second addresses the difficulty to fund hypothesis tests. This is certainly true given the tight budget constraints facing most agencies, but administrators are recognizing the need. For example, the USFS has embraced the concept of adaptive management that is management based on the evaluation of results

from experimentation, evaluation, and new management experiments (Walters and Holling 1990). Administrators are realizing they should be able to justify why they spend money on tests of hypotheses that explicitly evaluates the cost-effectiveness of their management actions.

The third challenge that the H-D method is impractical to implement assumes the method only allows for manipulative, controlled, and replicated experiments. However, this argument rests on a very narrow definition of experimentation. As Nudds and Morrison (1991) and Murphy and Noon (1991) point out, this challenge does not recognize what is most important about the H-D approach is the attempt to falsify hypotheses and erect better ones. H-D research is not characterized by whether or not it is experimental, because hypotheses can be evaluated with non-experimental data (Ratti and Garton 1994). Data collected in non-experimental or descriptive studies are more limited in terms of their reliability (e.g., one can not infer cause and effect from non-experimental data), but they can be used to test hypotheses and are certainly better than ignoring hypothesis testing completely. Well-designed descriptive studies that include unbiased sampling techniques, adequate sample sizes, and appropriate statistical tests can be used to evaluate management hypotheses.

DEMANDS FOR SCIENCE-BASED MANAGEMENT

The ESA requires that we use best scientific data when conserving species that are listed as threatened or endangered on the federal level and the ecosystems upon which they depend (Smallwood et al. 1999). This approach should apply to management of sensitive species such as the goshawk. Squires et al. (1998) surveyed USFS wildlife biologists across the country asking them to list two general information needs that would be most useful for managing sensitive species. The biologists responded that information regarding natural range of variation in population characteristics, as well as autecological habitat relationships were their top information needs. Clearly, management of sensitive or listed species should be science based as described above and not based on subjective judgments as is commonly the case (Nudds and Morrison 1991, Kennedy 1997, Smallwood et al. 1999).

Agencies are subjected to increasing congressional and judicial pressures to base their policies and management actions on good science (Data Quality Act enacted in 2002; U. S. Supreme Court, *Daubert v. Merrell Dow Pharmaceuticals* [113 S.Ct. 2786, 1993 decision; *Tellus Institute* 2003]). Thus,

land managers and decision makers not only have to determine if their management actions have a scientific basis, but they also must evaluate the quality of the underlying science in terms of peer review, clear objectives, adequate sample sizes, correct statistical analyses, and appropriate methods. In 2003, the Coalition of Arizona-New Mexico counties, the Washington Contract Loggers Association, the Northern Arizona Loggers Association, and a forestry company, Olsen & Associates, jointly submitted industry sponsored data-quality petitions challenging the USFS's decision to restrict logging in order to protect goshawk habitat according to USFS, Region 3 (Reynolds et al. 1992). In a detailed 281-page petition, the petitioners challenged the report as inaccurate, biased and arbitrary. Issues such as nest stand and foraging habitat conditions and canopy cover were contested. The other petitions filed by the industry groups challenged amendments to forest plans and goshawk management in the Black Hills National Forest that followed similar habitat recommendations as in the Southwest. The Center for Biological Diversity, with nine environmental groups co-signing, submitted comments requesting the USFS to reject the petitions because they failed to meet legal requirements and were intended to circumvent the forest planning process (<http://www.ombwatch.com> [2 February 2006]).

In July 2003, the USFS Rocky Mountain Research Station issued a response letter to the industry petitioners stating, that while eight minor errors were in the document, the inaccuracies did not affect desired forest conditions or specific management recommendations. In addition, Reynolds et al. (1992) had received peer review that was well beyond the norm—19 scientists and managers at universities, state wildlife agencies, and governmental agencies—prior to publication. The letter concluded that the claims of the petitioners had no substantive merit, and that the Reynolds et al. (1992) would not be retracted (<http://www.fs.fed.us/qoi/documents/2003/07/rfc3001response.pdf> [2 February 2006]).

This example illustrates the high level of scrutiny that management recommendations for sensitive species, like goshawks, can receive. It also illustrates the importance and central role that good science plays in resource decision making, and how data-quality standards can substantially impact the scientific underpinnings of management decisions. Forest planning in the Southwest would have been disrupted greatly had Reynolds et al. (1992) been rescinded due to lack of peer review or was found lacking in other data-quality issues.

CONCLUSIONS

In conservation planning, a fundamental mismatch often occurs between the state of knowledge and the feasibility of obtaining specific knowledge, and the actions that society would have land managers take towards species conservation (Ruggiero and McKelvey 2000). In this paper, we assessed the current knowledge concerning goshawk ecology, and we discussed the pressing information needs for conservation and management. The uncertainty associated with goshawk management is similar to issues confronted by the lynx science team when asked to define appropriate management for Canada lynx (*Lynx canadensis*), a species with a life history that also is poorly understood (Ruggiero et al. 2000). Ruggiero and his colleagues define what they called qualified insights that were an attempt to embrace science while recognizing uncertainty (Ruggiero and McKelvey 2000). Qualified insights are specific statements that are backed by the balance of scientific evidence, but they are fundamentally subjective because they are based on scientific judgment. The specific linkage between data and inference is what separates this method from opinion-based methods, i.e., Delphi. The statements are qualified because the relationships are scientifically known for given areas, and we then infer the degree that these understandings can be transferred to outside areas with local knowledge.

The qualified insights that we offer are based on: (1) our review of the current state of knowledge, (2) the degree this information is applicable to different subspecies and populations, and (3) our combined experience researching goshawks. These insights are on topics of key management concern and for which sufficient information is available to form some preliminary conclusions. The conclusions we present as qualified insights are our attempt to distill our current understandings to the most salient issues affecting goshawk management and conservation. However, we offer these insights fully recognizing our imperfect knowledge of this species' life history. Our conclusions are best viewed as testable hypotheses that merit further research and testing.

ARE GOSHAWK POPULATIONS DECLINING?

The goshawk has been proposed for listing several times under the ESA and its status has been and still is the object of considerable litigation. It is currently not listed as a threatened species but is considered a sensitive species or a species of concern by most governmental agencies and non-governmental

organizations within the Rocky Mountain Region (Region 2) of USFS. Kennedy (1997) evaluated the demographic data available on goshawks through 1996 and concluded that no evidence showed goshawk populations were declining. The USFWS published a status review in 1998 (USDI Fish and Wildlife Service 1998a) and their review supported Kennedy's (1997) conclusions as did a recent technical review of the USFWS status review (Andersen et al. 2005).

No new demographic evidence suggests a decline in goshawk populations. Existing data, including those from migration counts, trends in BBS data, estimates of production, breeding distribution, detection surveys, local studies of population dynamics, and estimates of breeding density are inadequate to assess population trends in goshawks west of the 100th meridian. Although these studies have significantly increased understanding of goshawk distribution and population dynamics, no studies to date have generated adequate empirical stage-specific estimates of survival and fecundity for estimating lambda (λ). Demographic data are unavailable to estimate λ at the scale of western North America. In addition, densities are difficult to estimate due to the bird's low detectability and uncommon status, so trends in this parameter are also not available.

Four European studies have reported on population trends in various locales (Thissen et al. 1982, Widén 1997, Kenward et al. 1999, Krüger and Lindström 2001). Three of the four studies concluded that goshawk populations were stable or increasing (Thissen et al. 1982, Kenward et al. 1999, Krüger and Lindström 2001). One study (Widén 1997) concluded that goshawk populations in Fennoscandia declined by 50–60% from the 1950s to the 1980s. The trend since the 1980s is unknown.

We conclude that no evidence shows that North American goshawk populations are declining. However, we cannot separate the following hypotheses given the nature of the available evidence: the goshawk is not declining, or it is declining but there is not sufficient information to detect the declines. The majority of the data from Europe suggest that the species is not in jeopardy of extinction globally, although populations might be declining in regional pockets, e.g., Fennoscandia.

WHAT FACTORS LIMIT GOSHAWK POPULATIONS?

Experimental evidence shows that food during the breeding season limits goshawk reproduction (Ward and Kennedy 1996, Dewey and Kennedy 2001) and recruitment via natal dispersal (Kennedy and Ward

2003). Predation also limits goshawk reproduction and is influenced by food availability (Dewey and Kennedy 2001). Whether or not food and predation are additive or synergistic (as demonstrated in Song Sparrows [*Melospiza melodia*]; Zanette et al. 2003) has not been determined. The role of food and predation in limiting over-winter survival is unknown. Weather during the breeding season influences goshawk productivity, but the effect of weather on regulating populations is also unknown.

Strong correlative evidence demonstrates that goshawk population growth rate is also regulated by density-dependent territoriality (Krüger and Lindström 2001). In a German population, territories that were occupied more often and earlier had a higher mean brood size, and fecundity did not increase with increasing density in the best territories. Increased usage of poor territories at high densities results in a decrease in per capita reproductive success (Krüger and Lindström 2001). The site factors that influenced territory quality were not identified in this study.

We conclude that goshawk breeding populations are limited by food, predation, and density-dependent territoriality. High-quality territories which are regularly occupied and very productive likely contain high abundance of prey, low abundance of predators, and forest structural characteristics that enhance prey acquisition and predator avoidance. The factors regulating winter populations and the effect of winter conditions on breeding populations are unknown.

WHAT ARE THE PRINCIPAL HABITAT ATTRIBUTES AND RELEVANT SPATIAL SCALES OF NEST HABITAT?

Goshawks nests in many forest types throughout their range (Squires and Reynolds 1997). These forests include mixed hardwood-hemlock stands in the eastern deciduous forests (Speiser and Bosakowski 1987), various pine and aspen forests in western North America (Reynolds et al. 1982, Hall 1984, Younk and Bechard 1994a, Siders and Kennedy 1996, Squires and Ruggiero 1996, Clough 2000, McGrath et al. 2003), and ponderosa pine-mixed conifer forest (Erickson 1987, Crocker-Bedford and Chaney 1988, Kennedy 1988, Reynolds et al. 1994, Siders and Kennedy 1996). Within these types, there are at least three levels of habitat scale that appear to be biologically important during the breeding season—the nest area, the PFA, and the foraging area (Reynolds et al. 1992, Kennedy et al. 1994). How the size of these areas may differ among populations is not well understood.

Nest areas include forests with a narrow range of structural conditions (Reynolds et al. 1992, Squires and Reynolds 1997). Nest areas are usually mature forests with large trees, relatively closed canopies (60–90%), and open understories (Reynolds et al. 1982, Moore and Henny 1983, Speiser and Bosakowski 1987, Crocker-Bedford and Chaney 1988, Kennedy 1988, Hayward and Escano 1989, Reynolds et al. 1992, Squires and Ruggiero 1996, Penteriani and Faivre 1997, Selås 1997b, Squires and Reynolds 1997, Daw et al. 1998, Daw and DeStefano 2001, Finn et al. 2002b, McGrath et al. 2003). Within nest areas, goshawks usually nest in one of the largest trees (Reynolds et al. 1982, Saunders 1982, Erickson 1987, Hargis et al. 1994, Squires and Ruggiero 1996) with some exceptions (Speiser and Bosakowski 1989). Limited data also suggest that forest structure may be more important than prey abundance when selecting nest sites (Beier and Drennan 1997, Penteriani et al. 2001). Although understanding the structural characteristics of nest areas and nest trees is one of the best known aspects of goshawk ecology, it is still difficult to compare preference relationships among studies due to different field methods and biased nest-search methods.

The PFA was conceptualized by Reynolds et al. (1992) and empirically supported by studies of family movement patterns (Kennedy et al. 1994, Kenward et al. 1993a, and Kennedy and Ward 2003). The function of the PFA is unclear, but it may be important to fledglings by providing prey items on which to develop hunting skills or may provide cover from predation (Reynolds et al. 1992). PFAs are usually in mature forests with dense canopies and small openings (Daw and DeStefano 2001, Finn et al. 2002a, McGrath et al. 2003); these structural components appear to be important to site occupancy (Finn et al. 2002a). The size of the PFA was originally estimated at 170 ha (Kennedy et al. 1994), but a study by McGrath et al. (2003) found late-seral forests, high understory growth, and high canopy cover (50%) were more common around nests compared to random sites up to 83 ha. McClaren et al. (2005) measured PFA size for *A. g. laingi* on Vancouver Island, British Columbia, and mean PFA size for 12 juveniles at 12 nests was approximately 60 ha. PFAs likely vary in size depending on local environmental conditions and perhaps there are sub-specific differences in use of habitat by fledglings.

Goshawks use an array of habitat types in foraging areas, but often select forests with a high density of large trees, greater canopy cover, high tree basal area, and open understories (Doyle and Smith 1994,

Hargis et al. 1994, Beier and Drennan 1997), but with much variation (Kenward 1982, Widén 1989, Austin 1993, Bright-Smith and Mannan 1994, Hargis et al. 1994, Younk and Bechard 1994a, Beier and Drennan 1997). Habitat structure may be more important than prey abundance where goshawks kill prey (Beier and Drennan 1997, Good 1998, Bloxton 2002), again with exceptions (Kenward and Widén 1989).

We conclude that at least three spatial scales are biologically important to nesting goshawks—the nest area, the PFA, and the foraging area. Habitat structure may be as important as prey abundance when selecting nest areas and PFAs. The principal structural components include a high density of large trees, high canopy closure, and high tree basal area than generally available in the landscape; these components are provided in mature forests. Foraging areas are more heterogeneous, but often include mature-forest components.

ARE GOSHAWKS HABITAT SPECIALISTS OR GENERALISTS?

Goshawks in western North America breed in forested habitats, and in most places appear to select old-growth and mature forests for nesting. Goshawks often place their nests in the larger or largest trees in a stand, and stands in which nests are placed tend to be older than adjacent stands. However, not all goshawk territories are equally suitable. Thus, nesting habitat diversity may increase with nesting density because lower-quality territories are more regularly occupied at higher densities. These lower-quality territories may have different structural characteristics than high quality territories.

A core area seems to exist around goshawk nests (<100 ha) where the forest can be characterized by large trees with high canopy closure, and this core is surrounded by a heterogeneous landscape with a variety of forest cover types and seral stages. Within this heterogeneous landscape, goshawks may forage selectively in forests with a high density of large trees, greater canopy cover, high tree basal area, and open understories.

The limited data on winter-habitat-use patterns suggest that winter-habitat diversity is greater than breeding-season habitat diversity. During the winter, goshawks use forests as well as non-forested habitats and their habitat-use patterns are partially dictated by residency patterns. Year-round they hunt a wide variety of prey species that occur in a variety of habitat types.

We conclude that goshawks have a strong preference for mature and old-growth forests, but this

preference is dependent on nest density, scale, and season; this preference seems strongest within approximately 100 ha of the nest stand. As nest density increases, low quality habitats are more likely to be occupied and thus, nesting habitat diversity used by the population may increase. As spatial scale increases from the nest site to the landscape in which home ranges are embedded, habitat heterogeneity increases. Goshawks are more of a habitat generalist at these larger spatial scales than at the scale of the nest site. Finally, the limited data on non-breeding habitat use patterns suggest that goshawks are more of a habitat generalist during the non-breeding season than during the breeding season.

WHAT HUMAN ACTIVITIES MOST AFFECT THE PERSISTENCE OF GOSHAWK POPULATIONS?

Forest management can have an impact on the structure and function of goshawk habitat (Reynolds 1989, Crocker-Bedford 1990, Bright-Smith and Mannan 1994, Woodbridge and Detrich 1994, Beier and Drennan 1997, Desimone 1997, USDI Fish and Wildlife Service 1998a, Greenwald et al. 2005). Habitat fragmentation may also favor early successional competitors and predators (Woodbridge and Detrich 1994). Forest management, such as controlled fire and thinning, may improve or degrade habitat depending on implementation, especially as they affect the density of large trees and canopy closure. Forest management that reduces the size of nest stands may decrease occupancy rates (Woodbridge and Detrich 1994). Few studies have directly assessed the impacts of timber management on goshawk populations, but limited data suggest goshawks can tolerate timber harvesting near their nesting area below some threshold (Penteriani and Faivre 2001, McGrath et al. 2003). The effects of forest management on prey populations vary by species, and specific effects are poorly documented.

Although human persecution may have had an impact on goshawk populations in the past, it is not believed to be a factor affecting the persistence of North American populations. Likewise, pesticides and other contaminants do not appear to have an impact on North American populations (Snyder et al. 1973, Reynolds and Wight 1978, Rosenfield et al. 1991, USDI Fish and Wildlife Service 1998a), but this topic has received little study in North America. Recent European data suggest some populations of goshawks still show high levels of organochlorines and PCBs (Kenntner et al. 2003), but the effect of these levels on population persistence is unknown. The populations with high levels of contaminants

occur in areas where regulatory control of the use of these chemicals is less stringent than in the US. Although falconry may impact local populations (Noll West 1998), it is not at a sufficient scale to affect North American populations (Brohn 1986, USDI Fish and Wildlife Service 1988, Mosher 1997).

We conclude that forest management—cutting, thinning, and controlled burning—is the primary human-caused activity that has an impact on goshawk populations. These impacts can either enhance or degrade goshawk habitat depending on type and extent of habitat alterations. Effects of timber management on goshawks are poorly documented, especially relative to prey populations and community interactions. The impacts associated with human persecution, pesticides, and falconry are negligible.

IS GOSHAWK MONITORING FEASIBLE GIVEN CURRENT TOOLS?

Information on goshawk populations in North America is generally obtained by monitoring nesting activity at local scales (Roberson et al., unpubl. data; Hargis and Woodbridge, *this volume*). These local monitoring programs typically focus on trends in reproduction which indicate extensive temporal and spatial variation and are difficult to interpret in the absence of survival data (McClaren et al. 2002). When survival has been estimated, it is usually based on mark-resighting techniques and the studies have insufficient sample sizes (<100 birds) to estimate survival with acceptable levels of precision (DeStefano et al. 1994b, Kennedy 1997). Although demography data are vital to determining trends in goshawk populations, funding for the goshawk waxes and wanes as the threat of listing the goshawk comes and goes (DeStefano 1998). This is counterproductive to implementing the long-term, large-scale studies needed to evaluate goshawk demographics. Estimating the rate of population change for a non-listed species such as the goshawk may simply be too difficult and take too long to provide meaningful information for listing decisions and other management concerns.

Documenting the distribution of all forest structural stages, including mature and old-growth forests, would be an important step in goshawk management. Such documentation will be important for a number of wildlife species, including the goshawk and has been suggested by Crocker-Bedford (1998), DeStefano (1998), and Smallwood (1998). Although methods to gather and compile data on current forest conditions need to be improved, assessing goshawk status based solely on the distribution of

old-growth or mature forests is not appropriate at present because our current understanding of goshawk-habitat relations is poor.

A viable alternative for monitoring goshawk population performance in a rigorous and cost-effective manner is estimating trends in site occupancy (presence or absence of breeding goshawks at a site). Currently the most accurate field method for determining site occupancy is dawn vocalization surveys (Dewey et al. 2003). If these surveys are conducted in a sampling framework that allows for estimation of detection probabilities (MacKenzie et al. 2002, 2003), trends in site occupancy could be used as an index of goshawk population performance. Hargis and Woodbridge (*this volume*) describe a bioregional monitoring program for northern goshawks that is based on this approach.

We conclude that the best current method available for monitoring goshawk population performance is monitoring trends in site occupancy. We recommend using dawn vocalization surveys as described by Dewey et al. (2003) and estimating detection probabilities of these surveys with recent analytical procedures described by MacKenzie et al. (2002, 2003).

IS GOSHAWK MANAGEMENT A SERIOUS ISSUE IN TERMS OF FEASIBILITY AND NEED?

Goshawks have life-history attributes that are specialized in terms of their morphology and their use of nest habitat. The mature forests that provide nesting and foraging habitat for goshawks are often the same areas that are important for producing forest products. As such, forest management does potentially impact goshawk populations. The density of nesting goshawks tends to be low, and is limited through a combination of food availability, predation, and density-dependent territoriality. Low density and general rarity makes it difficult to assess long-term population trends of regional and local populations. Although monitoring the effects of forest management on goshawks is difficult, it is possible given adequate funding and political will.

We conclude that goshawks have life-history attributes that make them sensitive to changes in forest structure and composition. These attributes also make it difficult to monitor population responses to habitat alterations. Thus, goshawk management is a serious issue because management agencies need concerted efforts to monitor goshawk responses to their management actions within an experimental context. This is necessary before the effects of

forestry on goshawk populations are elucidated across the broad landscapes that are congruent with goshawk spatial-use patterns.

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Effects of ski piste preparation on alpine vegetation

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Summary

1. Ski resorts increasingly affect alpine ecosystems through enlargement of ski pistes, machine-grading of ski piste areas and increasing use of artificial snow.

2. In 12 Swiss alpine ski resorts, we investigated the effects of ski piste management on vegetation structure and composition using a pairwise design of 38 plots on ski pistes and 38 adjacent plots off-piste.

3. Plots on ski pistes had lower species richness and productivity, and lower abundance and cover of woody plants and early flowering species, than reference plots. Plots on machine-graded pistes had higher indicator values for nutrients and light, and lower vegetation cover, productivity, species diversity and abundance of early flowering and woody plants. Time since machine-grading did not mitigate the impacts of machine-grading, even for those plots where revegetation had been attempted by sowing.

4. The longer artificial snow had been used on ski pistes (2–15 years), the higher the moisture and nutrient indicator values. Longer use also affected species composition by increasing the abundance of woody plants, snowbed species and late-flowering species, and decreasing wind-edge species.

5. *Synthesis and applications.* All types of ski piste management cause deviations from the natural structure and composition of alpine vegetation, and lead to lower plant species diversity. Machine-grading causes particularly severe and lasting impacts on alpine vegetation, which are mitigated neither by time nor by revegetation measures. The impacts of artificial snow increase with the period of time since it was first applied to ski piste vegetation. Extensive machine-grading and snow production should be avoided, especially in areas where nutrient and water input are a concern. Ski pistes should not be established in areas where the alpine vegetation has a high conservation value.

Key-words: artificial snow, biodiversity, functional groups, machine-grading, snow ecology, Switzerland

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Introduction

The structure of alpine vegetation is affected by altitude, aspect and inclination. Some alpine habitats are extraordinarily rich in species, while communities in the highest and most extreme regions consist of only a few specialists (Ellenberg 1988). Furthermore, most communities are characterized by specific proportions of functional groups, such as dwarf shrubs, grasses and herbs. The communities can consist of species from special eco-

logical groups, for example snowbed species, indicating depressions with a long-lasting snow cover and a very short vegetation period, or wind-edge species, indicating a long vegetation period and extreme winter temperatures (Körner 1999).

Alpine ecosystems are sensitive and susceptible to changes in land use and climate (Chapin & Körner 1995; Fischer & Wipf 2002; Laiolo *et al.* 2004). Perturbations of the alpine habitats and changes in snow cover characteristics, for example through skiing, are likely to have impacts on species composition, diversity and productivity of alpine vegetation, which in turn may have negative effects on ecosystem functioning and stability (Tilman 1996; Mulder, Uliassi & Doak 2001). As ski tourism is

one of the most important economical factors in European alpine regions (Abegg *et al.* 1997; Elsasser & Messerli 2001), the area affected by ski pistes or by constructions related to tourism is still increasing.

Skiing and ski piste preparation by snow-grooming vehicles are likely to cause mechanical damage to the vegetation and the soil (Cernusca *et al.* 1990; Rixen *et al.* 2004). Furthermore, the winter preparation of ski pistes leads to a thin and compressed snow cover with decreased temperature insulation capacity. Soils and vegetation under these ski pistes may experience temperatures lower than -10°C (Rixen, Haeberli & Stoeckli 2004), while under undisturbed snow-packs, temperatures rarely fall below 0°C (Rixen 2002; Rixen, Stoeckli & Ammann 2003). As a result, plant species with insufficient cold hardiness and plants sensitive to mechanical stress may be damaged, resulting in shifts among functional groups and a higher proportion of unvegetated ground. In summer, piste construction measures, such as machine-grading, are carried out to remove obstacles like trees and rocks or to level rough or bumpy soil surfaces. In the process of machine-grading, the upper soil layers and the vegetation are removed or heavily damaged (Pröbstl 1990; Haeberli 1992; Bayfield 1996; Titus & Tsuyuzaki 1999; Ruth-Balaganskaya & Myllynen-Malinen 2000). Seed mixtures are often applied to accelerate revegetation, but the success of revegetation measures declines with height above sea level (a.s.l.) (Urbanska 1997).

In response to ongoing climatic changes, artificial snow production is increasingly used in most ski resorts of the world. Climate-change scenarios predict changes in seasonal snowfall patterns, with the snow season beginning later and ending earlier, and a rise in the snow line (IPCC 1996, 1998, 2001). As a consequence, the minimum altitude termed snow-secure for winter sports in the European Alps would rise from 1200 m today to 1500 m a.s.l. within the next 30 years (Abegg 1996). Winters with little snow have already been a major concern of winter sport resorts since the mid-1980s (Seilbahnen Schweiz 2001). As a strategy to minimize the dependence on natural snowfall, ski areas invest in systems for artificial snowing.

Effects of ski piste manipulation in single resorts and single effects of artificial snowing or machine-grading have been investigated in earlier studies (Urbanska 1997; Kammer 2002). In our comprehensive study, sites covered a wide range of locations, altitudes and aspects in 12 Swiss ski resorts. We investigated plots on ski pistes and adjacent control plots beside pistes. With a total of 76 vegetation records arranged in a factorial design, we addressed the following specific questions. (i) Do productivity, species richness and composition of the vegetation on ski pistes differ from the vegetation off pistes? (ii) What are the impacts of machine-grading on productivity, species richness and composition of ski piste vegetation? (iii) How does the use of artificial snow modify environmental conditions on ski pistes and how do productivity, species richness and composition

of the vegetation respond? (iv) Do the effects of artificial snow differ between graded and ungraded ski pistes?

Materials and methods

STUDY SITES AND DESIGN

We studied the vegetation of plots on and next to ski pistes in 12 ski resorts in the Swiss Alps (see Appendix 1), ranging in altitude between 1750 and 2550 m a.s.l. and representing a wide range of vegetation types (mostly alpine grasslands on acidic or calcareous bedrock and dwarf shrub heath), time since grading and years of application of artificial snow. The study sites were chosen on machine-graded or ungraded ski pistes with either natural or artificial snow, resulting in four different ski piste types: natural snow/ungraded (ns), artificial snow/ungraded (as), natural snow/graded (nsg) and artificial snow/graded (asg). Sites were selected in consultation with the local ski piste managers to ensure that the pistes had received the same management continuously in previous years.

At each study site, we randomly chose a plot on a ski piste and an undisturbed control plot in the nearest off-piste area to allow for pairwise comparisons. The distance between piste and control plot was 15–50 m and the pair of plots did not differ significantly in altitude, inclination, aspect and management. All ski pistes were prepared by snow-grooming vehicles and were used annually by skiers from approximately mid-November/early December to Easter (mid-April). Artificial snow had been produced in all ski resorts for 2–15 years ($n = 21$ pistes, mean 7.1 years). On 17 pistes in nine resorts, machine-grading (i.e. construction of ski pistes during which vegetation and topsoil are removed) had been carried out 4–30 years ago ($n = 17$ pistes, mean 18.7 years). On 10 machine-graded plots, revegetation had been encouraged by sowing seed, but details of seed mixtures and sowing techniques were not available.

VEGETATION DATA

From 1 July to 24 August 2000, we visited each site to collect vegetation records. In 4×4 -m plots, we noted the presence of each vascular plant species and estimated its cover in seven classes according to Braun-Blanquet (Müller-Dombois & Ellenberg 1974). We assigned a cover value to each class for further calculations (0.01% to 'r', 0.1% to '+', midpoint to other classes). To compare site conditions between plots, we calculated weighted indicator values for moisture (F), soil reaction (R), nutrients (N) and light (L) per plot according to Landolt (1977). For each plot, we also estimated the percentage area not covered by vascular plants.

To assess productivity, we randomly selected three patches of 0.2×0.2 m plot⁻¹, harvested the biomass 3 cm above ground and pooled the samples. In cases where plots had been grazed, we randomly sampled ungrazed

areas with similar vegetation within 5 m distance from the plot. Three grazed plots with no undisturbed vegetation nearby were omitted from biomass sampling. We measured annual productivity as the total biomass excluding litter, dead biomass and woody shoots older than 1 year. The biomass was dried at 70 °C and weighed to the nearest 0.01 g.

For each plot we calculated species number and Shannon's index of diversity as $H = -\sum P_i \ln P_i$, where P_i is the abundance class of species i . We calculated the abundance of four functional groups: graminoids (Poaceae, Cyperaceae, Juncaceae), woody plants, legumes and remaining forbs (including Pteridophyta), to obtain taxonomical and plant functional characteristics of the plots. According to their habitat preference in relation to snow cover and length of growing season (Ellenberg 1988; Wilmanns 1998; Delarze, Gonseth & Galland 1999), we classified 26 of 322 species as inhabiting snowbeds and 30 as inhabiting wind-edges (Wipf *et al.* 2002). Depending on their phenology, we also classified 67 species as early flowering and 94 as late-flowering, according to the flowering period indicated in Lauber & Wagner (2001). For the four functional, two ecological and two phenological groups, we calculated the proportions relative to total species number and total vegetation cover. See Appendix 2 for a list of species and their classification.

STATISTICAL ANALYSIS

We analysed our data with hierarchical analysis of variance (ANOVA) models. Differences in the type of bedrock, aspect, slope and hours of sunshine between pairs were taken into account by the pairwise design of piste and off-piste plots. Moreover, we considered altitude as a covariate in all analyses. To mirror the study design with pairs of plots on and next to pistes, we fitted the type of plot pairs, i.e. the type of piste treatment of the piste plot in the pair. Next we fitted the factor piste, which indicated differences between plots on and next to pistes within the pairs, across all types of piste treatment. Then, we fitted the interactions of type of pair (machine-grading or years of artificial snow) and piste, which indicated whether the difference between plots on and next to the piste depended on the type of piste treatment. We considered machine-grading, which is applied only once, as a binary factor, and artificial snowing as a continuous variable (time since start of application of artificial snow) because of its potentially cumulative impacts. Three-way interactions between resort, type of plot pair and piste indicated whether effects of machine-grading and artificial snow differed between resorts. To analyse the effect of succession and revegetation measures on the vegetation of machine-graded ski pistes, we performed the same analysis on a reduced data set (pairs of graded piste and control plots) and included years since machine-grading as a continuous variable and sown as a binary factor. If necessary, dependent variables were transformed prior to analysis to reach

normality. Residuals were checked visually for normal distribution. Analyses were carried out with SPSS 10.0.5 (SPSS 1999).

Results

IMPACTS OF SKI PISTES VS. NO PISTE

The indicator values of the vegetation composition showed an increased supply in moisture and nutrients available for plants (indicator value F, $P = 0.098$; N, $P = 0.003$; Tables 1 and 2 and Fig. 1) and a tendency for higher base content of the soil (R, $P = 0.059$; Tables 1 and 2) on ski pistes. Despite the favourable environmental conditions for growth, plant productivity on ski pistes was lower than beside the pistes (Tables 1 and 3 and Fig. 2). The mean number of species per plot was 11% lower on piste plots than on off-piste plots ($P = 0.047$; Tables 1 and 3 and Fig. 2). The pistes thus had a negative effect on the species richness in alpine grassland and dwarf shrub vegetation.

Woody plants covered 24.3% of unmanipulated control plots, but were significantly less frequent on ski pistes (10.5% cover, $P = 0.003$; Tables 1 and 4 and Fig. 3), mainly because of their low abundance on machine-graded pistes (1.7% cover, see next section). The same pattern was found in the proportion of woody species (Tables 1 and 5 and Fig. 3). Legume species were more abundant and had higher cover on piste plots than on control plots. Both cover and species number of early flowering species were lower on piste than on control plots ($P = 0.005$; Tables 1 and 6 and Fig. 4). Thus, the snow compaction changed the plot composition of functional and ecological groups.

MACHINE-GRADING OF SKI PISTES

The proportion of ground not covered by vegetation was almost five times higher on graded than on ungraded piste plots ($P = 0.008$; Tables 1 and 3 and Fig. 2) but was unaffected by revegetation measures (sowing) or time since machine-grading. Corresponding with the high proportion of ground not covered by vegetation, the light input for the plants (expressed as indicator value L) was higher on graded piste plots than on ungraded ones ($P = 0.002$; Tables 1 and 2 and Fig. 1). Nutrient availability to the vegetation (expressed as indicator value N), which was generally increased on ski pistes, reached even higher values on graded pistes than on ungraded ones ($P = 0.07$; Tables 1 and 2 and Fig. 1). Whereas the productivity on ungraded piste plots was similar to that of off-piste plots, it was reduced 4.6 times on graded piste plots ($P = 0.011$; Tables 1 and 3 and Fig. 2). Machine-graded pistes that had been revegetated by sowing supported fewer species ($P = 0.098$). The Shannon index was lower for all graded piste plots ($P = 0.03$; Tables 1 and 3 and Fig. 2).

Machine-grading also affected the vegetation composition: woody plants, which were generally less common

Table 1. The effects of ski piste treatments on the parameters describing the vegetation in 12 Swiss ski resorts: Predicted means and slopes of the correlation with years of artificial snow. The *n* in parentheses refer to the biomass measurements (*n* lower because of missing values)

	Total <i>n</i> = 76 (73) Mean	Off-piste <i>n</i> = 38 (36) Mean	Piste <i>n</i> = 38 (37) Mean	Piste graded <i>n</i> = 17 (16) Mean	Piste ungraded <i>n</i> = 21 Mean	Correlation with years of artificial snow Slope
Indicator values						
F*	2.85	2.83	2.87	2.88	2.87	0.000
R†	2.55	2.50	2.59	2.61	2.58	0.007
N‡	2.46	2.38	2.54	2.56	2.53	0.003
L§	3.80	3.76	3.85	4.03	3.71	0.01
Diversity and productivity						
Species number	36.4	38.5	34.3	31.7	36.5	0.30
Shannon index	3.6	3.8	3.4	2.8	3.8	-0.02
Annual productivity (g m ⁻²)	158.0	173.1	143.3	46.9	216.7	-0.25
Proportion of cover (%)						
Grasses	41.4	38.8	44.0	38.7	48.4	-0.93
Forbs	24.2	26.5	22.0	20.5	23.1	0.13
Woody plants	17.4	24.3	10.5	1.6	17.7	0.38
Legumes	5.1	2.9	7.4	10.6	4.8	0.15
Snowbed species	8.4	7.3	9.6	14.0	6.0	1.36
Wind-edge species	7.5	7.7	7.4	8.0	6.9	-0.27
Early flowering species	35.6	40.8	30.5	22.9	36.6	-1.26
Late-flowering species	30.5	28.0	32.9	34.1	32.0	0.03
Bare ground	11.8	7.0	16.1	28.6	6.0	0.26
Proportion of species (%)						
Grasses	27.9	27.9	27.8	27.2	28.2	-0.13
Forbs	60.2	59.8	60.6	63.2	58.5	0.09
Woody plants	11.9	13.0	10.8	6.9	14.0	-0.23
Legumes	7.8	6.6	9.1	10.9	7.6	0.21
Early flowering species	33.4	35.7	31.1	25.5	35.7	-0.71
Late-flowering species	31.0	29.9	32.2	32.5	31.9	0.25

*F = 2, medium dryness; 3, medium humidity.

†R = 2, acid soils; 3, neutral or weakly alkaline soils.

‡N = 2, nutrient-poor soils; 3, medium- to nutrient-poor soils.

§L = 3, half-shaded conditions; 4, full-light conditions.

Table 2. ANOVA table for the indicator values of the vegetation for moisture (F), soil acidity (R), nutrient (N) and light availability (L) measured on 38 ski piste plots and 38 corresponding off-piste plots in 12 Swiss ski resorts. The type of piste treatment (machine-grading and years of artificial snowing) was fitted for pairs of piste/off-piste plots. The factor ski piste indicates the difference between piste and off-piste plots. The dependent variables were $(\ln(x + 1))$ -transformed prior to analysis. Three plots were excluded from biomass sampling. The sample size for productivity is therefore 73, and the degrees of freedom are indicated in parentheses. MS, mean squares; *F*, variance ratio; subscripts refer to source of variation (*) $P < 0.1$, * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$

Source of variation	Skeleton analysis						
	MS	<i>F</i>	d.f.	Variance ratio			
				F-value	R-value	N-value	L-value
Altitude	MS _E	MS _E /MS _{Rest}	1	3.14	5.87(*)	70.23**	37.19**
Resort	MS _R	MS _R /MS _{Rest}	11	3.34	4.87(*)	4.43(*)	1.83
Type of plot pair	MS _T	MS _T /MS _{RT}	3	0.16	0.50	0.25	0.75
Piste	MS _P	MS _P /MS _{RP}	1	3.27(*)	4.42(*)	14.64**	9.46*
Grading × piste	MS _{LP}	MS _{LP} /MS _{RLP}	1	0.32	2.68	4.51(*)	24.36**
Duration of snowing × piste	MS _{AP}	MS _{AP} /MS _{RAP}	1	3.68(*)	4.80(*)	3.26(*)	0.13
Grading × duration of snowing × piste	MS _{LAP}	MS _{LAP} /MS _{Rest}	1	1.02	0.03	0.03	0.06
Resort × type of plot pair	MS _{RT}	MS _{RT} /MS _{Rest}	23	1.42	1.52	3.97(*)	0.87
Resort × piste	MS _{RP}	MS _{RP} /MS _{Rest}	11	0.51	0.45	0.93	0.24
Resort × grading × piste	MS _{RLP}	MS _{RLP} /MS _{Rest}	7	0.37	0.44	1.31	0.18
Resort × duration of snowing × piste	MS _{RAP}	MS _{RAP} /MS _{Rest}	11	0.34	0.51	0.44	0.15
Rest	MS _{Rest}		4				
Total			76				

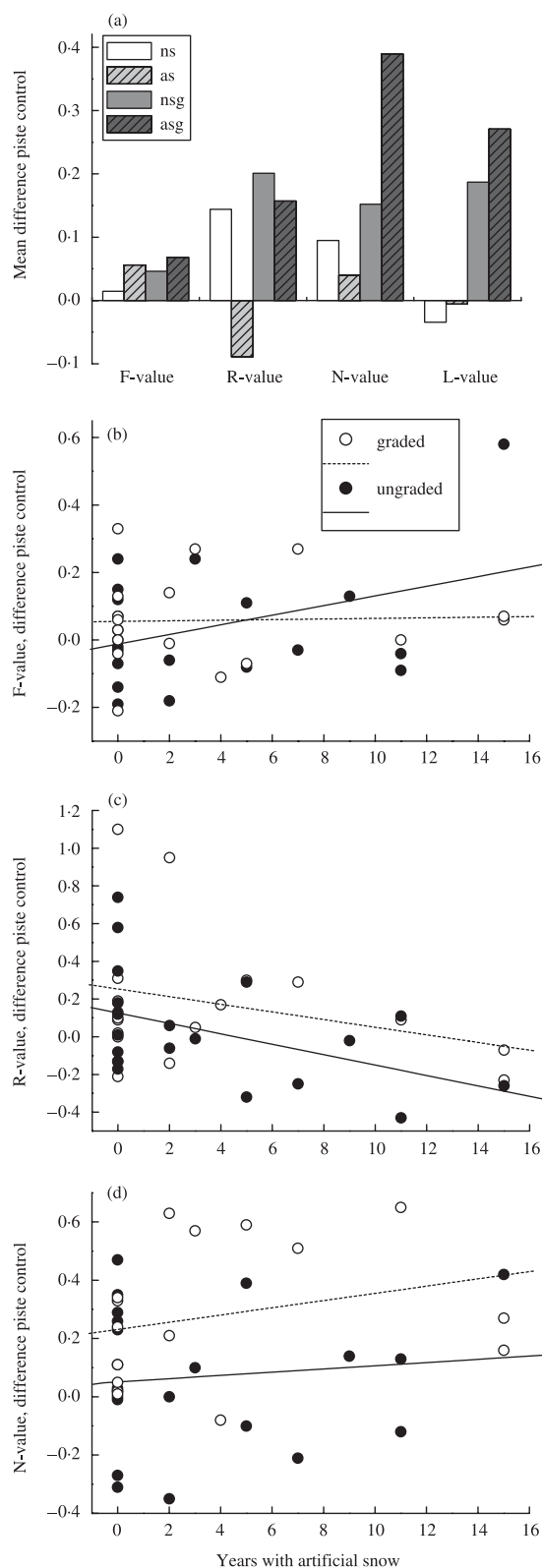


Fig. 1. Differences in indicator values between ski piste plots and corresponding control plots. (a) Mean differences in indicator values for the four ski piste treatments (ns, ungraded pistes with natural snow; as, ungraded pistes with artificial snow; nsg, graded pistes with natural snow; asg, graded pistes with artificial snow; F, moisture indicator value; R, reaction (soil acidity) indicator value; N, nutrient indicator value; L, light indicator value). (b–d) The relationship between the differences in (b) F (moisture), (c) R (soil acidity) and (d) N (nutrient) indicator values and the time since conversion to artificial snow.

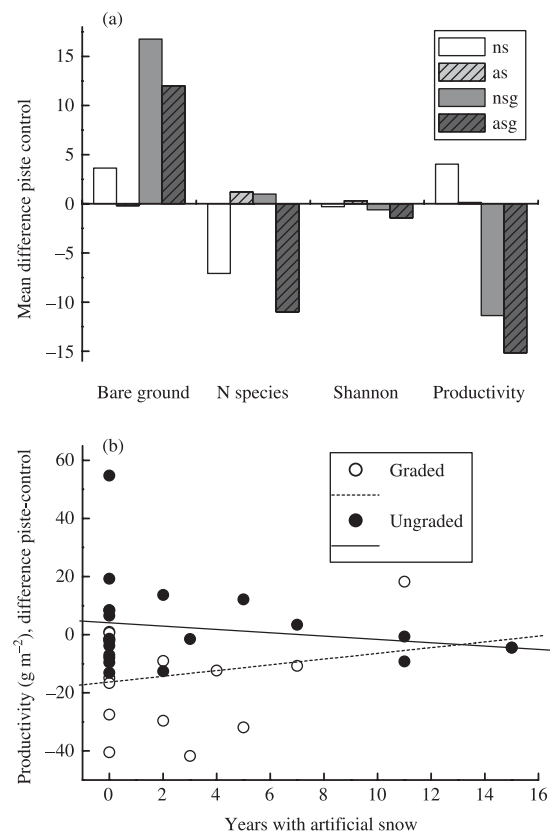


Fig. 2. Differences in productivity and diversity between ski piste plots and corresponding control plots. (a) Mean differences in productivity, species number, Shannon index and the proportion of open ground for the four ski piste treatments (ns, ungraded pistes with natural snow; as, ungraded pistes with artificial snow; nsg, graded pistes with natural snow; asg, graded pistes with artificial snow). (b) The relationship between the differences in annual productivity and the time since conversion to artificial snow.

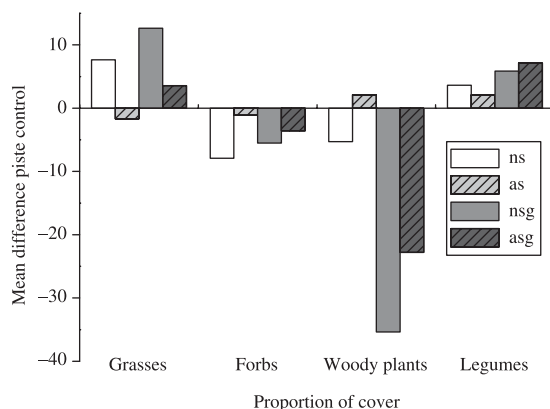


Fig. 3. Differences in species composition between ski piste plots and corresponding control plots. Mean differences in the percentage cover of the four functional groups for the four ski piste treatments (ns, ungraded pistes with natural snow; as, ungraded pistes with artificial snow; nsg, graded pistes with natural snow; asg, graded pistes with artificial snow).

on piste plots, were reduced by 91% on graded piste plots in comparison with ungraded ones ($P = 0.03$; Tables 1 and 4 and Fig. 3). Whereas only 6.9% of the species on graded piste plots were woody species, they accounted

Table 3. ANOVA table for the proportion of bare ground, annual productivity, species number and Shannon index measured on 38 ski piste plots and 38 corresponding off-piste plots in 12 Swiss ski resorts. The type of piste treatment (machine-grading and years of artificial snowing) was fitted for pairs of piste/off-piste plots. The factor ski piste indicates the difference between piste and off-piste plots. Three plots were excluded from biomass sampling. The sample size for productivity therefore is 73, and the degrees of freedom are indicated in parentheses. (*) $P < 0.1$, * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$

Source of variation	Skeleton analysis						
	MS	F	d.f.	Variance ratio			
				Bare ground (%)	Productivity	Species	Shannon number
Altitude	MS _E	MS _E /MS _{Rest}	1	254.41***	79.96**	5.59(*)	0.58
Resort	MS _R	MS _R /MS _{Rest}	11	9.53*	2.13	5.06(*)	8.00*
Type of plot pair	MS _T	MS _T /MS _{RT}	3	3.18	4.32(*)	1.33	1.62
Piste	MS _P	MS _P /MS _{RP}	1	8.81*	9.78**	5.02*	4.21(*)
Grading × piste	MS _{LP}	MS _{LP} /MS _{RLP}	1	13.64**	10.71*	0.35	7.27*
Duration of snowing × piste	MS _{AP}	MS _{AP} /MS _{RAP}	1	0.02	0.01	0.23	0.26
Grading × duration of snowing × piste	MS _{LAP}	MS _{LAP} /MS _{Rest}	1	2.02	1.83	9.81*	9.99*
Resort × type of plot pair	MS _{RT}	MS _{RT} /MS _{Rest}	23	7.74*	1.01	1.90	2.21
Resort × piste	MS _{RP}	MS _{RP} /MS _{Rest}	11	8.18*	0.90	1.09	2.68
Resort × grading × piste	MS _{RLP}	MS _{RLP} /MS _{Rest}	7	6.05(*)	0.93	1.16	1.85
Resort × duration of snowing × piste	MS _{RAP}	MS _{RAP} /MS _{Rest}	11 (9)	2.74	1.60	0.85	2.27
Rest	MS _{Rest}		4 (3)				
Total			76 (73)				

Table 4. ANOVA table for the proportion of the four functional groups, grasses, woody plants, forbs and legumes, at the plot area measured on 38 ski piste plots and 38 corresponding off-piste plots in 12 Swiss ski resorts. The type of piste treatment (machine-grading and years of artificial snowing) was fitted for pairs of piste/off-piste plots. The factor ski piste indicates the difference between piste and off-piste plots. Three plots were excluded from biomass sampling. The sample size for productivity therefore is 73, and the degrees of freedom are indicated in parentheses. (*) $P < 0.1$, * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$

Source of variation	Skeleton analysis						
	MS	F	d.f.	Variance ratio			
				Cover grass (%)	Cover woody plants (%)	Cover forbs (%)	Cover legumes (%)
Altitude	MS _E	MS _E /MS _{Rest}	1	40.49**	0.30	3.28	0.44
Resort	MS _R	MS _R /MS _{Rest}	11	6.37*	3.76	6.70*	9.95*
Type of plot pair	MS _T	MS _T /MS _{RT}	3	1.02	1.58	0.61	2.38
Piste	MS _P	MS _P /MS _{RP}	1	1.76	13.87**	2.47	5.39*
Grading × piste	MS _{LP}	MS _{LP} /MS _{RLP}	1	0.72	7.67*	0.00	1.54
Duration of snowing × piste	MS _{AP}	MS _{AP} /MS _{RAP}	1	29.86***	9.20*	0.69	0.20
Grading × duration of snowing × piste	MS _{LAP}	MS _{LAP} /MS _{Rest}	1	0.00	0.12	0.99	0.81
Resort × type of plot pair	MS _{RT}	MS _{RT} /MS _{Rest}	23	5.21(*)	1.01	2.69	4.66(*)
Resort × piste	MS _{RP}	MS _{RP} /MS _{Rest}	11	3.23	0.70	1.77	5.30(*)
Resort × grading × piste	MS _{RLP}	MS _{RLP} /MS _{Rest}	7	1.53	1.19	1.02	2.83
Resort × duration of snowing × piste	MS _{RAP}	MS _{RAP} /MS _{Rest}	11	0.26	0.40	0.54	4.14(*)
Rest	MS _{Rest}		4				
Total			76				

for 14% of the species on ungraded piste plots ($P = 0.02$; Tables 1 and 5). The reactions of forb and grass species were not uniform: in six resorts the proportion of forb species was higher on graded compared with ungraded pistes (resort × grading × piste, $P = 0.02$). The proportion of grass species depended on the time since machine-grading: compared with ungraded control plots, the proportion was higher in recently graded pistes, and lower the older the graded pistes were ($P = 0.016$). Species that flower early in the year were reduced in abundance by 28% ($P = 0.018$; Tables 1 and 6) and covered 37%

less ground on graded piste plots than on ungraded ones ($P = 0.004$; Tables 1 and 6).

ARTIFICIAL SNOW

The longer artificial snow had been applied on ski pistes, the higher the moisture and nutrient availability, and the lower the soil base content (indicator values F, N and R: $P = 0.081$, 0.099 and 0.051, respectively; Tables 1 and 2 and Fig. 1). However, we could not detect any effects of artificial snow on plant productivity (Fig. 2).

Table 5. ANOVA table for the proportion of the four functional groups, grasses, woody plants, forbs and legumes, of the total species number per plot measured on 38 ski piste plots and 38 corresponding off-piste plots in 12 Swiss ski resorts. The type of piste treatment (machine-grading and years of artificial snowing) was fitted for pairs of piste/off-piste plots. The factor ski piste indicates the difference between piste and off-piste plots. The dependent variables of were $(\ln(x + 1))$ -transformed prior to analysis. Three plots were excluded from biomass sampling. The sample size for productivity therefore is 73, and the degrees of freedom are indicated in parentheses. (*) $P < 0.1$, * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$

Source of variation	Skeleton analysis						
	MS	MS	d.f.	Variance ratio			
				Grass species (%)	Woody species (%)	Forb species (%)	Legume species (%)
Altitude	MS _E	MS _E /MS _{Rest}	1	2.72	0.08	22.07**	8.59*
Resort	MS _R	MS _R /MS _{Rest}	11	11.33*	2.01	18.79**	2.44
Type of plot pair	MS _T	MS _T /MS _{RT}	3	0.29	0.45	0.26	1.99
Piste	MS _P	MS _P /MS _{RP}	1	0.30	5.72 *	0.24	7.31*
Grading × piste	MS _{LP}	MS _{LP} /MS _{RLP}	1	1.28	10.18 *	0.31	3.19
Duration of snowing × piste	MS _{AP}	MS _{AP} /MS _{RAP}	1	0.02	0.01	0.04	0.08
Grading × duration of snowing × piste	MS _{LAP}	MS _{LAP} /MS _{Rest}	1	0.04	0.09	3.22	0.01
Resort × type of plot pair	MS _{RT}	MS _{RT} /MS _{Rest}	23	3.03	2.36	11.63*	1.11
Resort × piste	MS _{RP}	MS _{RP} /MS _{Rest}	11	6.93*	0.90	6.21	0.36
Resort × grading × piste	MS _{RLP}	MS _{RLP} /MS _{Rest}	7	4.19(*)	0.58	17.73**	1.13
Resort × duration of snowing × piste	MS _{RAP}	MS _{RAP} /MS _{Rest}	11	3.44	0.79	11.84*	0.53
Rest	MS _{Rest}	MS _E /MS _{Rest}	4				
Total			76				

Table 6. ANOVA table for the proportion of snowbed and wind-edge, as well as early flowering and late-flowering species, of the total vegetation cover in a plot (%) measured on 38 ski piste plots and 38 corresponding off-piste plots in 12 Swiss ski resorts. The type of piste treatment (machine-grading and years of artificial snowing) was fitted for pairs of piste/off-piste plots. The factor ski piste indicates the difference between piste and off-piste plots. Three plots were excluded from biomass sampling. The sample size for productivity therefore is 73, and the degrees of freedom are indicated in parentheses. (*) $P < 0.1$, * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$

Source of variation	Skeleton analysis						
	MS	MS	d.f.	Variance ratio			
				Snowbed species (%)	Wind-edge species (%)	Early flowering (%)	Late-flowering (%)
Altitude	MS _E	MS _E /MS _{Rest}	1	85.42***	34.45**	51.38**	5.29(*)
Resort	MS _R	MS _R /MS _{Rest}	11	3.45	3.79	2.45	1.93
Type of plot pair	MS _T	MS _T /MS _{RT}	3	2.18	1.04	1.24	0.61
Piste	MS _P	MS _P /MS _{RP}	1	3.14	0.07	13.90**	3.92(*)
Grading × piste	MS _{LP}	MS _{LP} /MS _{RLP}	1	0.29	0.01	17.93**	2.12
Duration of snowing × piste	MS _{AP}	MS _{AP} /MS _{RAP}	1	13.19**	6.68*	5.68*	0.09
Grading × duration of snowing × piste	MS _{LAP}	MS _{LAP} /MS _{Rest}	1	0.43	0.84	7.35(*)	1.21
Resort × type of plot pair	MS _{RT}	MS _{RT} /MS _{Rest}	23	4.09(*)	0.83	2.87	2.13
Resort × piste	MS _{RP}	MS _{RP} /MS _{Rest}	11	0.79	0.22	1.68	0.74
Resort × grading × piste	MS _{RLP}	MS _{RLP} /MS _{Rest}	7	2.77	2.28	0.86	0.72
Resort × duration of snowing × piste	MS _{RAP}	MS _{RAP} /MS _{Rest}	11	1.56	0.55	1.20	1.74
Rest	MS _{Rest}	MS _E /MS _{Rest}	4				
Total			76				

The impact of artificial snow on diversity was ambiguous. While the use of artificial snow had negative effects on species number and Shannon index on graded pistes, the opposite was found for ungraded pistes (three-way interaction between piste, grading and duration of snowing, $P = 0.034$; Tables 1 and 3).

The application of artificial snow affected the relative proportion of plant functional groups. The longer artificial snow had been used, the more it had reduced the negative effect of the ski piste treatment on the

cover of woody plants per plot ($P = 0.011$; Tables 1 and 4). However, the proportion of a plot covered by grass species declined the longer a ski piste had been treated with artificial snow ($P < 0.001$; Tables 1 and 4). The effect of artificial snow on the species proportion of forbs and the cover of legumes was not uniform but differed between ski resorts (three-way interaction resort × artificial snow × ski piste, $P = 0.014$ and $P < 0.083$, respectively; Tables 5 and 6). The longer artificial snow had been applied to a ski piste, the higher the cover of

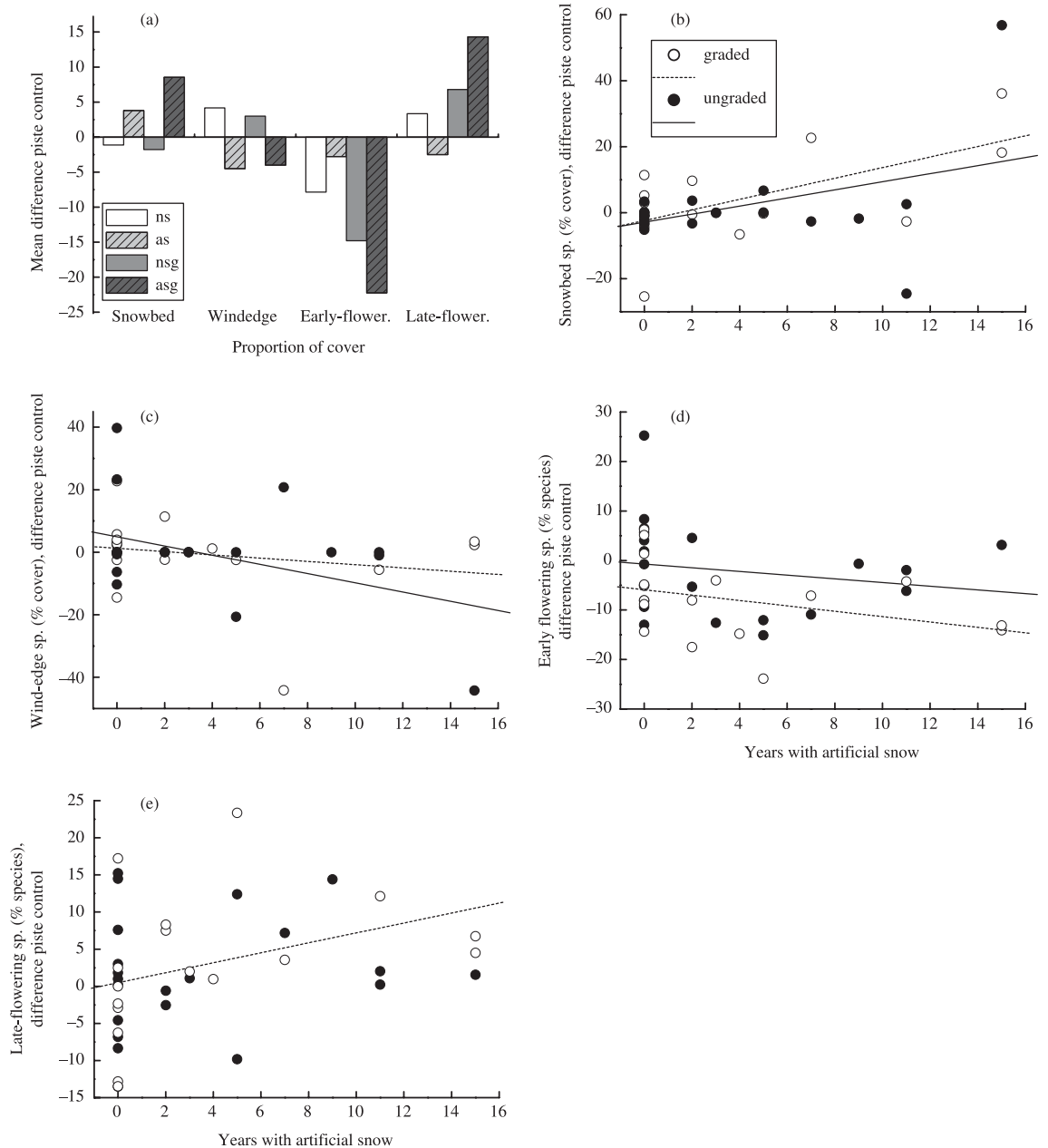


Fig. 4. Differences in ecological groups between ski piste plots and corresponding control plots. (a) Mean differences in the proportion of plot covered by ecological groups for the four ski piste treatments (ns, ungraded pistes with natural snow; as, ungraded pistes with artificial snow; nsg, graded pistes with natural snow; asg, graded pistes with artificial snow). (b–e) The relationship between the differences in (b) percentage cover of snowbed species, (c) percentage cover of wind-edge species, (d) proportion of early flowering species and (e) proportion of late-flowering species and the time since conversion to artificial snow.

snowbed species ($P = 0.004$; Tables 1 and 6 and Fig. 4). Wind-edge species showed the opposite reaction. They covered less ground the longer a ski piste had been treated with artificial snow ($P = 0.024$; Tables 1 and 6 and Fig. 4). The longer artificial snow had been applied, the lower the cover of early flowering plants on piste plots ($P = 0.036$; Tables 1 and 6 and Fig. 4). On the other hand, the relative number of late-flowering species tended to increase the longer artificial snow had been used ($P < 0.096$; Tables 1 and 6 and Fig. 4). Overall, the potentially snow-sensitive groups were affected most by the production of artificial snow.

Discussion

IMPACTS OF SKI PISTES VS. NO PISTE

The changes in indicator values for soil nutrients, moisture and reaction (base content) under ski pistes may be considered beneficial for plant growth (in terms of enhancing growth). However, other non-beneficial factors, including disturbance, seem to prevail because overall productivity and species richness on ski pistes are decreased. The negative effects may be the direct result of disturbance of the vegetation via snow

compaction under skiing and via mechanical abrasion. Although some types of disturbance can increase biodiversity by suppressing dominant species in productive environments (Connell 1979; Vujanovic, Wein & Dale 2002), abiotic stress reduces productivity and dominance in alpine habitats and therefore reverses any positive effects of disturbance on plant diversity (Kammer & Möhl 2002).

The changes in the cover of woody plants on the ski pistes may also be explained by mechanical disturbance. Woody plants (mainly dwarf shrubs of the *Ericaceae*) are particularly sensitive to mechanical injuries because of their size, longevity and vulnerability of their hibernation buds (Körner 1999).

In contrast to woody plants, legumes were more abundant on pistes than next to pistes, perhaps because of decreased competition from shrubs. Legumes may have been responsible for the increased nutrient indicator values on piste plots as a consequence of their ability to fix nitrogen. The reduced abundance of early flowering species on pistes in our study was most probably the result of a narrowed temporal niche for those species. In field surveys, the flowering time of early seasonal species was postponed after soil frosts on pistes with natural snow (Baiderin 1981; Köck *et al.* 1989). A delay in flowering often decreases fecundity and, consequently, can negatively affect the abundance of early flowering species (Kudo 1993; Stanton & Galen 1997).

IMPACTS OF MACHINE-GRADING

Vegetation responses were highly pronounced on graded pistes, most probably because machine-grading of ski pistes is a drastic measure where soil and plants are removed in summer during active plant growth. There was a strong compositional shift from woody plants to grasses or forbs, the extent of which depended partly on the resort and partly on the successional stage of the ski piste. The increased indicator values for nutrients and light may be the result of the disturbance itself (through mobilized nutrients and opened vegetation cover), or of characteristics of the following pioneer species, which often grow with high light and nutrient levels (Grime & Jarvis 1975; Grime 1977). Graded ski pistes with high proportions of bare ground are particularly prone to increased surface runoff and erosion during heavy rain (Löhmansröben & Cernusca 1987). Revegetation processes at high altitudes are slow, even if revegetation measures such as sowing and planting are applied (Bayfield, Urquart & Rothery 1984; Urbanska 1995; Titus & Tsuyuzaki 1999; Fattorini 2001). In our study, the proportion of vegetation cover on graded pistes was negatively correlated with altitude, but positively affected by neither sowing nor time since machine-grading. This indicates how difficult it is to achieve revegetation at high altitudes. Machine-grading therefore is a particularly damaging management activity, the consequences of which are more severe and long lasting at higher altitudes.

IMPACTS OF ARTIFICIAL SNOW

Application of artificial snow increased the moisture indicator values of the vegetation on piste plots. Artificially snowed pistes contained twice as much snow mass as normal pistes at our study sites in the winter of 1999–2000 (Stoeckli & Rixen 2000). Because water for artificial snow making is taken from lakes, rivers or ground water, it usually contains minerals and other chemical compounds (Kammer & Hegg 1990; Kammer 2002), and thus provides a nutrient input during spring melting for about 4 weeks in late spring. Accordingly, the vegetation on piste plots with artificial snow had an increased nutrient indicator value. Adding artificial snow to the ski pistes appeared to mitigate the mechanical disturbance of skiing because woody species became more abundant the longer artificial snow had been applied. Artificial snow is usually produced at the beginning of the winter and lasts beyond the end of the skiing season in spring.

The increase in snowbed and late-flowering species, and the decrease in wind-edge and early flowering species, on pistes with artificial snow probably reflect the shortened growth period resulting from a delay in snowmelt of 2–3 weeks (Newesely 1997; Stoeckli & Rixen 2000). Similar to the effects on normal pistes with their compacted natural snow, the narrowed temporal niche in spring presumably conferred a competitive advantage to the snowbed and late-flowering species over wind-edge and early flowering species (Cernusca *et al.* 1990; Newesely 1997; Rixen *et al.* 2001).

Plant diversity reacted differently to artificial snow on the graded and ungraded pistes. The increase in diversity on the ungraded pistes might be because of the decreased mechanical disturbance. The decrease in diversity on the graded pistes, on the other hand, might be a consequence of a decelerated revegetation process because of the shortened growing period. These effects can be enhanced if ice layers in the artificial snow cover decrease gas permeability (Newesely, Cernusca & Bodner 1994).

Whether the impact of artificial snow on alpine vegetation is considered positive or negative depends on the current state of the vegetation and the environmental objectives of a specific ski resort. If mechanical disturbance through snow-grooming vehicles or ski edges is a major problem, the increased protection afforded by artificial snow can be considered beneficial. However, in the case of endangered habitats poor in nutrients, like oligotrophic fens or nutrient-poor grasslands, the additional nutrients input by the melt water of artificial snow is clearly a negative impact.

We have shown that ski pistes in general, and machine-grading and artificial snow production in particular, cause deviations from natural plant species composition and decrease plant species richness. Machine-grading constitutes the most drastic vegetation disturbance on ski pistes. It should be avoided wherever possible, as it causes lasting damage that cannot be overcome even by

revegetation measures, particularly at higher altitudes. Impacts of ski pistes in general, and of artificial snowing in particular, appear comparatively moderate, but are by no means negligible. With the ongoing intensification of ski resorts, the use of artificial snow will become more prevalent and the vegetation will change over an increasing area. Moreover, impacts of artificial snowing are cumulative and will become even more pronounced in the long term. In summary, mountain regions with a high proportion of areas with extensive outdoor recreation activities, like the European Alps, are facing continuous change of their traditional unique environment and vegetation. Therefore, we recommend that environmental goals in ski resort management should be established and respected. In particular, we recommend carefully recording the vegetation in a specific area before any intensification of use as ski piste, and complete avoidance of areas with vegetation of particularly high conservation value. Moreover, we recommend that large-scale machine-grading should be avoided, and that long-term snow production should be banned in areas where any increase in the supply of nutrients and water is a concern. Overall, the establishment of ski pistes should not be allowed in areas where any changes in vegetation composition or any decrease in plant species richness cannot be tolerated.

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Supplementary material

The following material is available from
<http://www.blackwellpublishing.com/products/journals/suppmat/JPE/JPE1011/JPE1011sm.htm>.

Appendix 1. List of study sites

Appendix 2. List of species

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Forest bird diversity and ski-runs: a case of negative edge effect

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Abstract

Among tourist activities in the Alps, winter sports have a prominent role because of the large scale of changes they cause at the habitat and landscape level. We have analysed whether ski resorts lead to significant threats to the avian diversity in the coniferous forests of the western Italian Alps, by comparing the bird communities of plots located in (1) the forest interior, (2) forest at the edge of ski-runs and (3) forest at the edge of pastures (the latter two are anthropogenic elements of forest fragmentation). Ski-runs produce a negative edge effect in the study forests: plots at their edges present lower bird species richness and Shannon diversity than those located in the forest interior or at the edges of pastures. In particular, birds typical of ecotone habitats seem to favour forest plots set at the edge of pastures. Ski-run-edges are linear landscape features that create high contrast edges; conversely, vegetation structure is more complex at the edge of pastures, attracting a rich and diverse avifauna. In the study area, pastures tend to be abandoned whereas winter sport resorts are increasing in extent. Accordingly, there is a need for coordinated management and cooperation between sport- and land-management agencies, in order to preserve native biodiversity while simultaneously managing land for sport activities.

INTRODUCTION

The creation of edges, i.e. transition zones between adjacent habitats, is one of the effects of habitat fragmentation (Murcia, 1995). Historically, land managers considered habitat fragmentation to be beneficial for biodiversity (Leopold, 1933), on the basis of what was later called the 'edge effect', i.e. the hypothesis that species richness and density increase at the border between different habitats (Odum, 1971). Recent investigations, however, have described radical changes in community structure at edges, suggesting problems from a diversity perspective (Matlack & Litvaitis, 1999). These problems increase when anthropogenic intervention determines a proliferation of edges, emphasising the natural physical gradients in topography, hydrology and substrate (Saunders, Hobbs & Margules, 1991; Andrén, 1994; Rochelle, Lehmann & Wisniewski, 1999; Shochat, Abramsky & Pinshow, 2001). It has been shown, for instance, that anthropogenic forest fragmentation might cause local or regional extinction of the most forest-dependent animal species, as a consequence of increased predation rates and brood parasitism at the forest edge

(Andrén & Angelstam, 1988; Andrén, 1992; Faaborg *et al.*, 1995; Kurosawa & Askins, 2003), inhibition of dispersal and reduction of home range (Forman, 1997) and intensification of human disturbance (McGarigal *et al.*, 2001). In Europe, the effects of habitat fragmentation have been severe in lowland forests that have experienced a long history of anthropogenic disturbances (Hanson, 1983; Cushman & McGargal, 2003; Gurdebeke *et al.*, 2003). The impact of human activities in high-elevation environments is more recent and a common form of disturbance comes from the development of winter sport resorts. Ski-runs, in particular, brought about considerable damage both above and below the timberline: forest tracts are abruptly clear-cut, bulldozers and power shovels are used for soil removal (to provide comfortable slopes for skiers) and artificial seeding, if any, is conducted to control for soil erosion (Siniscalco *et al.*, 1997; Urbanska, Erdt & Fattorini, 1998; Tsuyuzaki, 2002). After construction, tree pruning and cutting of shrubs are carried out at regular intervals and large amounts of chemicals are spread for soil stability (Barni, Siniscalco & Montacchini, 2002).

Despite ski-runs becoming a common feature in alpine landscapes, there is a paucity of research on their effects on wildlife (Delmas, 1986; Watson & Moss, 2004). This study was undertaken to provide information on the effects of ski-runs on the bird communities of the coniferous forests of the Alps. We compared bird diversity and community composition in plots located in (1) the

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forest interior, (2) forest at the edge of ski-runs and (3) forest at the edge of pastures. In particular, we examined whether avian diversity is greater in forest plots located at the edge of an open space – ski-run or pasture – than in the forest interior (as expected when an edge effect occurs). Like ski-runs, pastures have an anthropogenic nature, but while the former form abrupt edges, pastures tend to create more ragged edges. We also investigated bird–habitat relationships, to determine important floristic and structural components of the habitat of the alpine coniferous forest avifauna.

METHODS

Study area

The study was carried out in the coniferous forests of the Alta Val Susa, Val Chisone and Val Germanasca, in the western Italian Alps. We surveyed 10 localities comprising ski areas and a Natural Park (Fig. 1). In 2006, the XX Olympic Winter Games will take place in the study area. Since the 1970s, ski-runs have been constructed both on high-elevation grasslands and within coniferous forests; they were established by scraping off the extant vegetation

and the topsoil and by artificially seeding with prevailing native herbs. Coniferous forests of the area are dominated by the larch *Larix decidua*, but the fir *Abies alba*, Norway spruce *Picea abies*, Arolla pine *Pinus cembra* and Scots pine *Pinus sylvestris* also occur. Broadleaved trees (*Fraxinus excelsior*, *Acer pseudoplatanus*, *Betula pendula*, *Alnus viridis*, *Corylus avellana*, *Sorbus spp.*, *Salix spp.*) are found as scattered individuals within the coniferous matrix. The understorey is sparse, mainly composed of *Juniperus*, *Rhododendron*, *Vaccinium* and *Arctostaphylos* spp.

Bird and habitat sampling design

Field work was carried out in April, May and June 2003. Birds were counted using 50-m fixed radius point-counts, between sunrise and 5 h later in good weather conditions (Bibby *et al.*, 2000). All birds detected during a 7 min period, aurally and/or visually, were recorded. Overall, 252 point-counts were made at 1100–2200 m above sea-level (a.s.l.). The exact location of plots was established in the field by means of a Global Positioning System (GPS) Garmin eTrex® Navigator. Each plot was located at a minimum distance of 200 m from the next nearest sampling plots and we were careful not to record the same

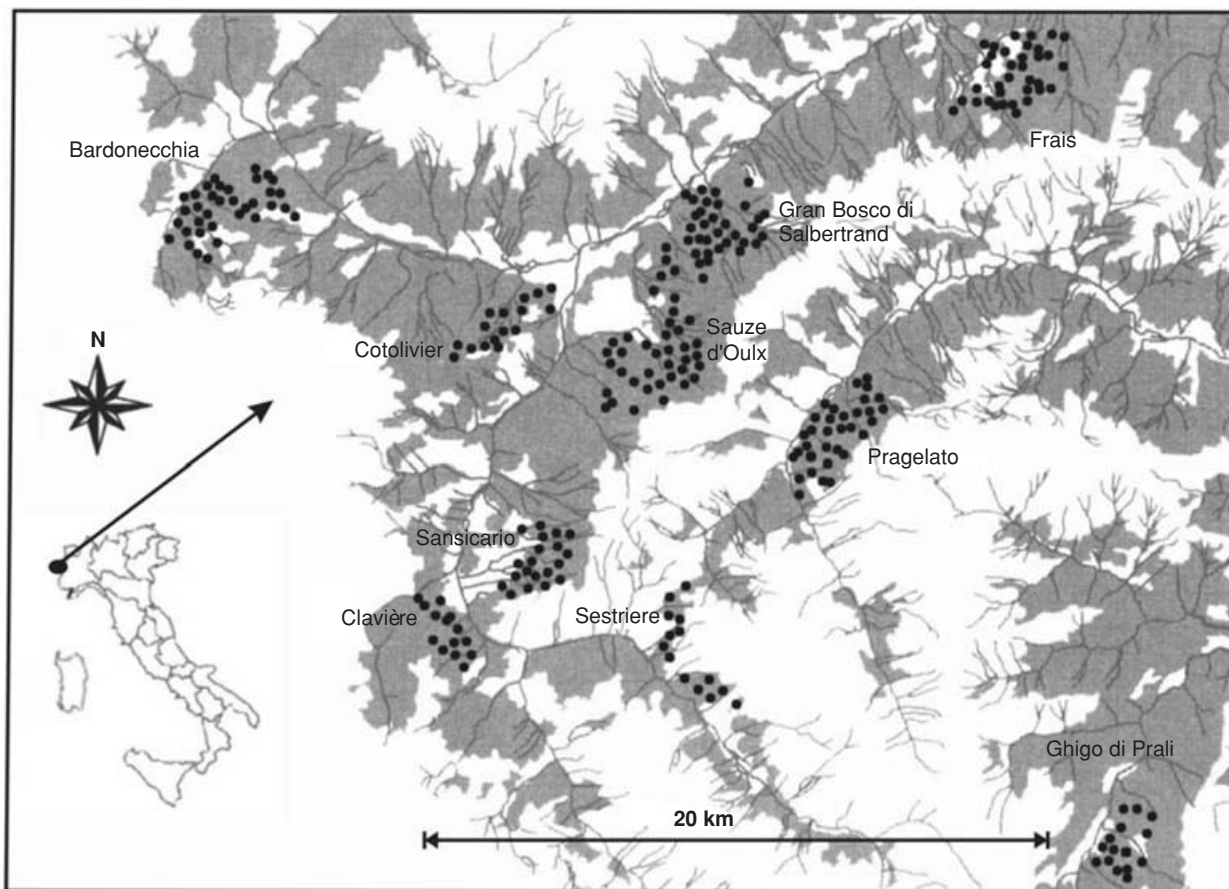


Fig. 1. Geographical location and map of the study area. Survey plots (circles), forests (grey areas) and water courses (lines) are shown. Ski-run strips and small pastures (< 5 ha) cannot be distinguished at this detail. The study ski resorts are located in Sestriere, Clavière, Sansicario, Bardonecchia, Frais, Ghigo di Prali, Pragelato and Sauze d'Oulx. The Gran Bosco di Salbertrand is a Natural Reserve.

individuals on neighbouring points. Three types of plots were defined: forest-interior plots ($n = 112$), ski-run edge plots ($n = 68$) and pasture edge plots ($n = 72$). Ski-run strips were 30–50 m wide and > 500 m long, pastures covered > 1.5 ha. The centre of edge plots was located 50 m from ski-runs and pastures, so that the external perimeter of the plots embraced forest edge on one side. The centre of forest interior plots was located > 200 m from edges (the external perimeter on one side was at a minimum distance of 150 m from edges).

In circular plots of 20 m radius (centred in each census plot), structural parameters of the vegetation were measured. Tree height was measured using a clinometer, tree diameter at breast height was determined using a tape and tree density was established as the inverse of the distance between the nearest trees paced in metres. Ten measurements per plot were taken for tree height, diameter and distance and the averages of these habitat measurements were used in statistical analyses. The variability in canopy profile for each plot was determined through the coefficient of variation of tree height ($CV = SD/\text{mean height} \times 100$). In each point count station of 50 m radius, all trees > 6 cm diameter at breast height were counted and their taxonomic identity recorded, to derive a measure of arboreal diversity per plot (Shannon index: $H' = -\sum p_i \times \ln p_i$, where p_i is the relative frequency of tree species i).

Hence, local habitat at each count-station was depicted by means of six parameters: arboreal diversity (AH), relative abundance of larch (the dominant tree, %L), tree height (H), diameter (DBH), density (D) and variability in canopy profile (CVH). Avian community was described in terms of bird species richness (S), diversity (Shannon index, BH) and the density of three ecological groups of birds: woodland species (birds typical of forest and open forest habitats), ecotone-shrub species (species that use grassland and woodland alternatively or dwell in shrubby areas) and grassland species (birds that require open fields both for breeding and foraging).

Data analysis

Differences between plot types

We tested for differences in mean bird species richness, diversity and density of woodland, ecotone-shrub and grassland species between the three plot types (forest-interior, ski-run-edge and pasture-edge) by means of nested ANOVAs (plots nested into 10 study localities). The values of Shannon diversity was transformed to logarithms ($y = \log(x) + 1$) and those of species richness and density of the three ecological groups were transformed to square roots ($y = \sqrt{x + 0.5}$) to attain a normal distribution.

Relationships between bird community and habitat

Principal component analysis (PCA: [Gaunch, 1984](#)) was chosen to compensate for multicollinearity and to reveal patterns in the data for vegetation structure (DBH, H, D

and CVH variables), using standardised data (zero mean and unit standard deviation).

We used generalised linear models to test for the effects of vegetation structure (three scores of PCA), floristics (arboreal diversity, percent larch cover), elevation, locality and plot type (categorical variable defining forest interior, ski-run- and pasture-edges) on bird species richness, diversity and the abundance of the three ecological groups of birds. Species richness and bird abundance values matched Poisson distribution, whereas species diversity matched a Gaussian distribution. Both Poisson/Gaussian regressions and Akaike's Information Criterion (AIC: [Akaike, 1973](#)) were used to select the most appropriate models, i.e. those fitting best the available data set. AIC is based on the principle of parsimony and helps to identify the model that accounts for the most variation with the fewest variables: the model that best explains the data is that with the lowest AIC. This information criterion is one of the most powerful approaches for model selection from a set of alternative plausible models and it solves the problems of stepwise model selection because no sequential statistical test is conducted ([Burnham & Anderson, 1998](#)).

Generalised linear models and AIC were calculated using the R Package ([Ihaka & Gentleman, 1996](#)).

Relationships between bird species and habitat

Density of bird species at each plot was compared with vegetation characteristics by means of the Canonical Correspondence Analysis (CCA). This is a multivariate technique that ordinales plots using both a primary matrix of species densities and a secondary matrix of environmental variation (ter [Braak, 1986](#)). The primary matrix included 29 bird species, i.e. those contributing with at least eight individuals to the data set, the secondary matrix included floristic and physiognomic descriptors (AH, %L, H, DBH, D and CVH), elevation and plot type. To assess the significance in the CCA axes, we used Monte Carlo simulations to test the hypothesis that there was no correlation between the primary (bird) and secondary (environment) matrices: P values were based on the proportion of 1000 Monte Carlo simulations with an eigenvalue greater than the observed eigenvalue. CCA was performed using PC-ORD ([McCune & Mefford, 1999](#)).

RESULTS

Differences between plot types

Overall, 1256 individuals from 42 species were sampled in 252 plots (see Appendix 1 for a complete list of bird species and Appendix 2 for the distribution of points within plot types and localities). Forest-interior, ski-run and pasture-edge stations showed significant differences in terms of bird diversity and species richness and no significant interaction resulted between locality and plot type (Table 1). Plots located at the edge of pastures support

Table 1. Mean $\pm$ SD of bird species richness, diversity and abundance of woodland, ecotone-bush and grassland species per plot type

	(1) Forest interior	(2) Pasture-edge	(3) Ski-run-edge	Inter-plot differences (nested ANOVA)	Significant pair-wise comparisons at $P < 0.05$
Species richness	4.0 $\pm$ 1.7	4.5 $\pm$ 1.7	3.4 $\pm$ 1.7	$F_{2,225} = 7.6^{***}$	(1) vs (3), (1) vs (2), (2) vs (3)
Diversity	1.2 $\pm$ 0.5	1.4 $\pm$ 0.4	1.0 $\pm$ 0.7	$F_{2,225} = 7.7^{***}$	(1) vs (3), (2) vs (3)
Abundance of woodland species	4.5 $\pm$ 2.0	4.7 $\pm$ 2.2	3.6 $\pm$ 2.1	$F_{2,225} = 5.1^{**}$	(1) vs (3), (2) vs (3)
Abundance of ecotone-bush species	0.5 $\pm$ 0.8	1.0 $\pm$ 1.2	0.7 $\pm$ 1.0	$F_{2,225} = 5.3^{**}$	(1) vs (2)
Abundance of grassland species	0.02 $\pm$ 0.2	0.1 $\pm$ 0.4	0.2 $\pm$ 1.2	$F_{2,225} = 2.2$	

Inter-plot differences were tested with nested ANOVAs (plot type nested into locality). Least-squares deviation (LSD) post-hoc tests were used for pair-wise comparisons of means. vs, versus.

** $P < 0.01$, *** $P < 0.001$.

the greatest bird species richness and diversity, whereas those set at the edge of ski-runs presented the lowest values. Woodland species density was greatest in forest interior and pasture-edge plots, numbers of ecotone-shrub birds peaked in plots at the edge of pastures (Table 1). Using one-way ANOVAs, we tested for differences between bird diversity of plots located in the surroundings of ski-runs and diversity of plots located further away (distance classes: < 0.5 km, $0.5-1$ km and > 1 km). When plots located at the edge of ski-runs were included in the analyses, bird species richness and diversity were significantly lower in forests around ski resorts than in forested areas located at least 1 km apart from them (S: $F_{2,249} = 4.2$, $P < 0.05$; BH: $F_{2,249} = 3.4$, $P < 0.05$). However, when only forest interior and pasture-edge plots were considered, no significant difference was found between distance classes (all $P > 0.05$), suggesting that forest bird diversity only drops in the close proximity of a ski-run.

Relationships between bird community and habitat

The first three principal components (PC1, PC2, PC3) accounted for 89% of the total variation in the vegetation structure matrix, with eigenvalues > 1 . Tree height and diameter at breast height showed the highest correlation with PC1 scores (suggesting a gradient from young *versus* old stands), the variability in tree height provided the

major loading (negative) on PC2, tree density showed a negative correlation with PC3 (Table 2).

Results of generalised linear models of bird species richness, diversity, density of woodland, ecotone-bush and grassland birds on environmental predictors are shown in Table 3. Bird species richness and diversity were best modelled by plot type alone, with the AIC minimised for just this variable (S: AIC = 991, BH: AIC = 345); all other variables and their combinations had greater AIC values (S: AIC > 1000 , BH AIC > 360). Poisson/Gaussian regressions confirmed these results, since they were significant only when plot type was entered, although

Table 3. Generalised linear models of bird species richness, diversity, density of woodland, ecotone-bush and grassland birds on environmental predictors (arboreal diversity, larch cover, elevation, plot type, locality, PCA scores for structural variables)

Predictor	β	SE	P
Species richness			
Plot type pasture-edge	0.29	0.09	< 0.001
Plot type forest interior	0.16	0.08	< 0.05
AIC = 991			
Diversity			
Plot type pasture-edge	0.32	0.08	< 0.001
Plot type forest interior	0.18	0.07	< 0.01
AIC = 345			
Abundance of woodland birds			
Plot type pasture-edge	0.21	0.08	< 0.05
Plot type forest interior	0.12	0.08	$= 0.1$
Elevation	-0.53	0.23	< 0.05
Larch cover	-0.07	0.03	< 0.05
AIC = 1076			
Abundance of ecotone-scrub birds			
Plot type pasture-edge	0.56	0.19	< 0.01
Elevation	-0.13	0.67	< 0.001
AIC = 573			
Abundance of grassland birds			
PC1	-0.39	0.20	< 0.05
PC3	-0.56	0.19	< 0.01
Plot type forest interior	-2.61	0.76	< 0.001
AIC = 173			

PC1 is an indicator of stand age, PC3 of tree density. Only variables included in the best model (i.e. that minimising AIC) are shown; variables were added sequentially. SE, standard error.

Table 2. Results of principal component analysis carried out on habitat structure data

	Factor loadings		
	PC1	PC2	PC3
Tree diameter (cm)	0.62	0.46	0.34
Tree height (m)	0.95	0.06	0.08
Coefficient of variation of tree height (%)	-0.13	-0.97	-0.04
Tree density (1/distance between trees)	-0.14	-0.06	-0.98
Eigenvalues	1.32	1.15	1.07
% Total variance	0.33	0.29	0.27

The highest loadings are in bold type.

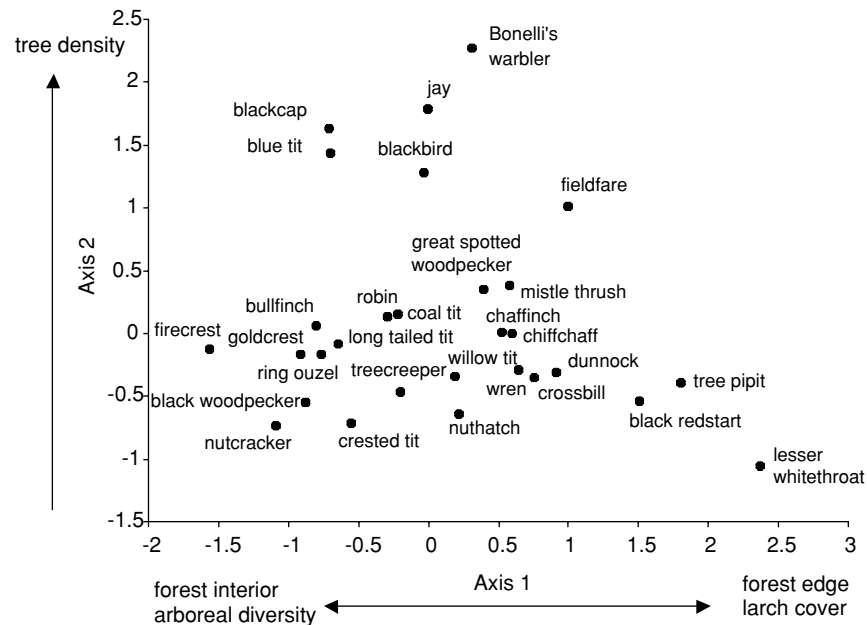


Fig. 2. Scatterplot of the bird community along the first two axes of Canonical Correspondence Ordination (CCA).

the model only explained 5% of the total variation. The density of woodland species decreased with elevation and larch cover and increased in forest interior and pasture-edge plots; birds of the ecotone and shrubs were associated with pasture-edge and high elevation plots, while grassland species only inhabited young woodlots with sparse tree cover at the margin of forest (Table 3).

Relationships between bird species and habitat

In canonical correspondence analysis (CCA), the first CCA axis represented a gradient from high tree diversity plots located in forest interior to larch-rich sites of forest margin (AH: $r = -0.514$; forest-interior: $r = -0.401$; pasture-edge: $r = 0.24$; ski-run-edge: $r = 0.22$; %L: $r = 0.39$), the second axis represented increasing tree density (D: $r = 0.343$). Black woodpecker, treecreeper, nutcracker, firecrest, goldcrest and tits were associated with high arboreal diversity and forest interior plots, whereas lesser whitethroat, tree pipit, black redstart, dunnock and mistle thrush occurred at forest edges dominated by larches (Fig. 2). The first two ordination axes of CCA had significant canonical eigenvalues (< 0.005), as determined by the Monte Carlo test.

DISCUSSION

Among tourist activities in mountains, winter sports have a prominent role because of the large scale of changes they cause at the landscape level and the large demand on energy supply. In particular, the construction of ski-runs in the study area requires the destruction of the pre-existing ecosystems through the removal of topsoil and extant native vegetation (both herbaceous and arboreal) in strips typically 30–50 m wide (Siniscalco & Montacchini, 1990).

Several studies have shown that plant diversity in ski-runs is lower than that of nearby grasslands (Urbanska *et al.*, 1998); vegetation successional stages are also disrupted (Tsuyuzaki, 2002). The effects on the faunal components are less studied and more varied: Shine, Barrott & Elphick (2002), for instance, found that artificial corridors in mountainous forests enable reptiles to penetrate higher into the forest, as these species take advantage of higher solar radiation in anthropogenic clearcuts. On the other hand, Watson & Moss (2004) found out that the breeding success of ptarmigan *Lagopus mutus* can drop as a consequence of ski-development in Scotland. The results of this study show that bird species richness and diversity of forests perforated by ski-runs are significantly lower than those of undisturbed forests. This could be ascribed to the negative edge effect that ski-runs produce in the forest: plots at their edges present lower bird diversity and species richness than those far from edges; conversely, species richness is enhanced when the forest grades into a pasture, suggesting that the latter element causes a local positive edge effect in the forest. We hypothesise that the factors that are responsible for the observed differences are related to the different structure and resource availability of these two types of forest edges. First, ski-runs are linear landscape features that create high contrast edges and bisect patches: the forest ends abruptly and shrub and tree encroachment is prevented by regular pruning and cutting. Second, several ski-runs, especially the steepest ones, have a high proportion of bare ground, due to soil erosion, compaction and the use of chemicals in artificial snow; these factors might limit, in turn, the resources available to forest birds in nearby open habitats. Conversely, at the edge of pastures the shrub layer is denser (due to extra light) and it is not removed as in ski-runs. Furthermore, the shrubs at forest edges may flower more regularly than in the heavily shaded forest interior and the light,

warm conditions at the edge may increase insect density and, in turn, insectivorous bird density. Several studies in temperate forests have shown that the presence of bushes and grassy headlands in forest margins can increase bird diversity (Kroodsma, 1984; Fuller & Warren, 1991; Fautsch, Delvingt & Paquet, 2003). In addition, pasture-edges may offer more suitable habitats for birds because they are older than ski-run edges: both the structure and the plant composition are generally thought to be more complex along old, established edges where there has been a constancy of light penetration (Fuller, 1995). Eventually, grazed patches and their surrounding forest edges may be richer in particular invertebrates that are important prey items for birds, such as bibionids and leatherjackets (flies), which depend upon the availability of organic matter (dung) (McCracken, Foster & Kelly, 1995; Vickery *et al.*, 2001).

Typical ecotone bird species preferentially dwell in plots at the edges of pastures and at high elevations, whereas woodland birds are more abundant in forest interior or at the edge of pastures and tend to avoid pure larch sites and high altitude. The fact that forest interior and pasture edge support similar overall abundance of woodland species probably depends on the relative paucity of true forest specialists, which make up a minor share of woodland birds in the study area. Grassland birds are found only close to the edges and prefer young forests where trees are very sparse. All in all, forest plots at ski-run edges are avoided by both typical forest birds and by ecotone birds, which constitute the bulk of the species sampled. Although this study concentrated on forest habitats, it is worth noting that several open-habitat species were more abundant, or occurred only, in pastures and avoided ski-runs: woodlark *Lullula arborea*, rock bunting *Emberiza cia*, yellowhammer *Emberiza citrinella*, red-backed shrike *Lanius collurio*, whinchat *Saxicola rubetra* and rock sparrow *Petronia petronia* (pers. obs.).

Although bird diversity peaks in forest plots at the edges of pastures, CCA shows that forest interior habitats are important for several species, such as the treecreeper, bullfinch, *Regulus* spp., black woodpecker, nutcracker and most tits; these species are also associated with plots with great tree diversity. Conversely, the lesser whitethroat, tree pipit, black redstart, crossbill and dunnoek seem to prefer larch-rich habitats at forest edges. Stand age, as indicated by tree height and diameter, is a poor predictor of individual species distribution and this contradicts a widely held general view that forest age is important to the distribution of birds in temperate woodlands (Lack, 1939; Lack & Lack, 1951; Moss, 1978; Helle & Mönkkönen, 1990).

A possible caveat of this research concerns the assessment of habitat quality from measures of bird densities, rather than directly estimating bird breeding success. However, the aim of this study was to investigate the value of different forest plots for the bird community on the whole. Ski-runs do negatively affect bird diversity *per se* and this has to be viewed as detrimental, irrespective of the effects on breeding success.

Despite its short-term nature, this study shows that the occurrence of ski-runs in the forested landscapes of

the Italian Alps lowers bird diversity, since a negative edge effect seems to occur. Plots at the edge of pastures have the greatest diversity, but they are avoided by some forest specialists, such as treecreeper and some *Parus* species. The latter species are priority species for forest-conservation (*sensu* Tucker & Evans, 1997) and their dependence upon forest interior emphasises the role of continuous habitat in the conservation of forest specialists. At present, forest clearing for winter sport activities is the major force driving the fragmentation of the coniferous forests, since there is a generalised trend towards pastoral abandonment in several alpine valleys and most grazed fields in the montane belt turned (or are turning) into forests (Laiolo *et al.*, 2004). In view of this, the only way to preserve the biodiversity of the area seems to be that of restoring the gradual transition from forest to the open habitat created by ski-runs. This could be achieved without compromising the safety of the ski-runs, by managing edge vegetation and encouraging side canopies, because physical gradients are much less pronounced behind close edges (Matlack & Litvaitis, 1999). The value of these measures in promoting natural diversity should be tested experimentally, through coordinated management and improved cooperation between sport- and land-management agencies, which should have the mandate to maintain native biodiversity while simultaneously managing land for commodity production, recreation and other objectives. Eventually, studies on the ecological impacts of alpine sport resorts on wildlife should also be encouraged outside the winter period, to understand whether disturbed ecosystems have already moved outside of their natural range of variation and to identify threshold levels within which human activities can be sustainable.

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APPENDIX 1. List of the bird species recorded in the 252 plots. Species were classed as grassland, ecotone-shrub and woodland birds according to their ecological preferences

Common name	Scientific name	Ecological group
Black grouse	<i>Tetrao tetrix</i>	Ecotone-shrub
Great spotted woodpecker	<i>Dendrocopos major</i>	Woodland
Black woodpecker	<i>Dryocopus martius</i>	Woodland
Green woodpecker	<i>Picus viridis</i>	Woodland
Tree pipit	<i>Anthus trivialis</i>	Ecotone-shrub
White wagtail	<i>Motacilla alba</i>	Grassland
Wren	<i>Troglodytes troglodytes</i>	Woodland
Duncock	<i>Prunella modularis</i>	Ecotone-shrub
Whinchat	<i>Saxicola rubetra</i>	Grassland
Robin	<i>Erithacus rubecula</i>	Woodland
Black redstart	<i>Phoenicurus ochruros</i>	Grassland
Redstart	<i>Phoenicurus phoenicurus</i>	Woodland
Ring ouzel	<i>Turdus torquatus</i>	Ecotone-shrub
Blackbird	<i>Turdus merula</i>	Woodland
Fieldfare	<i>Turdus pilaris</i>	Ecotone-shrub
Mistle thrush	<i>Turdus viscivorus</i>	Ecotone-shrub
Lesser whitethroat	<i>Sylvia curruca</i>	Ecotone-shrub
Garden Warbler	<i>Sylvia borin</i>	Ecotone-shrub
Blackcap	<i>Sylvia atricapilla</i>	Woodland
Bonelli's warbler	<i>Phylloscopus bonelli</i>	Woodland
Chiffchaff	<i>Phylloscopus collybita</i>	Woodland
Goldcrest	<i>Regulus regulus</i>	Woodland
Firecrest	<i>Regulus ignicapillus</i>	Woodland
Long-tailed tit	<i>Aegithalos caudatus</i>	Woodland
Coal tit	<i>Parus ater</i>	Woodland
Willow tit	<i>Parus montanus</i>	Woodland
Crested tit	<i>Parus cristatus</i>	Woodland
Blue tit	<i>Parus caeruleus</i>	Woodland
Great tit	<i>Parus major</i>	Woodland
Treecreeper	<i>Certhia familiaris</i>	Woodland
Short-toed treecreeper	<i>Certhia brachydactyla</i>	Woodland
Nuthatch	<i>Sitta europaea</i>	Woodland
Jay	<i>Garrulus glandarius</i>	Woodland
Nutcracker	<i>Nucifraga caryocatactes</i>	Woodland
Carrion crow	<i>Corvus corone corone</i>	Ecotone-shrub
Chaffinch	<i>Fringilla coelebs</i>	Woodland
Citril finch	<i>Serinus citrinella</i>	Woodland
Redpoll	<i>Carduelis flammea</i>	Woodland
Bullfinch	<i>Pyrrhula pyrrhula</i>	Woodland
Crossbill	<i>Loxia curvirostra</i>	Woodland
Rock bunting	<i>Emberiza cia</i>	Grassland
Yellowhammer	<i>Emberiza citrinella</i>	Grassland

APPENDIX 2. Number of points sampled in each plot type and locality

Locality	Forest interior	Pasture-edge	Ski-run-edge
Bardonecchia	14	5	16
Cotolivier	10	6	—
Sauze d'Oulx	11	6	17
Gran Bosco di Salbertrand	26	7	—
Frais	9	16	8
Sansicario	3	7	10
Clavière	12	—	3
Sestriere	1	7	6
Pragelato	19	14	3
Ghigo di Prali	7	5	5
Total	112	72	68

Consequences of pastoral abandonment for the structure and diversity of the alpine avifauna

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Summary

1. There is a long-term trend of depopulation of rural areas and pasture abandonment throughout the Alps. This trend peaked after the Second World War and is now omnipresent. Its ecological consequences are evident mostly below the timberline, where grassland gradually turns into shrub and, ultimately, to forest. This study addresses the consequences of land abandonment and the decline of pastoral practices on the diversity and structure of the bird communities of the Italian Alps.

2. The breeding birds of Gran Paradiso Natural Park in north-western Italy were surveyed, and bird diversity, abundance of grassland, ecotone, woodland and shrub species were analysed using regression in relation to a set of explanatory variables including elevation, local habitat variables, landscape variables and grazing intensity.

3. Avian diversity increased in abandoned pastures as higher numbers of shrub species followed tree and shrub encroachment. Conversely, open habitat species that benefited from grazing were mostly confined to pure grasslands and high altitudes.

4. The effects of grazing were more evident in the montane belt. Grazing maintained open habitats by limiting tree and scrub encroachment, thereby favouring grassland bird species. At higher altitudes, however, grazing had little effect on typical open habitat alpine species (choughs *Pyrrhocorax* spp., water pipit *Anthus spinoletta*, alpine accentor *Prunella collaris*, wheatear *Oenanthe oenanthe*, snow finch *Montifringilla nivalis*, rock thrush *Monticola saxatilis*) and only skylark *Alauda arvensis* and linnet *Carduelis cannabina* preferred grazed meadows.

5. *Synthesis and applications.* This study shows that the abandonment of grazing in the Alps has significant effects on bird species diversity and abundance, especially below the timberline where pastoral decline leads to significant changes in vegetation structure. However, grazing importance differs markedly depending on whether the focus is avian α -diversity or grassland bird abundance. Pastoral abandonment leads to an overall increase in avian diversity, but most species invading abandoned pastures are already common, whereas several grassland bird species that are dependent upon grazed pastures have an unfavourable conservation status. Overall, in terms of bird conservation objectives, large-scale abandonment of long-established pastoral habitats and their complete replacement with scrub, or even forest, is likely to be detrimental.

Key-words: Alps, birds, endangered species, land abandonment, pastures

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Introduction

The farmed landscapes of Europe are very diverse, reflecting an ancient history of human settlement. The intensity of land use, and consequently the composition

and distribution of habitats and wildlife communities, has gradually changed across centuries (Pain & Dixon 1997). In the Alps, pastoral activities have been practised for at least 6000 years (Lichtenberger 1994), thereby shaping the alpine environment: pre-existing shrublands and forests were cleared or burned over large areas to increase the availability of wide open grasslands for livestock. Around and above the timberline, traditional mountain farming mostly consisted of

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the 'alpeggio' system, a sort of transhumance in which pastures were grazed during summer months by non-local livestock, which were moved back to valley bottoms for the rest of the year. Hay for feeding livestock in winter was grown below the timberline, especially on rich valley bottom soils. The development of industry in the alpine valleys made the agricultural management regime of mountainous areas less and less necessary or economically viable. As a consequence, people moved to the valley bottoms and the traditional agropastoral systems collapsed, especially in unproductive and remote mountain valleys (Anthelme *et al.* 2001; Didier 2001). Depopulation of rural areas and reduction of stocking levels is a long-term trend that peaked after the Second World War. Now it is omnipresent throughout the Alps and is one of the major driving forces behind changes in ecosystem function and dynamics (Cernusca, Tappeiner & Bayfield 1999; Dirnböck, Dullinger & Grabherr 2003). The ecological consequences of undergrazing or complete elimination of grazing are evident mostly where conditions are suitable for tree and shrub growth: through processes of natural succession grassland gradually turns into shrub and, ultimately, to forest. In the montane belt, shrubs can cover pasture 6–7 years after abandonment, while the same process takes 10–12 years in the subalpine belt (Reyneri 2001). Tree and shrub encroachment leads to a decrease in open ground habitats and reduces heterogeneity in the landscape. In addition, it can have a considerable impact on vegetation characteristics and animal populations (Beaufoy, Baldock & Clark 1994; Pain & Pienkowski 1997). Birds have served as model organisms in a number of studies investigating the individual-, population- and community-level consequences of changes in agropastoral practices. Farmland habitats are known to hold a rich avifauna, comprising several specialists that are highly dependent upon agriculture and grassland (Pain & Pienkowski 1997). Due to agricultural intensification or to the abandonment of traditional, low-intensity farming systems, many birds typical of agropastoral landscapes have an unfavourable conservation status (Tucker & Evans 1997). In order to prevent or reverse declines in these species, we need a clear idea of their requirements. While much work has been done on the effects of intensification of agriculture on farmland birds (Vickery *et al.* 2001), few researchers have addressed the consequences for birds of land abandonment and the decline of pastoral practices (Blanco, Tella & Torre 1998). Moreover, in Europe most studies have concerned bird communities inhabiting lowland grasslands. Few quantitative data are available on the avifauna of montane and alpine pastures, ranging from the lower limit of 1000–1200 m to an upper limit of 3000 m a.s.l.

The aim of this study was to assess the consequences of land-use changes on the diversity and community structure of alpine birds. We focused on the montane belt, where abandoned pastures have been altered through invasion by trees and shrubs, and on the alpine

belt, where structural changes driven by pastoral abandonment are less evident. We analysed the responses of bird communities in terms of their diversity and abundance to a set of variables (elevation, local habitat and landscape variables, plus a descriptor of grazing intensity), in order to highlight important factors for the avifauna of high altitude environments.

Methods

STUDY AREA

The study was carried out in Gran Paradiso National Park (45°31' N, 7°16' E, north-western Italian Alps; Fig. 1) in June–July 2001 and 2002. The park area extends for about 70 000 ha. The bottom of the valleys is covered by mixed-broadleaved woods (*Castanea sativa*, *Quercus* spp., *Betula alba*, *Populus* spp., *Fraxinus* spp., *Acer* spp.), whereas coniferous woods of European larch *Larix decidua* mixed with Norway spruce *Picea abies*, arrolla pine *Pinus cembra* and, occasionally, silver fir *Abies alba* dominate from around 1000 m a.s.l. to the treeline (1600–2200 m a.s.l.). Progressing up the slopes, trees are replaced by a shrub belt (*Juniperus*, *Rhododendron*, *Vaccinium*, *Arctostaphylos*, *Salix* spp.), wide alpine pastures and natural grassland dominated by *Festuca* and *Nardus* spp. Above 3000 m a.s.l., rocks, screes and snowbeds dominate the alpine landscape, up to the highest peaks and glaciers of Gran Paradiso massif (4061 m a.s.l.). Non-woody vegetation below the timberline consists mainly of semi-natural grasslands dominated by grasses (Gramineae) and green alder *Alnus viridis* shrub growing on disturbed sites (wet and steep slopes, avalanche tracks).

In the study area the decline of stocking levels and summer transhumance activities has precipitated a marked reduction in the extent of grassland below the treeline (Fleury *et al.* 2001). In abandoned pastures, shrubs such as *Berberis*, *Rhododendron*, *Juniperus*, *Alnus*, *Salix* spp., bracken *Pteridium aquilinum* and European larch are encroaching rapidly from field borders and colonizing previously open habitats (Cavallero *et al.* 1997). In pastures that are still exploited, grazing pressure is normally weak, as it occurs for very short periods: 1–2 (sometimes 3) months in July–September.

BIRD SURVEY AND QUANTIFICATION OF LOCAL HABITAT STRUCTURE, GRAZING PRESSURE AND LANDSCAPE PARAMETERS

The grasslands used in this study covered a wide range of altitudes (1000–2800 m a.s.l.) and differed greatly in topography, size (from less than 1 to 1200 ha) and degree of shrub and tree cover. In such heterogeneous landscapes, traditional survey methods such as fixed radius point counts or transects are inappropriate, as differences in bird detectability would bias intersite comparisons. We therefore used a standardized area count method (Bibby *et al.* 2000), surveying birds in

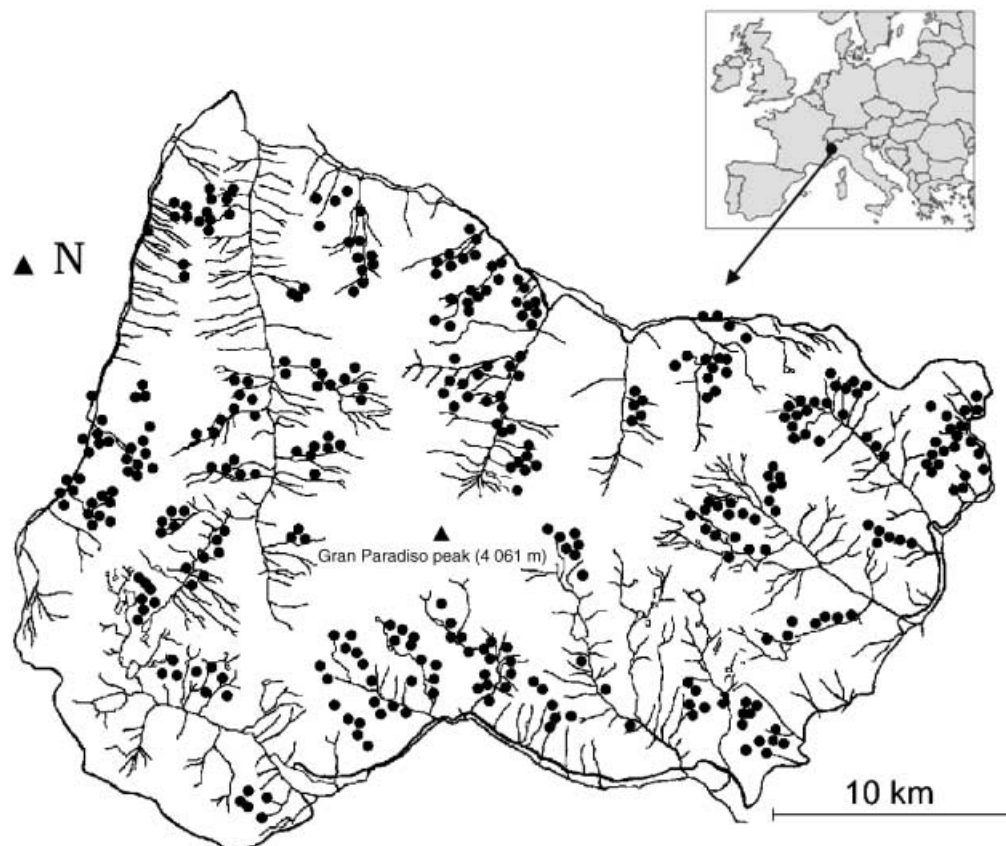


Fig. 1. Location of the study area and plots (solid circles); water courses are also shown. The distribution of plots matches that of pastures and abandoned pastures (alpeggi) in the study area; the central zone was under-sampled because it includes bare rocks and glaciers above 3000 m a.s.l.

circular plots of radius 50 m. Counts lasted 15 min. During the first 5 min of the recording period the observer stood still and quiet at the centre of the plot, as in a standard point count, while in the latter part of the count the observer moved around and stopped at suitable vantage points to look and listen, recording all birds seen or heard within the plot. This method is particularly useful when comparing community structure of habitats that differ in vegetation density. Each census plot was visited twice (in June and July of the same year) and the largest values from the two censuses were used as a measure of bird species abundance per plot; overall, 350 plots were visited on two occasions (Fig. 1). Each day a 5–18-km long transect was walked, in an ascent of 800–1500 m. Plots along daily transects were located 200–6000 m away from each other; we were very careful not to record the same individuals on neighbouring plots by tracking birds with binoculars if they were flushed off.

For each plot we calculated the following five variables: vegetation (grass and shrub) height (H , mean value of 40 measurements per plot taken with a wooden dowel subdivided into 1-cm units; in grazed pastures these were taken prior to grazing); heterogeneity of vegetation height [$CV = H/SD(H) \times 100$]; percentage shrub cover; percentage tree cover; and percentage boulder/stone cover (percentages estimated by eye).

Grazing pressure was estimated, after interviewing local people and consulting the archives of the park as: 0, abandoned pasture where grazing no longer occurred; 1, low to moderate grazing intensity (grasslands were either rapidly crossed by sheep/cows or grazed by free-ranging livestock); 2, high grazing intensity (high stocking levels, with cattle kept in fenced pastures until the whole area was grazed); 3, very high utilization (haymaking associated with grazing, so that the herb layer was kept uniformly short). In the interest of clarity, the terms 'high' and 'very high' have a relative value, as the pastoral activities in the study area were largely extensive. Two landscape variables were calculated from land cover data in the Gran Paradiso GIS database (digitized from 1 : 10 000 aerial photographs) using ArcView (version 3.1, ESRI, CA): the amount of contiguous grasslands (total grassland area) around each census plot and the distance between each plot and the nearest woodland (nearest-neighbour distance from woodland).

DATA ANALYSIS

Plots on each transect that were close together were more likely to be similar in bird community composition than those far apart. Accordingly, we tested for plot autocorrelation within transects with Moran's I coefficient (Moran 1950), a weighted correlation coefficient

used to detect departures from spatial randomness. This index varies between -1 and 1 , and a high value indicates positive autocorrelation between plots along a transect. The autocorrelation between the study plots was low (mean $I = -0.02$, range -0.40 – 0.20 , $n = 70$ daily transects). Monte Carlo tests with 100 permutations of the data set were used to test for the significance of spatial autocorrelation coefficients via randomization, allowing us to determine if the observed coefficients were significantly different from a random pattern. In all cases, probability levels were > 0.05 , suggesting that plots were spatially independent. Moran's I and Monte Carlo randomization were performed with RookCase Software (Sawada 1999).

We classified bird species into four major ecological groups: open habitat–grassland species (hereafter grassland species, species that require open fields both for breeding and foraging); ecotone species (species that use grassland and woodland alternatively); shrub species (species that dwell in shrubby areas); and woodland species (species typical of forest and open forest habitats) (see the Appendix).

Bird community structure at each individual plot was expressed in terms of diversity (Shannon index: $H' = -\sum p_i \times \ln p_i$, where p_i is the relative frequency of species i) and abundance of the four ecological groups. Results obtained by considering species richness per plot were similar to those achieved using Shannon diversity; hence only the latter index was considered here, as a measure of avian α -diversity.

To reveal patterns in the local habitat structure and compensate for multicollinearity we summarized habitat attributes with a principal components analysis (PCA) on standardized data (zero mean and unit SD). PCA condensed the original information on three derived axes (PC1, PC2 and PC3) having the benefit of being orthogonal and uncorrelated (Jongman, ter Braak & Van Tongeren 1995). This gave three main factors with eigenvalue > 1 that explained 73.5% of the variability of the data set. Percentage shrub cover and vegetation height showed the highest correlation with PC1 scores (factor loadings $R = 0.87$ and 0.80 , respectively); PC2 was positively correlated with percentage stone cover ($R = 0.78$) and negatively correlated with tree cover ($R = -0.66$), whereas heterogeneity of vegetation height provided the major loading on PC3 ($R = 0.97$). Hereafter PC1, PC2 and PC3 are termed SHRUB-HEIGHT, STONE-TREE and VEGHETERO, respectively.

Mean diversity and abundance of ecological groups were used as dependent variables in stepwise multiple regression analyses using (i) local habitat variables (three PCA scores), (ii) landscape variables, (iii) grazing pressure levels and (iv) elevation as quantitative predictors. To attain a normal distribution, these variables were log-transformed ($y = \log(x + 1)$). Because this transformation proved to be ineffective with the variables bird diversity, abundance of shrub species, abundance of ecotone species and abundance of woodland species, in these four cases normality was achieved through

Box–Cox transformation [$y = (x^\lambda - 1)/\lambda$, with $\lambda = 0.92$ for bird diversity and abundance of woodland species, $\lambda = 0.98$ for the abundance of shrub species and $\lambda = 0.50$ for the abundance of ecotone species; Box & Cox 1964].

Before carrying out these regressions, we further tested for correlations between the variables. Grazing pressure proved to be negatively correlated with both elevation ($R = -0.31$) and SHRUB-HEIGHT ($R = -0.30$; with 9% of the variability in SHRUB-HEIGHT being explained by grazing). To control for the effects of vegetation structure and topography on grazing, we used the residuals of the regression between grazing levels vs. elevation and SHRUB-HEIGHT rather than raw values in all the regression models.

In keeping with Herrando & Brotons (2002), we used a parsimonious approach assuming that bird diversity and abundance were affected primarily by elevation, local habitat and grazing pressure, and then by the landscape. A stepwise multiple regression analysis was carried out in two steps. First, bird diversity and abundance of the four ecological groups were used as dependent variables and (i) elevation, (ii) SHRUB-HEIGHT, (iii) STONE-TREE, (iv) VEGHETERO and (v) residuals of grazing pressure (partialling out the effects of elevation and SHRUB-HEIGHT) were used as predictors. Secondly, we used the residuals of the former regression as the dependent variable and (i) total grassland area and (ii) nearest-neighbour distance from woodland as the predictors.

Differences in environmental variables (local habitat and landscape) and bird community among the four grazing levels were also tested by means of one-way ANOVAS on log- or Box–Cox-transformed data (in the case of environmental variables, bird diversity, abundance of grassland, edge, shrub and woodland species) and χ^2 tests of independence (occurrence of the most common species); in this analysis the altitudinal ranges of 1000–1900 (montane belt) and 1900–2800 (subalpine and alpine belt) m a.s.l. were considered separately.

In order to verify the accuracy of our approach, one-sample Kolmogorov–Smirnov tests were always carried out to test whether the residuals of previous models fit a Gaussian distribution: in all the cases Kolmogorov–Smirnov d was < 0.06 , and $P > 0.10$, suggesting that all residuals were still normally distributed.

Results

In 350 independent plots we recorded the occurrence of 59 species (see the Appendix), of which 18 were grassland, nine ecotone, four shrub and 25 woodland species. Three species were unclassified either because they occurred in all habitats, for example the cuckoo *Cuculus canorus* L., or because they depended on other habitat features, e.g. wallcreeper *Tichodroma muraria* (L.) on cliffs and dipper *Cinclus cinclus* C.L. Brehm on streams. Grasslands supported the greatest number of threatened species (one-third of grassland species were

declining or vulnerable; *sensu* Tucker & Heath 1994), whereas ecotones, woodlands and shrubs, respectively, held 11%, 4% and 0% of birds with an unfavourable conservation status (see the Appendix).

Within the PCA scores of local habitat, bird diversity was positively correlated with SHRUB-HEIGHT and negatively correlated with STONE-TREE, whereas the four ecological groups showed contrasting responses to habitat predictors. Abundance of grassland and ecotone species decreased at increasing SHRUB-HEIGHT, whereas shrub and woodland species did the opposite. On the other hand, the abundance of ecotone and grassland species showed opposite trends with respect to the elevation, as grassland species increased and ecotone species decreased at increasing altitude. Ecotone and woodland species were also negatively affected by stone cover and positively affected by tree cover (as represented by STONE-TREE).

By considering grazing pressure, the species diversity and abundance of shrub and woodland species were all negatively correlated with grazing pressure, whereas

grassland species were significantly more abundant in grazed pastures (Table 1).

Once local habitat factors, elevation and grazing were controlled for using the residuals of the former model, species diversity and the abundance of woodland species peaked in plots close to woodlands. Conversely, grassland species were positively affected by the distance from the forest (Table 1).

When testing for differences in local habitat and landscape variables among the four levels of grazing pressure, below 1900 m, abandoned and slightly grazed fields showed significantly greater cover of shrubs, trees and stones. Vegetation was significantly taller in abandoned pastures and in fields where both haymaking and grazing occurred (level 3 in grazing pressure), whereas the total grassland patch area was larger in pastures undergoing high utilization (level 2). Above 1900 m a.s.l., abandoned pastures contained significantly taller vegetation and greater shrub cover, while highly grazed plots had the largest grassland patch area. With reference to bird community metrics in the altitudinal range

Table 1. Multiple regression models on bird species diversity and abundance of four ecological groups (grassland, ecotone, shrubland and woodland species). The models were conducted in two steps. Step 1: bird diversity and abundance of four ecological groups as dependent variables and elevation, local habitat variables (SHRUB-HEIGHT, STONE-TREE and VEGHETERO) and grazing pressure* as predictors. Step 2: residuals of the former analysis as dependent variables and landscape variables as predictors. At each step, a backwards stepwise procedure was used; only variables that entered in the model are shown

Variable		Coefficient	SE	<i>t</i> -value	<i>P</i>	<i>R</i> ²	<i>F</i>	<i>P</i>
Step 1: local habitat, elevation and grazing pressure*								
Species diversity	Intercept	-0.10	0.03	3.10	< 0.01	0.09	<i>F</i> _{3,346} = 11	< 0.01
	SHRUB-HEIGHT	0.08	0.03	2.63	< 0.01			
	STONE-TREE	-0.11	0.03	3.41	< 0.01			
	Grazing pressure*	-0.11	0.03	3.56	< 0.01			
Abundance of grassland species	Intercept	-4.9	0.81	6.04	< 0.01	0.23	<i>F</i> _{3,346} = 35	< 0.001
	Elevation	1.63	0.25	6.62	< 0.01			
	SHRUB-HEIGHT	-0.09	0.02	5.29	< 0.01			
	Grazing pressure*	0.04	0.02	2.34	< 0.05			
Abundance of ecotone species	Intercept	12.9	4.01	3.17	< 0.01	0.10	<i>F</i> _{3,346} = 12	< 0.01
	Elevation	-3.63	1.23	2.94	< 0.01			
	SHRUB-HEIGHT	-0.27	0.08	3.51	< 0.01			
	STONE-TREE	-0.23	0.06	2.86	< 0.01			
Abundance of shrub species	Intercept	-0.53	0.04	12.5	< 0.001	0.44	<i>F</i> _{2,347} = 138	< 0.001
	SHRUB-HEIGHT	0.67	0.04	15.9	< 0.001			
	Grazing pressure*	-0.20	0.04	4.7	< 0.001			
Abundance of woodland species	Intercept	36.3	6.92	5.24	< 0.01	0.31	<i>F</i> _{4,345} = 39	< 0.001
	Elevation	-10.4	2.09	4.95	< 0.01			
	SHRUB-HEIGHT	0.90	0.13	6.83	< 0.01			
	STONE-TREE	-0.46	0.13	3.33	< 0.01			
	Grazing pressure*	-0.50	0.13	4.24	< 0.01			
Step 2: landscape								
Species diversity	Intercept	0.28	0.11	2.60	< 0.01	0.02	<i>F</i> _{1,348} = 8.6	< 0.01
	Nearest-neighbour distance from woodland	-0.13	0.05	2.94	< 0.01			
Abundance of grassland species	Intercept	-0.40	0.11	3.60	< 0.01	0.05	<i>F</i> _{1,348} = 17	< 0.01
	Nearest-neighbour distance from woodland	0.19	0.05	4.09	< 0.01			
Abundance of ecotone species	Intercept	0.38	0.11	3.46	< 0.01	0.04	<i>F</i> _{1,348} = 15	< 0.01
	Nearest-neighbour distance from woodland	-0.18	0.05	3.92	< 0.01			

*Residuals of grazing pressure vs. elevation and SHRUB-HEIGHT (predictors), in order to partial out the effects of vegetation structure and elevation on grazing intensity.

of 1000–1900 m a.s.l., diversity peaked in abandoned pastures, but this habitat was not attractive to grassland species. Conversely, shrub and woodland species were more abundant in abandoned pastures. At the species level, eight species were significantly more common in abandoned or lightly grazed fields [dunnock *Prunella modularis* (L.), wren *Troglodytes troglodytes* (L.), chiffchaff *Phylloscopus collybita* (Vieillot), lesser whitethroat *Sylvia curruca* (L.), robin *Erithacus rubecula* (L.), garden warbler *Sylvia borin* (Boddaert), coal tit *Parus ater* L. and willow tit *Parus montanus* Conrad], whereas four species preferred grazed or mown fields [fieldfare *Turdus pilaris* L., red-backed shrike *Lanius collurio* L., whinchat *Saxicola rubetra* (L.) and white wagtail *Motacilla alba* L.; Table 2]. Above 1900 m a.s.l., differences were tested only among the first three grazing levels, as haymaking associated with grazing is no longer practised at such elevations. Bird diversity and

abundance of shrub and woodland species were still greater in abandoned pastures; ecotone species were more abundant in slightly grazed pastures, whereas there was no difference in numbers of grassland species in abandoned or grazed pastures. At the species level, dunnock, wren and willow tit *Parus montanus* still preferred abandoned fields, linnet *Carduelis cannabina* (L.) was more common in slightly grazed fields and skylark *Alauda arvensis* L. favoured grasslands under heavier grazing regimes (Table 3). Below 1900 m a.s.l., the bird community of abandoned pastures was dominated by woodland and shrub species (respectively 45.6% and 26.1% of all the individuals observed), that of grazed pastures by grassland and ecotone species (Table 4); above 1900 m, grassland species made up a disproportionate share of the avifauna in both abandoned and grazed pastures (Table 4).

Table 2. Mean $\pm$ SD of habitat variables, landscape variables, bird diversity and abundance of the four ecological groups in plots under different grazing levels below 1900 m a.s.l. The frequency of occurrence (%) of the most common species is also shown. Differences were tested with one-way ANOVAs and χ^2 test of independence (d.f. = 3). Grazing levels 0, 1, 2 and 3 represent a gradient of increasing sward utilization. * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$. See the Appendix for the scientific names of the species listed

	Grazing level				Differences
	0 <i>n</i> = 46 plots	1 <i>n</i> = 21 plots	2 <i>n</i> = 27 plots	3 <i>n</i> = 19 plots	
Below 1900 m a.s.l. (montane belt)					
Vegetation height (cm)	37.4 $\pm$ 34.5	13.2 $\pm$ 7.6	21.8 $\pm$ 26.9	37.4 $\pm$ 29.9	$F_{3,109} = 5.90^{***}$
Heterogeneity of vegetation height (CV percentage)	42.0 $\pm$ 26.1	42.1 $\pm$ 15.4	46.9 $\pm$ 27.9	45.7 $\pm$ 33.3	$F_{3,109} = 0.64$
Shrub cover (%)	34.4 $\pm$ 34.1	7.7 $\pm$ 14.9	1.41 $\pm$ 2.4	1.37 $\pm$ 3.5	$F_{3,109} = 5.36^{**}$
Tree cover (%)	6.54 $\pm$ 10.0	3.14 $\pm$ 7.2	0.39 $\pm$ 1.1	2.26 $\pm$ 7.1	$F_{3,109} = 10.7^{***}$
Boulder/stone cover (%)	10.5 $\pm$ 5.5	10.1 $\pm$ 12.0	1.98 $\pm$ 4.8	0.68 $\pm$ 2.4	$F_{3,109} = 5.90^{***}$
Nearest-neighbour distance from woodland (m)	226 $\pm$ 370	181 $\pm$ 285	98 $\pm$ 164	239 $\pm$ 341	$F_{3,109} = 0.17$
Total grassland area (km ²)	1.03 $\pm$ 2.2	0.84 $\pm$ 1.5	4.14 $\pm$ 4.3	1.85 $\pm$ 2.9	$F_{3,109} = 6.82^{***}$
Bird diversity	1.25 $\pm$ 0.6	0.91 $\pm$ 0.4	0.77 $\pm$ 0.6	0.85 $\pm$ 0.6	$F_{3,109} = 4.50^{**}$
Abundance of grassland species	1.17 $\pm$ 1.8	1.62 $\pm$ 1.6	1.63 $\pm$ 1.7	2.68 $\pm$ 2.5	$F_{3,109} = 3.00^{*}$
Abundance of ecotone species	0.59 $\pm$ 1.0	1.00 $\pm$ 1.3	1.41 $\pm$ 1.6	1.53 $\pm$ 2.3	$F_{3,109} = 1.95$
Abundance of shrub species	1.63 $\pm$ 1.5	0.43 $\pm$ 0.9	0.04 $\pm$ 0.2	0.00 $\pm$ 0.00	$F_{3,109} = 18.9^{***}$
Abundance of woodland species	2.85 $\pm$ 3.01	1.24 $\pm$ 1.5	0.74 $\pm$ 1.7	0.79 $\pm$ 1.3	$F_{3,109} = 7.51^{***}$
Frequency of occurrence (%)					
Black redstart	21.7	28.6	14.8	0.0	$\chi^2 = 6.5$
Red-backed shrike	4.4	4.8	0.0	21.1	$\chi^2 = 9.3^{*}$
White wagtail	0.0	0.0	18.5	21.1	$\chi^2 = 14.3^{**}$
Rock bunting	15.2	9.5	0.0	5.3	$\chi^2 = 5.2$
Whinchat	8.7	28.6	55.6	63.2	$\chi^2 = 26.6^{**}$
Tree pipit	15.2	33.3	29.6	15.7	$\chi^2 = 4.1$
Fieldfare	2.2	0.0	11.1	15.8	$\chi^2 = 6.7^{*}$
Mistle thrush	15.2	19.1	18.5	0.0	$\chi^2 = 4.0$
Ring ouzel	4.4	4.8	14.8	0.0	$\chi^2 = 5.1$
Carrion crow	4.4	4.8	11.1	15.8	$\chi^2 = 3.3$
Redpoll	8.7	0.0	11.1	15.8	$\chi^2 = 3.6$
Dunnock	41.3	14.3	3.7	0.0	$\chi^2 = 22.4^{**}$
Garden warbler	54.4	9.5	0.0	0.0	$\chi^2 = 40.3^{**}$
Lesser whitethroat	15.2	0.0	0.0	0.0	$\chi^2 = 10.9^{**}$
Wren	34.8	4.8	0.0	5.3	$\chi^2 = 20.9^{**}$
Robin	34.8	4.8	7.4	0.0	$\chi^2 = 18.3^{**}$
Willow tit	17.4	9.5	3.7	0.0	$\chi^2 = 6.2^{*}$
Coal tit	17.4	19.1	0.0	0.0	$\chi^2 = 9.0^{**}$
Chiffchaff	26.1	9.5	7.4	0.0	$\chi^2 = 9.9^{*}$
Chaffinch	23.9	19.1	18.5	10.5	$\chi^2 = 1.6$
Blackcap	10.8	4.8	0.0	10.5	$\chi^2 = 3.4$

Table 3. Mean $\pm$ SD of habitat variables, landscape variables, bird diversity and abundance of the four ecological groups in plots under different grazing levels above 1900 m a.s.l. The frequency of occurrence (%) of the most common species is also shown. Differences were tested with one-way ANOVAS and χ^2 test of independence (d.f. = 2). * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$. Plots under grazing level 3 were not recorded above 1900 m. See the Appendix for the scientific names of the species listed

	Grazing level			Differences
	0 <i>n</i> = 119 plots	1 <i>n</i> = 93 plots	2 <i>n</i> = 25 plots	
Above 1900 m a.s.l. (subalpine and alpine belts)				
Vegetation height (cm)	16.5 $\pm$ 29.2	6.6 $\pm$ 4.3	5.9 $\pm$ 2.8	$F_{2,234} = 5.53^{**}$
Heterogeneity of vegetation height (CV percentage)	51.3 $\pm$ 63.4	41.0 $\pm$ 17.2	46.1 $\pm$ 13.5	$F_{2,234} = 1.57$
Shrub cover (%)	21.4 $\pm$ 35.1	8.21 $\pm$ 19.7	2.0 $\pm$ 6.2	$F_{2,234} = 5.00^{**}$
Tree cover (%)	0.5 $\pm$ 2.5	0.19 $\pm$ 0.8	0.08 $\pm$ 0.3	$F_{2,234} = 0.43$
Boulder/stone cover (%)	16.7 $\pm$ 18.5	17.0 $\pm$ 19.4	12.7 $\pm$ 13.2	$F_{2,234} = 0.01$
Nearest-neighbour distance from woodland (m)	765 $\pm$ 781	830 $\pm$ 1148	483 $\pm$ 291	$F_{2,234} = 0.00$
Total grassland area (km ²)	2.30 $\pm$ 2.5	2.34 $\pm$ 3.1	5.37 $\pm$ 4.8	$F_{2,234} = 3.85^*$
Bird diversity	0.98 $\pm$ 0.5	0.79 $\pm$ 0.6	0.79 $\pm$ 0.6	$F_{2,234} = 3.69^*$
Abundance of grassland species	3.7 $\pm$ 4.3	4.09 $\pm$ 6.1	4.72 $\pm$ 3.5	$F_{2,234} = 1.59$
Abundance of ecotone species	0.44 $\pm$ 1.1	0.88 $\pm$ 1.5	0.40 $\pm$ 1.0	$F_{2,234} = 3.71^*$
Abundance of shrub species	0.57 $\pm$ 1.2	0.12 $\pm$ 0.4	0.16 $\pm$ 0.6	$F_{2,234} = 7.47^{***}$
Abundance of woodland species	0.75 $\pm$ 1.55	0.40 $\pm$ 1.0	0.20 $\pm$ 0.8	$F_{2,234} = 3.70^*$
Frequency of occurrence (%)				
Black redstart	54.6	50.5	32.0	$\chi^2 = 4.2$
Wheatear	41.2	45.2	56.0	$\chi^2 = 1.9$
Rock thrush	3.4	2.2	4.0	$\chi^2 = 0.3$
Whinchat	1.7	4.3	8.0	$\chi^2 = 2.9$
Water pipit	57.1	47.3	68.0	$\chi^2 = 4.1$
Alpine accentor	10.1	3.2	12.0	$\chi^2 = 4.3$
Skylark	0.8	6.5	12.0	$\chi^2 = 8.3^*$
Snowfinch	4.2	1.1	0.0	$\chi^2 = 2.8$
Red-billed chough	4.2	3.2	4.0	$\chi^2 = 0.1$
Alpine chough	15.1	18.3	16.0	$\chi^2 = 0.4$
Linnet	4.2	14.0	8.0	$\chi^2 = 6.5^*$
Tree pipit	7.6	9.7	0.0	$\chi^2 = 2.6$
Mistle thrush	8.4	17.2	4.0	$\chi^2 = 2.6$
Ring ouzel	8.4	9.7	0.0	$\chi^2 = 5.1$
Dunnock	23.5	8.6	8.0	$\chi^2 = 10.0^{**}$
Lesser whitethroat	9.2	2.2	4.0	$\chi^2 = 4.0$
Wren	15.1	4.3	4.0	$\chi^2 = 8.1^*$
Willow tit	5.9	0.0	0.0	$\chi^2 = 7.2^*$
Nutcracker	3.4	3.2	0.0	$\chi^2 = 0.9$
Chaffinch	10.9	8.6	4.0	$\chi^2 = 1.3$
Redpoll	5.9	4.3	0.0	$\chi^2 = 1.7$

Table 4. Percentage relative abundance of the ecological groups (*n*, individuals of the four groups in turn divided by the total number of individuals observed) in plots under different grazing pressure below and above 1900 m a.s.l. Differences among the four groups were tested with χ^2 goodness-of-fit tests. Grazing levels 0, 1, 2, 3 represent a gradient of increasing sward utilization

	Grazing level			
	0	1	2	3
Below 1900 m a.s.l. (montane belt)				
Grassland species (%)	18.8	37.8	42.7	53.7
Ecotone species (%)	9.4	23.3	36.9	30.5
Shrub species (%)	26.1	10.0	1.0	0.0
Woodland species (%)	45.6	28.9	19.4	15.8
<i>P</i>	< 0.001	< 0.001	< 0.001	< 0.001
Above 1900 m a.s.l. (subalpine and alpine belts)				
Grassland species (%)	67.5	74.5	86.1	
Ecotone species (%)	8.2	16.1	7.3	
Shrub species (%)	10.5	2.2	2.9	
Woodland species (%)	13.8	7.3	3.7	
<i>P</i>	< 0.001	< 0.001	< 0.001	

Discussion

Ecologists face the complex task of identifying pertinent predictors of community structure within a plethora of environmental characteristics at different scales. The dependence of species–habitat relationships on many factors, ranging from local vegetation structure to landscape features, suggests that several processes operate simultaneously at different scales to influence the community (Pearman 2002). In this study, we developed a conservative model to analyse the relationships between species and environment, supposing that birds are primarily affected by the environmental conditions in their immediate surroundings and only secondarily by the landscape matrix. We believe that such an approach is appropriate for many of the small passerines that are considered here. Individuals often present a restricted range (compared with larger birds), and we hypothesize that they respond primarily to the habitat within their

territories, and then secondarily to the conditions outside. By using this approach and exploiting residuals, we attempted to reduce multicollinearity among predictors.

THE EFFECT OF ELEVATION, LOCAL HABITAT AND LANDSCAPE VARIABLES

Bird α -diversity in the study grasslands increased with shrub and tree cover. By increasing heterogeneity in habitat structure at the local scale, viable populations of more species can be supported. Trees and shrubs increase the available resources and fulfil the habitat requirements of more species. In addition, trees and shrub provide important foraging and nesting substrates, as well as microclimatic refuges during periods of environmental stress (Söderström *et al.* 2001). Considering the four ecological groups of birds, we conclude that the peak of diversity in shrub- and tree-rich patches is determined by the invasion of shrubland and woodland species. Woodland species also tend to prefer pastures as close as possible to the forest. Conversely, open habitat species are mostly confined to higher altitudes, far from wooded areas. Ecotone species show intermediate preferences: they are abundant in pastures with scattered trees, as woodland species, but concurrently prefer shrub-free habitats, as grassland species. These species [tree pipit *Anthus trivialis* (L.), carrion crow *Corvus corone* L., several thrushes *Turdus* spp. and finches *Carduelis* spp.] utilize multiple habitat types and therefore depend on combinations of open grassland for feeding and scattered trees for nesting or singing.

THE EFFECT OF GRAZING

In contrast with several centuries of overgrazing elsewhere, the grazing regime in the study area has been declining to a great extent over the last 50 years (Cavallero *et al.* 1997; Fleury *et al.* 2001). Stocking levels have been gradually reduced and the grazing period is now mostly restricted to 1–3 summer months. As grazing and hay-making usually take place from July onwards, the direct effects of grazing (e.g. deterioration of the sward as nesting and sheltering habitat, nest and young destruction through trampling and mowing, decrease in flowering and seed set) are less conspicuous than indirect ones (increase in particular invertebrate prey, long-term changes in sward structure, vegetation and habitat). The most striking effect of grazing on habitat below and around the timberline seems to be the maintenance of large open habitats through the limitation of tree and scrub encroachment: percentage tree and scrub cover increases significantly from heavily grazed through slightly grazed to abandoned pastures. Abandoned fields below 1900 m also show greater stone cover, either because human management involves the removal of stones to increase grassland surface or because the first pastures that were actually abandoned were the less productive ones, with larger proportions of boulders and stones.

Pastoral abandonment temporarily increases habitat heterogeneity, and creates circumstances favoured by more bird species, especially by those of forest origin that follow tree and scrub encroachment. It should be noted, however, that while forest and shrub species are negatively affected by grazing (they represent 70% of the individuals in abandoned pastures below 1900 m, with eight species occurring preferentially in this grassland type), the abundance of grassland species is positively associated with grazing intensity. This is particularly true below 1900 m, where the abundance of grassland species in grazed/mown plots is more than twice that in abandoned fields, and where four species are significantly more common in pastures undergoing heavier grazing or mowing (red-backed shrike, whinchat, fieldfare and white wagtail). The importance of grazing in maintaining an open habitat is much reduced in the alpine belt, where the effects of pastoral abandonment on grassland species are less conspicuous. Above 1900 m a.s.l., ecotone species are more abundant in slightly grazed fields, whereas shrub and woodland species still prefer abandoned pastures. These three groups, however, constitute a minor share of the overall avifauna of high altitude areas (ranging from 32% of all individuals in abandoned fields to 14% in highly grazed plots). At the species level, only two species preferentially dwell in grazed pastures: the linnet, which is mostly found in slightly grazed pastures, and the skylark, which prefers highly grazed pastures.

In conclusion, open habitat species of the montane belt benefit from grazing to a large extent. At higher altitudes only linnet and skylark seem to prefer grazed meadows, whereas for most other species grazing makes no difference. Unfortunately, this study lacks detailed analyses of vegetation composition, which might provide a better indicator of land-use changes at high altitude. It should be stressed, however, that grazing intensity is negatively correlated with elevation, and above 1900–2000 m a.s.l. it is generally modest compared with that at lower elevations (Table 3). Red-billed chough *Pyrrhocorax pyrrhocorax* L. and rock thrush *Monticola saxatilis* (L.), whose decline in Europe has been related to the loss of extensive grazing systems (Sanchez 1994; McCracken & Bignal 1998), show no preference for grazed (either slightly or heavily) fields. However, these species are quite rare in our study area.

CONSERVATION IMPLICATIONS

According to the European Union (EU) Habitat Directive, more than 50% of the biotopes in Europe warranting special conservation measures occur in low-intensity farmland landscapes (Bignal & McCracken 1996). Habitat loss of semi-natural grasslands is recognized as a serious threat to many rare and declining animal and plant species (Fuller 1987; Beaufoy, Baldock & Clark 1994; Labaune & Magnin 2002). This study shows that abandonment of upland pastures in the Italian Alps has profound effects on bird assemblages,

but the assessment of grazing importance can differ markedly depending on whether the focus is α -bird diversity or grassland bird abundance. Avian diversity responds positively to pastoral abandonment because forest species invade abandoned meadows, whereas grassland and ecotone species (to a lesser extent) benefit from grazing. While pastoral abandonment leads to an overall increase in avian α -diversity, not all species have equal conservation value. Most woodland species that are now invading abandoned pastures need no special assistance, as only 4% have unfavourable status. Furthermore, forest species with unfavourable conservation status need ancient climax forest, which would require centuries to develop from these abandoned pastures; we do not even know if true forest is able to recover fully because the soil has eroded after forest clearance and grazing. Conversely, one-third (33%) of the grassland species recorded in this study are threatened, and some of them are dependent upon grazing. Skylark and red-backed shrike are, respectively, vulnerable and declining species, and the whinchat, despite being secure, is becoming rare in western Europe (populations are declining in 54% of countries), while the linnet is showing a negative population trend in Britain (Tucker & Heath 1994; Chamberlain & Crick 1999; Henderson, Vickery & Fuller 2000). Thus, in terms of bird conservation objectives, large-scale abandonment of semi-natural pastoral habitats and their replacement with scrub, or even forest, is likely to be detrimental, taking into account that upland grasslands are becoming important refuges for grassland species that extend their ranges down to lowlands, where suitable meadows are rapidly diminishing in extent. Moreover, although anthropogenic in nature, semi-natural grasslands are long-established habitats with a complex structure and plant composition, a crucial factor for most wildlife.

Based on the results of this study, bird diversity seems to reflect habitat heterogeneity rather than its quality. We suggest that the occurrence and abundance of some sensitive species (i.e. those listed as priority species for grassland conservation; *sensu* Tucker & Evans 1997) should be investigated in relation to habitat, landscape and grazing regimes before conservation plans are made in the alpine environments. Moreover, if a larger scale is considered, the landscape mosaic created by grazing may be of considerable importance in meeting the diverse habitat requirements of several species, thus contributing to α -diversity. Overall, semi-natural alpine grasslands need appropriate sustainable management for the benefit of birds, biological diversity and the sustainability and quality of life of rural communities. The latter is particularly important, as social factors cannot be divorced from nature conservation issues, and rural poverty and low standards of living cannot be encouraged just because they are associated with high nature conservation-value farmland (McCracken *et al.* 1997). An integrated approach to agricultural, environmental and social policies for such areas is therefore highly recommended.

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Appendix

List of the bird species recorded in the 350 plots of Gran Paradiso National Park. Species were classed as grassland, shrub, ecotone and woodland according to their ecological preferences. The frequency of occurrence (%) and the conservation status (Tucker & Heath 1994) are also shown. SPEC = Species of European Conservation Concern

Common name	Scientific name	Ecological group	Frequency of occurrence (%)	Conservation status
Black grouse	<i>Tetrao tetrix</i>	Ecotone	0.9	SPEC 3
Tree pipit*	<i>Anthus trivialis</i>	Ecotone	12.3	—
Ring ouzel*	<i>Turdus torquatus</i>	Ecotone	7.4	SPEC 4
Fieldfare*	<i>Turdus pilaris</i>	Ecotone	2.9	SPEC 4
Mistle thrush*	<i>Turdus viscivorus</i>	Ecotone	12.3	SPEC 4
Carrion crow*	<i>Corvus corone</i>	Ecotone	2.9	—
Serin	<i>Serinus serinus</i>	Ecotone	1.4	SPEC 4
Goldfinch	<i>Carduelis carduelis</i>	Ecotone	1.4	—
Linnet*	<i>Carduelis cannabina</i>	Ecotone	7.1	SPEC 4
Ptarmigan	<i>Lagopus mutus</i>	Grassland	0.3	—
Rock partridge	<i>Alectoris graeca</i>	Grassland	2.0	SPEC 2
Skylark*	<i>Alauda arvensis</i>	Grassland	3.4	SPEC 3
Water pipit*	<i>Anthus spinoletta</i>	Grassland	39.1	—
Grey wagtail	<i>Motacilla cinerea</i>	Grassland	2.6	—
White wagtail*	<i>Motacilla alba</i>	Grassland	2.9	—
Alpine accentor*	<i>Prunella collaris</i>	Grassland	5.1	—
Black redstart*	<i>Phoenicurus ochruros</i>	Grassland	40.0	—
Whinchat*	<i>Saxicola rubetra</i>	Grassland	12.9	SPEC 4
Rock Thrush*	<i>Monticola saxatilis</i>	Grassland	2.0	SPEC 3
Wheatear*	<i>Oenanthe oenanthe</i>	Grassland	31.1	—
Red-backed shrike*	<i>Lanius collurio</i>	Grassland	2.3	SPEC 3
Alpine chough*	<i>Pyrrhocorax graculus</i>	Grassland	11.4	—
Red-billed chough*	<i>Pyrrhocorax pyrrhocorax</i>	Grassland	2.9	SPEC 3
Raven	<i>Corvus corax</i>	Grassland	0.3	—
Snowfinch*	<i>Montifringilla nivalis</i>	Grassland	1.7	—
Italian sparrow	<i>Passer italiae</i>	Grassland	0.6	—
Rock bunting*	<i>Emberiza cia</i>	Grassland	4.3	SPEC 3
Dunnock*	<i>Prunella modularis</i>	Shrub	17.4	SPEC 4
Lesser whitethroat*	<i>Sylvia curruca</i>	Shrub	6.0	—
Whitethroat	<i>Sylvia communis</i>	Shrub	0.3	SPEC 4
Garden Warbler*	<i>Sylvia borin</i>	Shrub	9.1	SPEC 4
Great spotted woodpecker	<i>Dendrocopos major</i>	Woodland	0.3	—
Green woodpecker	<i>Picus viridis</i>	Woodland	0.3	SPEC 2
Wren*	<i>Troglodytes troglodytes</i>	Woodland	11.7	—
Robin*	<i>Erithacus rubecula</i>	Woodland	6.3	SPEC 4
Blackbird	<i>Turdus merula</i>	Woodland	0.9	SPEC 4
Song thrush	<i>Turdus philomelos</i>	Woodland	0.9	SPEC 4
Blackcap*	<i>Sylvia atricapilla</i>	Woodland	2.3	SPEC 4
Bonelli's warbler	<i>Phylloscopus bonelli</i>	Woodland	0.6	SPEC 4
Chiffchaff	<i>Phylloscopus collybita</i>	Woodland	6	—
Goldcrest	<i>Regulus regulus</i>	Woodland	0.9	SPEC 4
Long-tailed tit	<i>Aegithalos caudatus</i>	Woodland	0.9	—
Coal tit*	<i>Parus ater</i>	Woodland	4.3	—
Willow tit*	<i>Parus montanus</i>	Woodland	5.1	—
Marsh tit	<i>Parus palustris</i>	Woodland	0.3	—
Crested tit	<i>Parus cristatus</i>	Woodland	1.1	SPEC 4
Blue tit	<i>Parus caeruleus</i>	Woodland	0.3	SPEC 4
Great tit	<i>Parus major</i>	Woodland	0.3	—
Treecreeper	<i>Certhia familiaris</i>	Woodland	0.3	—
Jay	<i>Garrulus glandarius</i>	Woodland	1.7	—
Nutcracker*	<i>Nucifraga caryocatactes</i>	Woodland	3.4	—
Chaffinch*	<i>Fringilla coelebs</i>	Woodland	12.6	SPEC 4
Citril finch	<i>Serinus citrinella</i>	Woodland	0.9	SPEC 4
Redpoll*	<i>Carduelis flammea</i>	Woodland	6.0	—
Bullfinch	<i>Pyrrhula pyrrhula</i>	Woodland	1.7	—
Crossbill	<i>Loxia curvirostra</i>	Woodland	0.3	—
Wallcreeper	<i>Tichodroma muraria</i>	—	0.3	—
Dipper	<i>Cinclus cinclus</i>	—	0.6	—
Cuckoo	<i>Cuculus canorus</i>	—	0.9	—

*Birds included in comparisons at the species level (Tables 2 and 3).

Does artificial snow production affect soil and vegetation of ski pistes? A review

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Abstract

The production of artificial snow and the use of snow additives in ski resorts have increased considerably during the last 20 years. Their ecological consequences are the subject of environmental concerns. This review compiles studies about the ecological implications of ski pistes preparation in general and of artificial snow production. The main direct impacts of ski piste preparation on the vegetation are related to the compaction of the snow cover, namely the induction of soil frost, the formation of ice layers, mechanical damage and a delay in plant development. The vegetation reacts with changes in species composition and a decrease in biodiversity. Artificial snowing modifies some of these impacts: The soil frost is mitigated due to an increased insulation of the snowpack, whereas the formation of ice layers is not considerably changed. The mechanical impacts of snow-grooming vehicles are mitigated due to the deeper snow cover. The delay of the vegetation development is enhanced by a considerably postponed snowmelt. Furthermore, artificial snowing induces new impacts to the alpine environment. Snowing increases the input of water and ions to ski pistes, which can have a fertilising effect and hence change the plant species composition. Increasingly, snow additives, made of potentially phytopathogenic bacteria, are used for snow production. They enhance ice crystal formation due to their ice nucleation activity. Although sterilised, additives affected the growth of some alpine plant species in laboratory experiments. Salts are applied not only but preferably on snowed pistes to improve the snow quality for ski races. The environmental impacts of most salts have not yet been investigated, but a commonly used nitrate salt has intense fertilising properties. Although snowing mitigates some of the negative impacts of ski piste preparation in general, new impacts induced by snowing could be non-beneficial to the vegetation, which, however, has yet to be clarified.

Key words: fertilisation, ice nucleation activity, INA, *Pseudomonas syringae*, snowpack, snow additives

Introduction

Winter tourism has become an important economic sector in the mountain regions of the world (e.g. Abegg et al. 1997; Elsasser & Messerli 2001). Simulta-

neously, the creation and maintenance of ski pistes has been one of the major environmental concerns in these regions and a subject of numerous studies (e.g. Mosimann 1985; Bayfield 1996; Urbanska 1997; Titus 1999). The direct impacts of ski piste preparation on

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the vegetation are primarily caused by the compaction of the snow cover which results in a denser and less deep snow cover with an increased thermal conductivity and decreased gas permeability (Newesely 1997; Rixen 2002). As a consequence, plants can suffer from frost damage, oxygen deficiency, infection by fungi and pathogens, a delay in plant development and mechanical damage to the plant tissue (Cernusca 1989; Newesely 1997; Stoeckli & Rixen 2000). Changes in plant species composition and a decrease in biodiversity are the result (Rixen 2002).

The increased soil frost on ski pistes is caused by increased thermal conductivity of dense snow. March snow on Swiss ski pistes has an average density of approximately 480 kg m⁻³ because of compaction by snow-grooming vehicles while incompact snow has only 350 kg m⁻³ (Rixen 2002). As the thermal conductivity is a logarithmic function of the snow density (Sturm et al. 1997), the heat flux through the compacted snow cover is much higher than through undisturbed snow. The thermal conductivity in compacted natural snow was found to be about two times higher than in incompact natural snow (Geiger 1961; Cernusca et al. 1990). Together with the thermal conductivity of the snow, the air temperature and the snow depth are responsible for the cooling of the soil below (Sturm et al. 1997). Under the compacted dense and thin snow cover of ski pistes, severe and long-lasting soil frost occurs (Newesely 1997; Rixen 2002).

The gas permeability of the snowpack on ski pistes is strongly decreased by the formation of ice layers (Newesely 1997). Due to the respiration of soil microorganisms, the oxygen concentration at the soil surface can be decreased if gas exchange between the snow surface and the snow base is hindered. Hence, oxygen concentrations at the soil surface can be reduced to 5% (Newesely et al. 1994), whilst the carbon dioxide concentration can reach 8% (Cernusca et al. 1990). One of the various effects of oxygen deficiency on plants is that it may cause suitable conditions for fungi and pathogens, e.g. snow mould. Moreover, oxygen deficiency makes plants more sensitive to frost damage (Newesely 1997; Körner 1999). Therefore, ice layers can have negative effects on plants.

The disadvantageous winter snow conditions on the ski pistes results in a delayed development of the vegetation in Russian ski areas (Baiderin 1981), where plant species developing early in the year are suppressed in comparison to species with a late-season development. Similar tendencies were found on Swiss ski slopes (S. Wipf et al., unpubl. data) where the cover and species number of early-flowering species were lower on than beside ski pistes.

The grooming of the snow on ski pistes apparently results in mechanical damage to the vegetation (e.g.

Mosimann 1985; Wardle & Fahey 1999). Especially under a thin snow layer, it seems plausible that plants are damaged by the heavy machines and the sharp edges of skis. On Swiss ski pistes, woody plants are in particular reduced on ski pistes (S. Wipf et al., unpubl. observ.).

A major disturbance factor on ski pistes is ground levelling. Ground levelling is a measure carried out in summer to eliminate rocks and to smooth pistes allowing an early start of the ski season. It is usually a one-time measure with long-term impacts on the environment. The influence of ski piste levelling on the vegetation has been investigated extensively for decades. The species composition of the vegetation is transformed, the productivity is decreased and the soil is more likely to erode (Leser et al. 1982; Cernusca 1984; Tsuyuzaki 1991, 1993, 1995; Bayfield 1996; Titus 1999). The revegetation of levelled ski pistes appears to be difficult at high elevations. Above the timberline levelled areas remain visible for decades (Bayfield et al. 1984; Urbanska 1990, 1994, 1995; Delarze 1994). At very high altitudes, the levelling of ski pistes can enhance the thawing of permafrost (Haeberli 1982, 1992).

In recent years, the production of artificial snow (also called 'man-made snow' or 'technical snow') has become an increasingly important issue in most ski areas of the world (Mosimann 1998) (Table 1, Fig. 1). Climate scenarios forecast a rise of 300 m in elevation where winter sport is economically viable from 1200 to 1500 m a.s.l. within the next 25–50 years (Bürki 1998). Therefore, ski resorts at elevations lower than 1500 m a.s.l. might not obtain enough snow to maintain a profitable winter sports industry.

Another problem besides changing winter snow conditions arises from the increasing demands of ski tourism. To meet the tourists' expectations, winter sport has to be possible very early in the winter season, as early as November in the northern hemisphere, when the natural snow fall is often sparse. Due to this reason, mountain railway companies invest increasingly in the production of artificial snow. In 2001,

Table 1. Extent and development of artificial snow production in the Alps based on CIPRA (1998) (–, no information). No information is available from Italy and the Scandinavian countries. Therefore, the numbers for Europe are considerably higher than the sums of values from the five countries in Table 1.

	Snowing facilities 1995 (%) ¹	Area with snow production 1995 (ha)	Number of snowing facilities	
			1992 (*1990)	1996 (*1995)
Austria	54.6	3848	175	300
Switzerland	23.7	1000	26*	130*
France	18.2	1560	60	100
Germany	1.9	121	–	10
Slovenia	1.6	109	–	9

¹ Percent of total in the Alps without Italy.

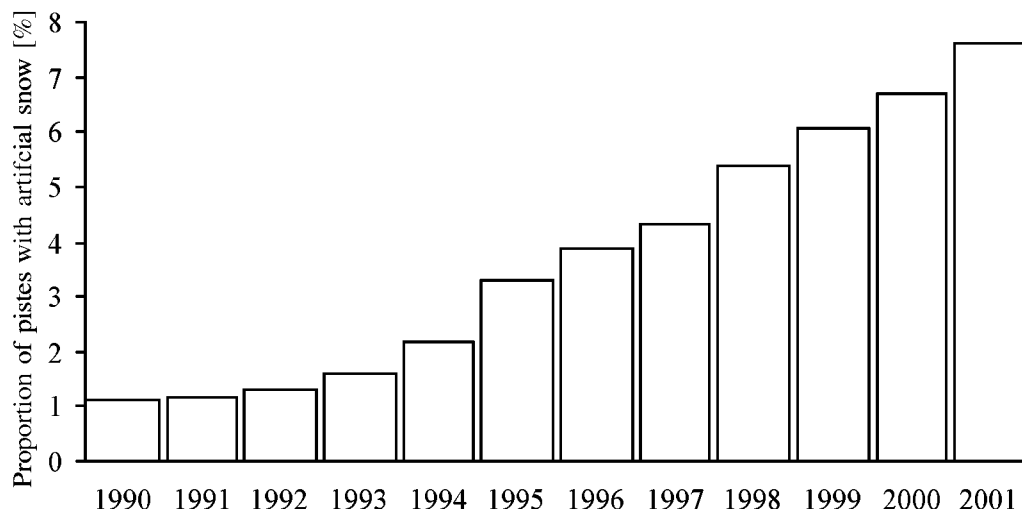


Fig. 1. Increase of artificial snowing in Switzerland (percentage of the total ski piste area covered with artificial snow; data from Seilbahnen Schweiz 2001).

7.6% of the total ski pistes area in Switzerland was covered with artificial snow (Fig. 1), and the snow production continues to increase. In the United States, 59% of all ski resorts already relied on snowmaking in 1984 (Kocak & van Gemert 1988), compared to approximately 90% in 2001.

Another issue in ski areas are snow additives that are increasingly used for snow production. These additives are products with ice nucleation activity (INA) that enhance ice crystal formation. The INA material consists of sterilised phytopathogenic bacteria (Hirano & Upper 2000). Besides the ice nucleation additives, salts (mostly chlorides and nitrates) are used for ski piste preparation after the snow has been distributed on the piste. The purpose of the salts is to harden the snow for ski races by creating an icy surface (Kobayashi et al. 2000).

Artificial snow production and the use of snow additives raise various conflicts with other interests within the alpine environment (Broggi & Willi 1989). Farmers fear that the productivity or fodder quality of pastures or meadows might be affected. Conservationists are concerned about a possible new hazard to sensitive habitats and an endangerment of rare species because of potential inputs of nutrients and snow additives (Bayfield & Barrow 1985; Price 1985; Meistershans 1988; WWF 1995; Ries 1996). Facilities for snow production affect the landscape aesthetics and, furthermore, snow production consumes energy and water (Baron et al. 2000) and causes considerable noise. On the other hand, it has been argued by snow producers that artificial snow may protect the ski piste vegetation and thus should be considered as an ecological improvement.

In this review, we examine how the addition of artificial snow modifies the general impacts of ski pistes described above, and whether it mitigates the negative effects of ski piste preparation. In particular, we will explain if artificial snow mitigates or enhances soil frost, the development of ice layers, the delay of vegetation development and the mechanical damage to plants. The ecological impacts of these factors will be discussed. Furthermore, we will address the additional environmental impacts of snowing, namely the input of water and ions and the input of snow additives. Despite the fact that artificial snow is extensively and increasingly applied, many aspects have not yet been fully investigated. Thus, we will point out open questions, ongoing research and future challenges throughout the review.

How is artificial snow produced?

Water, air, energy and temperatures below freezing are required to produce artificial snow with most of the common snowing facilities. During the snowmaking process, water is atomised by spraying water into the air with snow machines (Fig. 2). Given sufficiently cold temperatures, the water droplets freeze in the air and fall to the ground as snow.

Usually, temperatures of less than -7°C are required for the water droplets to freeze on their way to the ground (Fauve et al. 2002). If ice nucleates are added to the water, snow can be produced at temperatures up to -3°C . The most common ice nucleate is 'Snomax[®]', a product that contains the sterilised bacteria *Pseudomonas syringae* (see below).

The properties of artificial snow are in many respects different from natural snow. Unlike the common star-shaped natural snow flakes, artificial snow consists of round grains (Fig. 3). The water for snowing is usually taken from water reservoirs, rivers, lakes or springs and thus differs in its chemical composition from precipitation water (for effects on snow density and chemical properties see below).

Does artificial snow mitigate negative environmental impacts of ski pistes?

Subnivean temperatures and soil frost

The snow on snowed pistes is both denser and deeper than the snow on un-snowed pistes (Rixen 2002). Basically, dense snow results in decreased and deep snow in an increased insulation of the soil. The temperature conductivity in compacted artificial snow was found to be about 2.5 times higher than in incompact natural snow, while that of compacted natural snow was only 2 times higher than in incompact natural snow (Geiger

1961; Cernusca et al. 1990). However, temperature measurements at the soil surface showed higher values under the snowed than under the un-snowed pistes (Newesely 1997; Rixen 2002). The temperature regime at the soil surface beneath artificial snow was similar to that under incompact snow with temperatures around the freezing point and soil frosts lasting only for short periods. Thus, the increased snow depth is the more important parameter for the subnivean temperatures than the increased snow density under the given snowing practises.

The decreased temperatures and resulting soil frost under pistes with natural snow have major impacts on the environment. The changed temperature regime, especially induced soil frost, can increase lateral surface runoff (Kokelj & Lewkowicz 1998) and thus increase erosion. It has been hypothesised that the soil cooling could even induce permafrost at high elevations which would obviously have considerable impacts on the environment (Haeberli 1982, 1992). Winter soil temperature regime can directly affect plants. For example, the white clover *Trifolium repens* suffered from frost damage on ski pistes (Newesely 1997). A soil freezing experiment suggested that fine roots were damaged mechanically by soil frost (Tierney et al. 2001). Plants can as well be indirectly affected via soil microbial activity (Williams et al. 1995). Microbes can be active below 0 °C (Brooks et al. 1996) and thus have an impact on the nitrogen cycling in the soil (Brooks & Williams 1999) and the nitrogen availability for plants even during the winter. Hence, preventing frost in soils that are usually not exposed to temperatures much below freezing can be considered as beneficial.



Fig. 2. Production of artificial snow. Water is atomised through nozzles of snow machines into droplets and blown into the air with a built-in fan or with high pressure. The droplets usually require temperatures of below -7°C in order to be frozen thoroughly when they fall to the ground as snow.

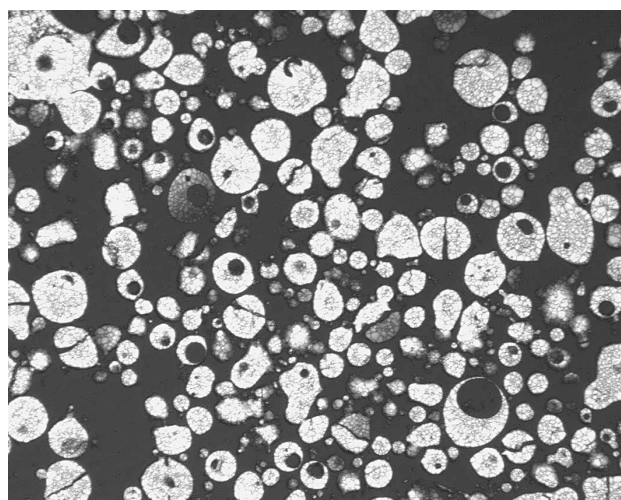


Fig. 3. Artificial snow grains (thin section 0.03 mm, $2\text{ mm} \times 2\text{ mm}$); liquid water in some grains. Some grains broken from pressure during freezing process (from Fauve et al. 2002).

Ice layers

Ice layers can develop in the snowpack when the snow is intensively compacted by snow-grooming vehicles. On unsnowed pistes ice is likely to develop earlier in the winter than on pistes with artificial snow, because the soil has less insulation (Newesely 1997). On the other hand, the ice layers in artificial snow remain until late winter. Furthermore, if artificial snow is not completely frozen due to high temperatures and groomed to early, additional ice layers can be the consequence (Fauve et al. 2002). Thus, adding artificial snow does not necessarily mitigate the formation of ice layers in the snowpack.

The ice layers strongly affect the gas permeability of the snow cover (Newesely 1997). When the gas exchange between the snow surface and the snow base is hindered, the active microorganisms in the soil use up the oxygen and produce carbon dioxide.

Delayed plant development

The additional mass of artificial snow on snowed pistes takes longer to melt, which leads to prolonged snow cover in the spring (Fig. 4; Aarrestad 1993; Stoeckli & Rixen 2000; Rixen et al. 2001). Snowmelt can be postponed by up to four weeks compared to pistes with natural snow (on average 17 days; Rixen 2002). Consequently, the phenology of plants is delayed by several weeks. Even a minor experimental delay in snowmelt of two days at the end of April resulted in a delay of flowering in *Taraxacum officinale* agg. in mid June (Rixen et al. 2001). On ski slopes in Savognin, Switzerland, Kammer & Hegg (1990) determined that the time span between the snowmelt of artificial snow and the first cut of hay meadows was too short to ensure the seed set of all meadow species. Hence, the artificial snow does not mitigate the delayed development on the ski pistes. Rather, it delays

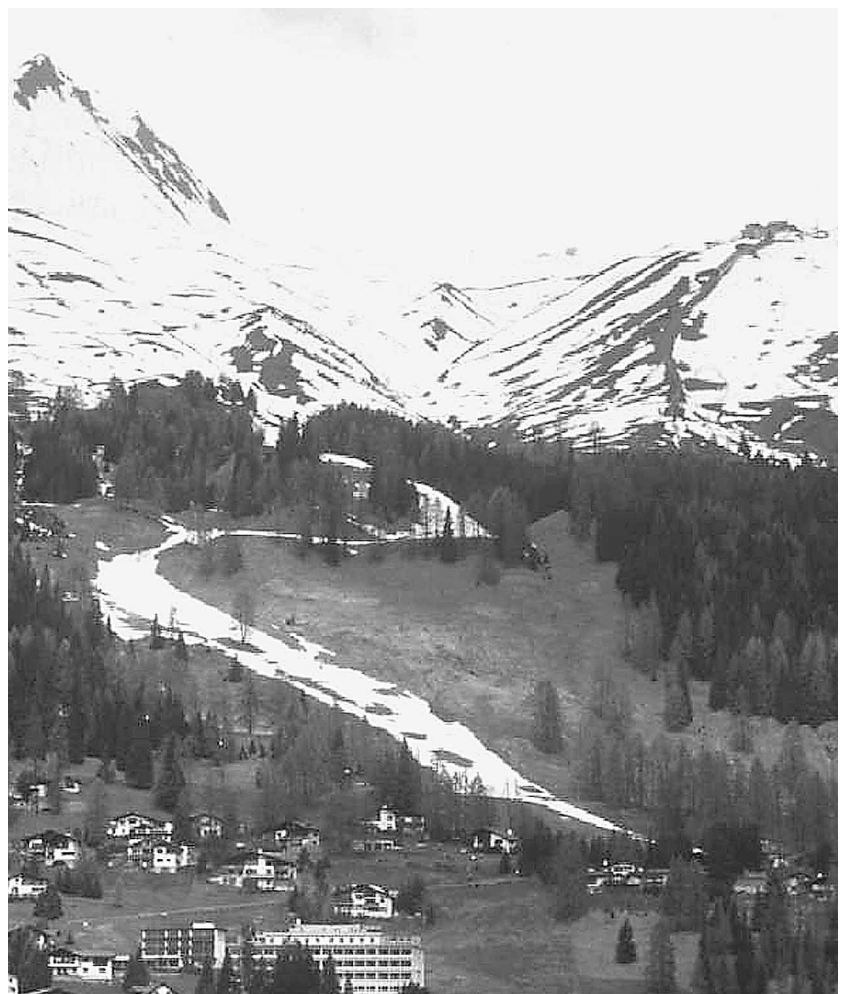


Fig. 4. Delayed snowmelt on ski piste with artificial snow in Davos, Switzerland. Where artificial snow is applied, snowmelt may be four weeks later than at sites with natural snow.

the plant development even more because of the late snowmelt.

Reactions of the vegetation composition to a delayed development have been reported in several studies. Knight et al. (1979) analysed how the plant species composition and the growth of subalpine dry and mesic meadows responded to the addition of snow during five years. Plant growth was delayed by about 7–9 days when snow was added. Plant species from high elevation habitats, such as *Sibbaldia procumbens*, increased in biomass during the five year experimental period. On the Swiss ski slopes different ecological groups of species were favoured on the snowed and un-snowed pistes types (Wipf et al. 2002). On pistes with natural snow, plant species were favoured that usually inhabit so-called wind edges. Wind edges are characterised by a thin snow cover and extremely low winter temperatures (Körner 1999), like those on ski pistes with natural snow. On pistes with artificial snow, so-called snowbed species were enhanced. Snowbeds are characterised by a long-lasting snow cover and short vegetation period (Körner 1999), like on pistes with artificial snow.

The influence of the snowpack on the productivity of the vegetation depends on the climate. Snow augmentation decreases the productivity of mesic vegetation and humid climatic conditions (Weaver & Collins 1977; Stoeckli & Rixen 2000). However, in an arid climate like for example in eastern parts of the Rocky Mountains, plant growth is less limited by the length

of the vegetation period than by the availability of water. Therefore, productivity is often increased by a deeper snow cover (Knight et al. 1979; Price & Waser 2000).

Mechanical damage

The snow depth is increased by artificial snowing due to the additional amount of snow cast on the pistes (e.g. Newesely 1997; Rixen 2002). This is an advantage for plants as they are better protected against mechanical damage. Woody plants that have sensitive tissues above the ground in winter (see Fig. 5) were an example for protective properties of artificial snow (S. Wipf et al., unpubl. observ.). They were decreased in abundance on ski pistes in general compared to control plots beside pistes, but they were more abundant on pistes with artificial snow than on pistes with natural snow. This suggests that they benefit most from increased snow depth. Therefore, woody plants indicate that artificial snow mitigates the mechanical disturbance to the vegetation through snow-grooming vehicles and skiers.

Input of water and ions

The production of artificial snow results in an extra input of water to the ski pistes. According to Mosimann (1998), the water input from artificial snow usually reaches 0.7 to 2 times, sometimes up to 5 times that



Fig. 5. Dwarf shrub (*Rhododendron ferrugineum*) on ski piste with natural snow. Woody plants suffer less mechanical damage when protected by an artificial snow cover.

from natural snow. Usual amounts of water applied as artificial snow are 100–600 mm (Mosimann 1998). These values were confirmed by a Swiss study, where the average water input from the melting snowpack was almost double the natural level (approx. 750 mm vs. 400 mm, Stoeckli & Rixen 2000). This may change the local hydrology and increase the erosion intensity. As the water used for snowmaking is usually pumped from rivers, lakes or ground water sources, it is enriched in minerals from the catchments, including ions that are essential for plant growth, such as Ca^{2+} , Mg^{2+} , Na^+ , K^+ , Cl^- , SO_4^{2-} , NH_4^+ or NO_3^- (Table 2).

The vegetation composition changes in response to inputs of water and ions. A study near Savognin, Switzerland, showed that the artificial snow led to changes in mesotrophic habitats, like grasslands with little fertilisation (Mesobrometum-Trisetetum vegetation; Kammer & Hegg 1990). Plants tolerant of dry, low-nutrient conditions (e.g. *Koeleria pyramidata*, *Silene nutans*, *Thymus pulegioides*) were replaced by more common mesic and nutrient-demanding species (e.g. *Chaerophyllum hirsutum*, *Myosotis silvatica*, *Pimpinella major*). Changes were less pronounced on fertilised meadows. In soils down to a depth of 15 cm, Kammer & Hegg (1990) recorded significantly higher pH-values on snowed piste compared to control plots. They attributed them to the high pH of the river water that was used for snow production. In 13 ski resorts in Switzerland similar changes were suggested by differences in the ecological indicator values (Landolt 1977): Moisture and nitrogen values were higher on snowed pistes than at control plots besides pistes (S. Wipf et al., unpubl. data). A Canadian study analysed the effects of watering with melt water from natural or artificial snow on the germination success of birch and spruce trees but failed to show any significant differences (Devarenes 1994).

Table 2. Chemical composition (electrical conductivity and ionic contents) of melt water from artificial and from natural snow (mean from 10 ski resorts in Switzerland $\pm$ SD). Artificial snow was sampled on ski pistes and actually represents a mixture of layers of artificial and natural snow. Natural snow was sampled beside the ski pistes. Statistically significant differences were tested with LSD tests based on t-tests (ns, $P \geq 0.05$; *, $P < 0.05$; **, $P < 0.01$).

	Artificial snow	Natural snow	P
Electrical conductivity (μS)	61 $\pm$ 30	15 $\pm$ 7	**
Ca^{2+} (mg l^{-1})	5.34 $\pm$ 3.12	0.71 $\pm$ 0.51	**
K^+ (mg l^{-1})	0.75 $\pm$ 0.43	0.75 $\pm$ 0.28	ns
Mg^{2+} (mg l^{-1})	1.28 $\pm$ 1.32	0.09 $\pm$ 0.06	*
Na^+ (mg l^{-1})	2.18 $\pm$ 2.23	1.03 $\pm$ 0.46	ns
Cl^- (mg l^{-1})	3.12 $\pm$ 4.31	1.18 $\pm$ 0.69	ns
SO_4^{2-} (mg l^{-1})	6.38 $\pm$ 5.84	0.47 $\pm$ 0.20	*
NO_3^- (mg l^{-1})	0.64 $\pm$ 0.26	0.53 $\pm$ 0.21	ns
NH_4^+ (mg l^{-1})	0.01 $\pm$ 0.06	0.14 $\pm$ 0.06	*

It is not clear, what fraction of the ionic input can be taken up by plants and how much percolates through the soil. However, it has been shown that alpine plants can take up considerable amounts of nitrogen during early spring snowmelt (Mullen et al. 1998; Bilbrough et al. 2000). This ability might be especially important as ions are not washed out of a snowpack evenly but in sequential ionic pulses (Abrahams et al. 1989). Hence, plants are probably able to take up additional ions and nutrients from the melt water that derives from the artificial snow even if the vegetation period has not yet started.

The water that is used for artificial snow is taken from a water source like rivers, lakes or springs. As the water table of rivers is low in the winter anyway, removing water enhances the drying of streams even more (WWF 1995). If water is taken from springs or if water reservoirs are built, the hydrology of alpine ecosystems, especially fens, is negatively affected. However, this has not been investigated yet.

Input of snow additives

Adding ice nucleation active (INA) bacteria to water enables snow production at temperatures of approximately -3°C , whereas without snow additives temperatures lower than -7°C are needed (Maki et al. 1974; Gurian-Sherman & Lindow 1993). It has long been known that various nuclei can stimulate the formation of ice (Mason & Hallett 1957). Especially effective nuclei were found on decomposed leaves in 1972 (Schnell & Vali 1972, 1973). In 1974, cultures of *Pseudomonas syringae* (31 A) isolated from North American alder leaves (*Alnus tenuifolia*; see Hirano & Upper 2000) showed ice nucleating properties, causing water to freeze at the relatively warm temperatures of -1.8 to -3.8°C (Maki et al. 1974). The bacteria contain proteins that resemble the structure of ice crystals and thus enhance the formation of ice (Wolber & Warren 1989; Pattnaik et al. 1997). The product 'Snomax' (Kocak & van Gemert 1988) contains sterilised *P. syringae*. Related species used in other INA products are *Erwinia herbicola* and *Xanthomonas campestris*.

According to Brown (1997), INA products are used in about half of North American ski resorts. During the 1994 Olympic games in Lillehammer all of the artificial snow was produced with Snomax. In the Alps the use of Snomax depends on the legislation of the different countries and regions. While in Germany and Italy the use of snow additives is forbidden no regulations exist in France. Within Switzerland and Austria the handling of this issue differs from region to region (Bonjour & Carle 1997). The input of INA substances can influence the ecosystem in different ways. The

most important concerns about using bacterial products in the alpine environment are potential pathogenic effects on plants either from surviving bacteria or from toxins in dead bacteria and an increased ice nucleation activity on plant tissue.

Salts are used for ski piste preparation, especially on race pistes, to improve the snow quality for skiing purposes, for example, if snow is too cold, too sticky or hard ice (USSA 1996; Raguso 2000). Comparable to salts used on roads, the chemicals used on ski pistes melt the uppermost layer of the snowpack and thus change the snow quality (Kobayashi et al. 2000).

Different salts are used depending on weather and snow conditions because the different salts vary in their snow melting properties. Among the most common salts are ammonium nitrate (PTXTM), ammonium chloride, ammonium sulphate, potassium chloride, sodium chloride and phosphates (Raguso 2000).

Salts are more likely to be used on ski pistes with artificial snow because, given the economical importance of ski races, ski resort managers will normally not rely on natural snow only. Artificial snow, however, is of course not necessarily required for ski races. The salts can be used occasionally when weather conditions require it for races, or on a regular basis to enable summer skiing on snow fields (Sno-Engineering 1996).

Pathogenic properties

Phytopathogenic effects of INA products on plants may occur if the product still contains live bacteria after sterilisation, or if toxins from dead bacteria are still effective. Phytopathogenic effects of live *P. syringae* (31A) on 53 non-alpine plant species were tested in Switzerland (see Bonjour & Carle 1997), and 3 of the 53 species showed chloroses. However, as alpine species were not tested, effects of *P. syringae* on alpine vegetation remain unclear. Even effects on vertebrates cannot be excluded as rats reacted with enlarged lymph nodes to the inhalation of aerosols containing nucleation-active *P. syringae* (Goodnow et al. 1990).

Ice nucleation activity (INA)

The presence of *P. syringae* on the surface of leaves can cause damage to plant cells by increasing the threshold temperature for the freezing of water. Enhanced plant tissue damage has been observed in buds of pears (Panagopoulos & Crosse 1964) and peaches (Wisniewski et al. 1997) infected with *P. syringae*. Lindow et al. (1978) found *P. syringae* on the surface of 74 out of 95 analysed species sampled from several locations (mostly not alpine) in North America. Bacteria numbers were potentially sufficient to cause freezing injury in plants. Only conifers showed infrequent colonisation

by INA bacteria. Freezing experiments in growth chambers with *Thymus serpyllum* and *Trifolium repens* showed no differences in the extent of frost damage between leaves with Snomax solution on the surface and those with control water (Rixen 2002). These results, however, do not prove that there are no possible effects of INA material, and it remains unclear to what extent alpine plants could be affected by substances with INA. It can be hypothesised that the plants' sensitivity depends on the respective physiological processes for dealing with extreme cold. Plant tissues can either avoid freezing by using 'anti-freeze'-based supercooling or can tolerate freezing (Körner 1999). Plant organs that can tolerate freezing are unlikely to be affected by INA bacteria, whereas plants with a supercooling strategy could be seriously harmed by substances enhancing the formation of ice crystals. This hypothesis, however, has yet to be proved. Supercooling is frequent in small cells, such as in buds or seeds, that only need to cope with relatively short periods of extreme cold. Freezing tolerance is more likely to occur in plants or tissues adapted to long-term low temperature extremes (Körner 1999). In terms of the growth forms of alpine species, supercooling is more common in relatively tall shrubs and freezing tolerance more common in low-stature plants.

INA tests of snow, plant and soil samples from different ski pistes where snow was produced with and without Snomax were carried out by Wallis et al. (1988, 1989) but left uncertainties. INA tests on plants and in snow yielded ambiguous results but soils showed a higher ice nucleation activity on the ski piste with Snomax. However, the authors of the INA study could not conclude whether or not INA substances percolate into the soil whilst retaining their activity. Furthermore, ice nucleation activity is not necessarily only caused by *P. syringae*. Other natural sources could have been the reason for the increased INA found in the soils investigated by Wallis et al. (1988, 1989). The remaining open questions have not been addressed since this study.

Survival of *Pseudomonas syringae* in the alpine environment

In a series of laboratory experiments, Goodnow et al. (1990) tested the survival rate and the INA of *P. syringae* in snow, soil and water. The snow was produced with a *P. syringae* content of 0.08 mg l⁻¹. It was kept in the dark for 21 days during which it was defrosted and refrozen 20 times. After this treatment, less than 3% of the bacteria survived, but the INA was still at 91% of the initial value. In another experiment where the snow was kept in daylight for 7 days, and was also defrosted and refrozen 20 times, no live *P. syringae* bacteria remained, but the INA was still 68% of the initial value. No live bacteria survived in a soil

sample kept at 0 °C for 15 days and at 15 °C for 20 days, but 50% survived in a soil at 7.5 °C. In river water stored at 0 °C and 7.5 °C for 25 days, 2% of the bacteria survived, but none survived in water stored at 15 °C. Harrison (1988), who searched for surviving *P. syringae* in alpine waters and soils, came to the conclusion that bacteria survive badly in alpine environment. However, the survival of *P. syringae* in the alpine environment cannot be dismissed. More research is needed, but no further investigations have been carried out since 1990.

Impact of INA products on plant productivity

Irrigation experiments in the greenhouse with three alpine-subalpine plant species demonstrated that plant growth responds to Snomax solutions but the effects were inconsistent (Rixen 2002): *Trisetum flavescens* showed increased biomass production when irrigated with Snomax solution, probably due to the input of organic nitrogen, whereas the biomass production of *Trifolium repens* and *Thymus serpyllum* was decreased. While it is possible that the symbiosis of *T. repens* with its N-fixing bacteria was affected by the N input, reasons for the reduced growth of *T. serpyllum* must be found elsewhere. It is unlikely to be due to nitrogen levels in the experiment which were not at toxic levels.

Input of salts

The ecological effects of salts on ski pistes have been addressed in only few studies (Sno-Engineering 1996; Rixen 2002), unlike the effects of de-icing salts on road verges (e.g. Richburg et al. 2001; Bryson & Barker 2002). Near a snowfield in Oregon with summer skiing where up to 500,000 kg of salts were used from May to September, chloride concentrations of streams within the drainage of the snowfield were around 30 mg l⁻¹ compared to 1–6 mg l⁻¹ outside the drainage (Sno-Engineering 1996). In an experiment on plant growth, the amount of a single application of PTX (50 g PTX m⁻², equivalent to 17 g N m⁻²) significantly increased the biomass production of alpine meadows (608 g m⁻² vs. 439 g m⁻²; Rixen 2002). Salt toxicity to plants on ski pistes as observed at road verges (Bryson & Barker 2002) has not yet been investigated.

Any other indications for impacts of salts on alpine vegetation have to be extrapolated from experiments with mineral fertiliser in alpine regions that can only briefly be described here. Such studies have shown that even at high altitudes plant growth reacts strongly to NPK fertilisation (Heer & Körner 2002), and that long-term effects of N, P, K and Ca fertilisation on plant species composition can still be detectable

50 years after the last application (Hegg 1984). However, the reactions of plants to mineral fertiliser may be more complex than just increased growth (Körner 1984): After fertilisation, the shrub species *Vaccinium uliginosum*, *Loiseleuria procumbens* and *Rhododendron ferrugineum* showed an increase in shoot length, ramification and leaf size but not in radial growth of the stems. This might make the shrubs more sensitive to mechanical stress due to a taller stature (Körner 1980). Furthermore, the fertilised *Loiseleuria* suffered from snow mould infestation, and *Vaccinium* displayed an earlier bud break in spring, making the plant more vulnerable to late frosts. These results show that fertilising salts can increase the sensitivity of dwarf shrubs to the harsh alpine environment. The impacts of fertiliser inputs can, furthermore, depend on the kind of fertiliser used (Seastedt & Vaccaro 2001). The addition of nitrogen reduced the species richness of alpine vegetation in Colorado whereas the addition of phosphorous did not. These results can only partly be transferred to ski pistes, however, they may indicate that salts and fertilisers have negative impacts on the ski piste vegetation by decreasing its species diversity.

Conclusions

Several studies have shown that the production of artificial snow and the preparation of ski pistes in general influence various aspects of the alpine environment. Changes due to snow treatment are related to changes in snow depth and density, insulation properties, gas permeability and duration of the snow cover. Soil properties and plant species composition are changed as a result of these changed environmental conditions.

The environmental impacts caused by ski pistes in general are modified by artificial snowing. The severe soil frosts that are caused by decreased insulation of the snow on ski pistes are mitigated by the addition of artificial snow. Increasing the snow depth with artificial snow increases the insulation properties of the snowpack. Ice layers that develop in the snowpack due to compaction with heavy machinery and decrease in gas permeability are not lessened by snowing. Neither does artificial snowing mitigate a delayed vegetation development on ski pistes, it rather enhances the late development due to a strongly delayed snowmelt. However, the artificial snow increases the mechanical protection of the plants under the snow and thus mitigates mechanical impacts of snow-grooming vehicles on ski pistes. Overall, the mitigating properties of snowing are not unambiguous enough to be clearly beneficial.

Artificial snow induces new impacts to the environment beyond modifying the impacts of ski pistes in

general. The plant species composition is changed by the input of water and ions. Since the responses of the vegetation are increasingly pronounced the longer artificial snow has been applied, we can expect further changes as the production of artificial snow continues. The impacts of the snow additives on the environment have not yet been clearly established. While some studies found no effects of snow additives, others showed impacts on, for example, plant growth, but plants reacted inconsistently. Hence, further investigations into the ecological consequences of using snow additives, especially long-term studies, are needed to improve these preliminary conclusions.

Environmental impacts of skiing and ski piste preparation are not only important environmental issues in terms of nature conservation, erosion and the utilisation of energy and resources in alpine regions. The findings from studies of an artificially changed snow cover can be applied to the issue of climate change, as changes in snow cover distribution are expected to be one consequence of climate changes. Predictions from climate models for snow distribution vary regionally, from decreases in snow depth due to higher temperatures and/or lower precipitation, to increases in snow depth due to higher precipitation. Hence, the examination of ecological changes induced by artificial snowing can, to a certain degree, help when estimating the consequences of climatic changes.

Ecological characteristics and conservation value of a particular area are important to evaluate environmental impacts of ski piste preparation and snow production. Although snowing mitigates some negative impacts of ski piste preparation, it induces some new problems. For instance, in nutrient-poor fens, where for nature conservation reasons any input of nutrients should be avoided, using artificial snow is likely to pose a threat to endangered species. On the other hand, on cultivated land that has been fertilised, a nutrient input would have negligible consequences. In sensitive areas, for example those with rare species, geomorphological peculiarities or a high erosion risk, any ski piste with or without artificial snow can be considered negative, and complete abstinence from ski piste creation should be considered. With respect to snow additives, the snow hardener ammonium nitrate should only be used very restrictively, if at all, and the impacts of other salts and of ice nucleation active substances must be studied more thoroughly. Finally, it must be emphasised that the findings reviewed in this contribution about the impacts of snow production and snow additives probably only represent the beginning of ongoing and increasing future changes. Therefore, new research initiatives should address the remaining open questions, for example, on changed hydrology but also on long-term impacts of snowing and snow additives including salts on the vegetation.

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Watershed analysis of forest fragmentation by clearcuts and roads in a Wyoming forest

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Abstract

Remotely sensed data and a Geographic Information System were used to compare the effects of clearcutting and road-building on the landscape pattern of the Bighorn National Forest, in north-central Wyoming. Landscape patterns were quantified for each of 12 watersheds on a series of four maps that differed only in the degree of clearcutting and road density. We analyzed several landscape pattern metrics for the landscape as a whole and for the lodgepole pine and spruce/fir cover classes across these maps, and determined the relative effects of clearcutting and road building on the pattern of each watershed. At both the landscape- and cover class-scales, clearcutting and road building resulted in increased fragmentation as represented by a distinct suite of landscape structural changes. Patch core area and mean patch size decreased, and edge density and patch density increased as a result of clearcuts and roads. Clearcuts and roads simplified patch shapes at the landscape scale, but increased the complexity of lodgepole pine patches. Roads appeared to be a more significant agent of change than clearcuts, and roads which were more evenly distributed across a watershed had a greater effect on landscape pattern than did those which were densely clustered. Examining individual watersheds allows for the comparison of fragmentation among watersheds, as well as across the landscape as a whole. Similar studies of landscape structure in other National Forests and on other public lands may help to identify and prevent further fragmentation of these areas.

Introduction

Forest managers and researchers are increasingly concerned about the impacts of timber harvesting on western North American forests. Clearcutting and its associated road building have altered the structure and function of many forests by reducing the amount of mature forest cover, increasing edge density, and isolating remaining mature forest stands (Harris 1984; Noss and Csuti 1994; Reed et al. 1996a, 1996b). Although natural processes (e.g., fire, windthrow) also alter forest pattern, the landscape pattern produced by these processes is generally different from the pattern produced by timber harvesting (Mladenoff et al. 1993). Timber harvesting also removes a larger amount of biomass from a forest than do most

natural disturbances, and results in a disproportionate removal of late-successional stands with high timber volume and quality (Harris 1984). Noss and Csuti (1994) suggested that patches generated by natural disturbances are fundamentally different from patches created by anthropogenic activities. Natural disturbances typically create patches with less contrast and therefore less edge effect between adjacent patches. However, researchers are only beginning to quantify these differences.

Clearcutting has several impacts on the biotic and abiotic components of a forest, including the fragmentation and elimination of habitat for animals that require late-successional forests (e.g., Ruggiero et al. 1994). Clearcutting can also attract habitat generalists (e.g., Lyon and Jensen 1980) and potentially damag-

ing edge-adapted species (e.g., Gates and Gysel 1978). Wind damage is usually more extensive along these edges than in interior forests, further reducing the size of remaining stands over time (Chen et al. 1992; Vaillancourt 1995). Additionally, clearcutting reduces downstream water quality by increasing soil erosion and streamflow (Coats and Miller 1981).

Other anthropogenic influences on landscape pattern, such as fire suppression, probably affect landscape structure to a lesser degree than do clearcutting and road building. For example, Romme and Despain (1989) suggested that on the subalpine plateaus of Yellowstone National Park, which are similar in elevation and cover type to much of our study area, effective fire suppression has only been in place since World War II, when technological advances such as slurry-bombing and helicopters provided accessibility to remote lightning strikes. While this may have resulted in an accumulation of fuels in some areas, it seems unlikely that major changes in landscape structure were produced during this relatively short time span.

Recognition of these detrimental impacts has, in part, led to the adoption of an ecosystem management philosophy by the USDA Forest Service (Shands 1994). Ecosystem management attempts to maintain the integrity of natural systems while continuing to provide for multiple uses, including timber harvesting (Kaufmann et al. 1994; Jensen et al. 1996). In order to achieve this goal, future timber harvests must be integrated into existing landscapes in ways that minimize detrimental impacts on other forest uses and processes. Such integration requires accurate quantification of landscape patterns over large land areas and the ability to predict how future timber harvests will alter existing patterns.

The adoption of ecosystem management has underscored the need for standardized methods of evaluating and comparing ecosystems. Ecosystems are defined in many different ways and, because many ecosystems lack definitive boundaries, it is difficult to compare results across broad regions. Ecosystem management requires examination of ecosystems at a variety of spatial scales, from specific sites to the landscape scale. Several authors have suggested the use of the watershed as an analysis unit for the evaluation of ecosystems (Lotspeich 1980; Montgomery et al. 1995). Because watersheds have relatively well-defined, natural boundaries, watershed analysis enables researchers to compare results across broad spatial scales. In addition, multi-scale analyses may be performed by the aggregation of watersheds

at several spatial scales (Montgomery et al. 1995). Watersheds have become fundamental units in a standard U.S. Forest Service hierarchical framework for diagnosing ecological health (USDA Forest Service 1993; Maxwell et al. 1995), yet watershed-based landscape analysis methods have seldom been employed.

Remotely sensed data and geographic information systems (GIS) are ideally suited for describing landscape-scale patterns relative to timber harvesting. Researchers have used these tools to quantify the effects of timber harvesting in the Pacific Northwest (Ripple et al. 1991; Spies et al. 1994), a region in which timber harvesting has become the focus of acrimonious and well-publicized debates. Recently, researchers have begun to use GIS technology to quantify forest patterns in the Rocky Mountain region, where timber harvesting is rapidly becoming a contentious management issue (Baker 1994; Reed et al. 1996a, 1996b; Shinneman 1996). Because timber harvesting in the Rocky Mountain region is not yet as extensive as it is in the Pacific Northwest, forest managers have an opportunity to use GIS technology to plan future timber harvests in a manner more consistent with ecosystem management philosophy.

We used remotely-sensed data and a GIS to analyze the effects of clearcutting and road building on the landscape-scale pattern of cover types on the Bighorn National Forest (BNF), in north-central Wyoming. Using the 12 major watersheds of the BNF as the analysis units, landscape patterns were quantified using a series of four maps that differed in the degree of clearcutting and road building. By comparing landscape pattern metrics across these maps, we determined the relative effects of clearcutting and road building on forest landscape pattern. We hypothesized that the extent of fragmentation of landscape patterns in the BNF, as measured by directional changes of these landscape metrics, has increased as a result of existing clearcuts and roads.

Study area

The BNF in north-central Wyoming encompasses about 4.5×10^5 ha and extends about 115 km south from the Montana border across the Big Horn Mountains (Figure 1). The forest is dominated by lodgepole pine (*Pinus contorta*) and spruce/fir (*Picea engelmannii*/*Abies lasiocarpa*) forests, with occasional aspen (*Populus tremuloides*) stands, herbaceous meadows, shrublands, and riparian willow (*Salix* spp.) commu-

From: Sargent E Schutt
To: comments-intermtn-bridger-teton-jackson@fs.fed.us
Cc: [Town Council](#); [County Commissioners](#)
Subject: Snow King Improvements
Date: Thursday, October 04, 2018 2:44:49 PM

To Whom It May Concern:

As a resident of Jackson, I've appreciated the improvements Snow King has made in recent years, and look forward to them further developing the resort facilities in accordance with their plans. As a father of a young boy who participates in the JHSSC Ski Team, and who would love the opportunity to have lift accessed biking, to the thought of 'date nights' at the mountain top restaurant, I am very much in favor of the plans I've seen.

My family has no personal vested interest in the profits of the operators, but we do enjoy the improvements, and look forward to seeing them continue.

Also, as more tourists continue to come to Jackson, I feel it would be beneficial to have safe, enjoyable options for them to enjoy near town, as it would likely help keep many of them from taking the extra steps to wander further into outlying areas, causing higher use, and more problems with trash, overuse, and displacement of animal habitation in our pristine wilderness areas.

In sum, I fully support their development plans and hope the Forest Service will continue to support those plans as well.

Sincerely,

Sargent Schutt

Sargent Schutt Photography

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PO Box 1970
Jackson, WY 83001

To: Mary Moore, Jackson District Ranger

From: Jim LaRoe, Brad Nielson, Geneva Chong, Rod Newcomb (members of the Snow King Stakeholder Group)

Date: October 4, 2018

Attention: Snow King On-mountain Improvements Project

Clarification of the Snow King Stakeholder process and outcomes

We want to thank the US Forest Service (USFS) for your investment of time and resources into this critical issue for our Town, County and public lands and for voluntarily attending each of the long and detailed Snow King Stakeholder Group meetings. We understand the multi-faceted approval process that surrounds this decision and are heartened with the cooperation between all the various entities involved.

All of us were active participants of the Snow King Stakeholder Group that was convened to discuss various issues associated with the proposals that these investors were preparing to submit to the Town of Jackson (TOJ) and the USFS. As such, we all invested considerable personal time and effort to develop a thoughtful and clear understanding of all the issues raised by Snow King's proposal. The Stakeholder process provided a valuable forum to openly discuss and debate some of the complex details surrounding Snow King's proposal and the long-term impacts on our community.

We want to clearly present three points to clarify the results of our work:

- (1) the scenarios do not reflect all of the discussions and the give and take behind each component
- (2) more importantly, none of the scenarios should be taken as "the proposal" of all Stakeholders
- (3) Snow King's proposal should certainly not be read as a summary of a position reached, and agreed to, by all Stakeholders.

Although there were four scenarios that were eventually published as the "product" of that effort, it is critically important that you understand that those scenarios do not reflect all the important discussions, concerns and commitments that were raised with regard to each of the key issues associated with the Town Base Area Master Plan Amendment (BAMPA) or USFS proposals.

The scenarios cannot be taken as the only four possible development scenarios for the Snow King resort area. More importantly, none of the scenarios should be considered as scenarios that all Stakeholders agreed to and would unanimously recommend for implementation. Any attempt to couch these Scenarios as "unilaterally accepted" by all Stakeholders is very misleading.

Each of the components of Snow King's proposal which became the focus of the Stakeholders' discussions (e.g. SKRMA responsibilities, boundary expansion, road expansion, gondola, zip line, restaurant, observatory, additional ice rink, mountain recreation center) raised important commercial, cultural, and environmental concerns and tradeoffs. Unfortunately, many or most of those tradeoffs are not adequately addressed and reflected in Snow King's final proposals.

The inclusion of any component (say for example the location of the proposed gondola) in any of

the scenarios involved a discussion about the various tradeoffs, commitments and compensation that would be expected in exchange for that component. Therefore, even though some of the Stakeholder may have supported the possibility of a gondola landing in what is now Phil Baux Park (and not all did), they only did so after taking into consideration other significant concessions to be received from Snow King with regard to other components of that scenario or even more importantly, just compensation to be paid by Snow King in consideration for including that component.

This attribute of the process has been taken advantage of by Snow King in their proposals to TOJ and USFS. What Snow King has done in their proposal is select various components from each of the scenarios while ignoring the important tradeoffs, commitments and compensation that were discussed, stressed and *required* by many of the Stakeholders in exchange for the inclusion of that component in that particular scenario. As a result, any statement by the developers that their proposals reflect the outcomes of the Stakeholder process or the desires of a majority of the public in general is misleading and incorrect, and seriously misrepresents the discussions that took place throughout the Stakeholder process.

In essence, what Snow King has delivered to the TOJ, USFS, and the community at large is extremely vague and leaves out many of the essential details and commitments that are directly connected to each item in their proposal. This negates the months of work by the Stakeholder Group and public participation. With all the investment made by so many people we expected a fully detailed proposal reflecting the in-depth issues, impacts and trade-offs which have been considered, discussed and mandated. We cannot see how the TOJ, the USFS and the County can be expected to respond or comment on so little information on such a critical long-term decision for the community.

In light of the foregoing, as members of the Stakeholder Group, we request that you kindly consider the following points as you review the facilitator's summary, other materials presented as products of the Stakeholder Group, and the proposals submitted by the investors/developers.

The Gondola Landing

Showing a new Gondola landing in what is currently Phil Baux Park (PB Park) is misleading without considerable insight into the Stakeholder discussions on this point. The idea of a Gondola in PB Park was only supported by many of the Stakeholders on the basis that it would be granted in exchange for significant commitments by Snow King, both financial and otherwise. In addition, the majority of public comment was against landing the gondola in Phil Baux Park.

Nonetheless, Snow King's proposal lands the gondola in PB Park and includes only a vague reference to expanded green space which is far-off from the type of financial and other commitments that were discussed during the Stakeholder process.

The footprint of the Gondola station is a small part of the issue. A Gondola in PB Park will draw large crowds of tourists going to the restaurant and may overrun PB Park negating any public use. We hope the Forest Service will consider that a Restaurant at the top will have a large and direct impact on PB Park at the Base. If the developers' proposal is adopted, PB Park will never be the summer haven for TOJ citizens that it is today. Tourist buses, restaurant, a zip line, huge increase in human traffic will forever change the character of PB Park.

Zip Line in PB Park

In our opinion a zip line has no place landing in PB Park. If the gondola is located in PB Park, there will already be considerable new congestion from tourists loading the Gondola as well as associated new bus traffic at the Base. We also believe that a Zip-Line does not fit the character of our Community that prides itself in embracing nature and the Wild outdoors. A Zip-Line is an isolated thrill-ride that does not encourage people to explore nature.

The Road

We do not support the large road expansion outside the boundaries. Our 2012 Comprehensive Plan states no resort expansion. Please urge respect of the plan and deny boundary expansion. Alternative front-side road options exist. Alternative summer roads were provided by Snow Engineering Group that could also serve beginner skiers. Or, as stated in Rod Newcomb's letter, we recommend that Snow King instead use the existing road up the back. We were disappointed that Snow King refused to consider this throughout our discussions. The backside road and a helicopter can be used for any type of construction on the summit: a common construction practice used by many ski areas. We are also disappointed that Snow King has not proposed to have any expansion of the existing boundaries limited to the road itself as discussed at length during the Stakeholders process.

The Boundaries and the Back Side

We do not support boundary expansions as proposed. Snow King has proposed very large boundary expansions. Their proposal ignores many of the other options discussed and recommended during the Stakeholder process. We saw boundaries and the back-side as a potential area for compromise: expand one way and reduce the other. Instead, Snow King has proposed expanding in all directions. This was not our vision and we do not support it. Expanded snowmaking was not explicitly discussed and impacts to the town are potentially significant and warrant in-depth examination and detailed agreements for water use and management.

A Summit Restaurant

We ask again that the Forest Service take special care in evaluating the Restaurant's impact on the Base of the Mountain. In general, the majority of users will gather at the Base in PB Park to use the Gondi as the only way to reach the restaurant. We do believe that a restaurant can be a nice amenity for the community if well-designed and takes into consideration its greater impact. We understand the Forest Service has thoughtful guidelines for these structures but want to emphasize the structure be one story, a low visible profile using green design parameters. Consideration should be made of the historical value of the existing Panorama House and potential benefits of incorporating, restoring and respecting it in new construction.

We again want to again thank the USFS for its participation in this process and for taking the time to consider our detailed thoughts and concerns. Please do not hesitate to contact any of us with any questions.

Geneva Chong, Geneva.chong@gmail.com

Jim LaRoe, jtlaroe7@gmail.com

Rod Newcomb, rnewcomb@wyoming.com

Brad Nielson, bknielson@me.com

From: Rick Tarrel
To: comments-intermtn-bridger-teton-jackson@fs.fed.us; marymoore@fs.fed.us; [Town Council](#); [County Commissioners](#)
Subject: Snow King Improvements
Date: Friday, October 05, 2018 2:30:50 AM

TO: The Chief of the US Forest Service

Re: Development at Snow King Mountain, Jackson, WY

Dear Sir:

I am writing to express my support for the upcoming development plans of Snow King Mountain. I have been employed at Snow King for the past 5 years, and I have had the opportunity to learn and witness the value that it brings to the Jackson community. This mountain and ski resort has been part of the fabric of Jackson, WY for over 75 years, yet it has not benefitted proportionally with the times with regard to growth, modernization, and use.

Snow King's plans for development are reasonable, and I believe they will benefit the citizens of Jackson, as well as the workforce that makes the town attractive to visitors from all over the world. Snow King complements the offerings of the Jackson Hole Mountain Resort (JHMR) by providing an affordable alternative for local patrons, and domestic visitors that are unable to aspire to the financial and skill challenges offered by JHMR.

Specifically, I support and encourage those improvements that would make Snow King Mountain more accessible to visitors and provide a wider variety of terrain. The installation of a gondola serving the top of the mountain would foster greater utility of the terrain that Snow King already uses. It would also replace a chair lift that not only has limited capacity, but due to its age, has growing safety risks.

I also greatly support the expansion of the mountain's terrain to include more gentle slopes for beginning skiers and mountain bikers. This expansion would benefit the current users of the mountain by eliminating crowding and the extremely limited easy and moderate terrain that Snow King currently has.

These are just two of the expansion proposals that I feel are important and beneficial to the appropriate land use of the town of Jackson. Expansion will invite additional real estate building opportunities that, one wisely, will allow Snow King to retain its small mountain feel while simultaneously generating additional revenue for the town.

All of the current proposals for improvement provide benefits to visitors for activities of all seasons, allowing the resort to reach the tipping point where it can be self sustaining. From a local perspective alone, Snow King has long been a crucible for the development of young skiers and mountaineers who go on to make their impact felt across the globe, thus bringing additional recognition and financial benefit to the entire Jackson Hole area.

I urge you to approve the Snow King Phase 2 plans so that its elements can be implemented sooner rather than later to benefit the residents, employees, visitors of Jackson Hole, the town of Jackson, and Teton County.

Respectfully yours,
Richard J. Tarrel
888-718-7156

From: Jeff Wogoman
To: comments-intermt-n-bridger-teton-jackson@fs.fed.us
Cc: [Town Council](#); [County Commissioners](#)
Subject: SKMR On-mountain improvements Project
Date: Thursday, October 04, 2018 11:26:08 AM

Dear Bridger-Teton National Forest Representatives,

I'm writing to voice my support for the planned upgrades proposed by Snow King Mountain owners. I've attended a community engagement workshop, read the proposals as outlined by Snow King management, and followed the reporting and opinions in the local media. There are many elements to the plan, and I'm not going to dive into each specifically, but none of the proposals seem egregious or leading to the "disneyfication" of Jackson.

I first visited Snow King as a High School Sophomore racing for the Cody Ski Team in the winter of 1986 (we won state that year in case you're wondering.). Outside of the gelande jump going away, and an ice rink being constructed, the overall footprint and amenities offered hadn't changed much from my first visit until the recent additions over the last few years. My hometown ski hill as a kid, Sleeping Giant, which opened in the 40's not long after Snow King, served much the same purpose to our community. A family-friendly, inexpensive option for recreation and life long memories and friendships. In the early 2000's, with deteriorating equipment, lack of investment, and poor management, Sleeping Giant closed to the public. There were no community meetings, no local input, it was just there one winter, gone the next.

It was closed for about 6 years until investors with the capital and vision, and yes, an expectation of return on investment, bought the hill and re-opened. New lifts went in, new lodging options, snowmaking, and even the evil of all evils, a zip line. The world kept spinning.

That's obviously not a complete apples to apples comparison to Snow King. But, as someone who works in the Ski and Snowsports industry, the decline of the independent, local ski hill is pervasive. The idea that Snow King can "just stay the same" is not only economic suicide for the new owners, but more importantly will have a lasting effect on its longevity and services to the community. It's not feasible for Snow King owners, nor in my opinion very democratic, that we believe we can pick and choose which planned developments go in, and which don't based on its importance to us personally. Unless it's illegal, outside of current zoning regulations, or presented under false pretenses, then it should move forward under the guidelines allowed by the USFS and local agencies.

I appreciate the concerns of locals who think it's too much, too fast. But, if you look at the history of upgrades at the King, I hope it's not too little, too late. From the comments I've read and the opinions I've heard at local meetings, I get the sense of entitlement hiding behind the veneer of concerned citizen. In my opinion, Snow King management has been very transparent and open about their plans, their intentions, and motivations.

I have two children in the Jackson Hole Ski and Snowboard Club. The experiences and opportunity that the King has afforded them, and countless generations before them in my mind is equal to the education they receive at TCSD. The King is a world class venue, with third rate facilities and I believe that the planned upgrades will allow future generations of locals to continue the tradition of the King.

That's what it's really about. Continuing the tradition of snowsports in downtown Jackson. Local government officials support the Lodging Tax because it's the "tax that we don't pay". I believe the same about the proposed changes to Snow King. If tourists want to pay \$300 for a day at the King to ride the gondola, eat at the new restaurant, and ride a zip line, great. Our community benefits with a new training facility, continued support of racing at the King, new beginner terrain for youngsters, and a planetarium so that when our kids realize they aren't making the US Ski Team, maybe they'll decide to be an astrophysicist.

Thank you for your time,

Jeff Wogoman
PO Box 2794
Jackson WY 83001
307-690-5923
jwogoman@gmail.com

"not the locals' fucking hill!"

Snow King HR Director Dylan Taylor¹

My name is Evan Germeles. You might fairly ask why I would lead off my comment in such a manner, and with such language. Fair enough. My answer is that while Snow King has been widely known and loved as the "Town Hill", Mr. Taylor's own words best convey the reality of what Snow King's ownership and management intend. And beyond that his words do seem to convey his feelings about "the locals". But more on this later.

INTRODUCTION

I worked at Snow King in both the lift operations and snowmaking departments and so I became aware first hand of what kind of atmosphere the new ownership and management was creating. But I also became aware of certain patterns in the day to day operation of Snow King that bear directly on the question of whether to approve or deny their request to greatly expand the permit area.

The reality is that management's conduct points to the inevitable conclusion that they wish to turn Snow King into a much larger resort capable of generating much larger revenues. In their own words:

"These small community ski resorts are going the way of the dodo bird in communities across the country...."

Jeff Golightly, VP of Gardner Capital Management²

While management may pay lip service to Snow King's long history as the "Town Hill", their intention, according to their own proposal, is to create something entirely different.

This is in fact born out by a common sense look at the actual reality of their proposed plans. And the reality is that Snow King continues to lose money:

Snow King officials have routinely said that the Town Hill continues to struggle financially but that they are making every effort to create a sustainable business model by investing millions into Phase 2....³

So the point here is that what is at the heart of management's argument is that in order to survive and reverse the current trend of continuing and consistent operating losses,

¹ Mr Taylor stated this in response to my concern that Snow King management was creating an adversarial relationship with both locals and local government. My concerns were specifically related to the Jackson Hole Daily running a front page article titled "Town Hill under scrutiny", by John Spina, on November 20, 2017.

² Jackson Hole Daily, "Town Hill under scrutiny", by John Spina, November 20, 2017, page 1.

³ Jackson Hole Daily, "Town Hill under scrutiny", by John Spina, November 20, 2017, page 1.

the Forest Service MUST approve their plans if Snow King is to survive. And to survive Snow King must become larger, A LOT larger.

Snow King in the News!!

Before taking their proposal at face value and discussing its merits, I would like to circle back and highlight these two questions:

What do recent Snow King controversies reveal?

And to what degree are these financial struggles self-inflicted?

So as to controversies, let's start with two that were reported by the Jackson Hole Daily.

"Town charges owner with rental violation", by Emily Mieuse, October 4, 2017.

As reported in this article, Snow King General Manager Ryan Stanley contracted with Jennifer Wilhite to house up to 20 employees in East Jackson. Rent was \$9,000 a month. An affidavit filed by Jackson Code Enforcement Officer Brian Morris stated that neighbors complained to the Town that there were up to 15 people living there and that Mr. Morris found 14 employees. Stanley was given a verbal citation and Wilhite was charged with eight counts of violating the municipal code by Prosecuting Attorney Lea Colasuonno. The tenants were summarily and hastily evicted.

What isn't reported in that article was that Snow King went on to house the tenants, who were J-1 Visa contract employees, in hotel rooms around Jackson. The problem was that August hotel rates were exorbitantly high due to the going booking rate for the total solar eclipse. These students were immediately asked to pay additional rent by Snow King management for these alternate housing arrangements and Snow King apparently didn't initially contact the company it had contracted with to provide these J-1 students. In effect Snow King attempted to quickly push the recently evicted employees into paying substantially more rent for substantially lower quality housing without informing the contracting company that it had provided illegal housing and was seeking more rent from the students. Luckily for the students, one of them organized a group of countrymen and also contacted the company contracted by Snow King and with which he also signed a contract. In the end a compromise was reached and Snow King bore the majority of the substantial cost of a month of hotel rooms.

"Snow King summit bar halts liquor sales", by Allie Gross, July 25, 2017.

As reported in this article, Snow King spent considerable capital renovating the Panorama House on top of the mountain in order to allow alcoholic beverage sales, but had been illegally selling alcohol without a liquor license. The County became aware of the sales and forced Snow King to cease sales shortly after the grand opening.

In a nutshell, Snow King had a town license for alcohol sales and for whatever reason didn't obtain a license for its location on top of the hill, which is located for purposes of licensing not in the Town of Jackson but in Teton County.

So..... Let's go back to Jeff Golightly, VP of Gardner Capital Management: "Any added expense is an opportunity lost for us...."⁴ And it's pretty clear that in both the

⁴ Jackson Hole Daily, *"Town Hill under scrutiny"*, by John Spina, November 20, 2017, page 1.

case of the illegal housing and also the illegal sale of alcohol there is nobody but Snow King's management to blame. There is obviously a self inflicted 'lost opportunity' here in terms of restoring Snow King to profitable operation. How do these self inflicted 'lost opportunities,' in addition to the real expenses involved with paying exorbitant hotel rates and the administrative time and wages and legal expenses, negatively affect their bottom line? They spent thousands on renovating a building they now propose to demolish and due to their mistake, have not sold a single beer since. And most relevantly, how many paid hours did Snow King management waste on these outcomes, either before the discovery of their actions or in addressing the consequences? Ouch!

But their actions raise the question of competence and more importantly the question of credibility and perhaps integrity.

As for competence, how could Snow King not be aware that the liquor license it held was only for the base area in the Town of Jackson and didn't cover the summit area which was in Teton County? Snow King has been heavily involved in various planning processes for the various expansion projects which are located in three somewhat overlapping jurisdictions (the Town of Jackson, Forest Service land and Teton County), so it definitely can't be stated that they were unaware the Panorama House is located out in the County. So how did they miss that for licensing purposes the Panorama House is located in Teton County and requires a separate license?

Similarly, how did Snow King enter into an illegal housing contract? Mr. Stanley was issued a verbal citation but not charged. Did he do so knowingly?

As for credibility and perhaps integrity the obvious question is what does Snow King being caught violating major local regulations twice in the span of a few weeks mean? How did others in management and supervisory ownership fail to catch either violation before being caught? Or did they? Why have they made no public representations regarding these events and the negative effects on their bottom line?

Then there is the question of Phil Baux Park and the bottom station of the proposed Gondola as well as other improvements, from the Jackson Hole Daily:

The Parks and Rec advisory board unanimously turned down a proposed location in the public park, roughly between the ballfield and bouldering walls. "Pretty much all the public comment that we received, both written and verbal, was from people who did not want to see that gondola bisect Phil Baux Park," said Dave Ellerstein, board chair. Snow King General Manager Ryan Stanley said miscommunication, and the wrong map, was the reason for the "no" vote. He tried to get the board to cast its vote on a revised map, which moves the gondola landing area uphill, closer to the Cougar Lift. Stanley said in an interview that the meeting went "poorly."⁵

Again, there is a major issue here with competence. There is the obvious failure to secure the board's approval, made worse by it's unanimity. There is the submission of the wrong map with their proposal. There is "miscommunication", whatever that means. There is the Snow King's failure to see the problem with needlessly bisecting a town

⁵ Jackson Hole Daily, "Parks & Rec: Don't split park with gondola" by Mike Koshmrl, Aug 10, 2018.

park. There is Mr. Stanley's attempt to get the board to vote on a map that it had just then and there been presented with and about which neither the board nor the public had been given time to consider, and in the case of the public no chance to comment on. *The really significant issue was that by failing to submit the proper map--if that is in fact what happened--Mr. Stanley completely wasted everyone's time, including his own.*

Prior to this was Snow King's initial failure to obtain the Town Council's permission to hold a professional Snocross event at the hill by a 3-2 vote on September 5, 2017.⁶ However on September 25, the Town Council reversed itself after several concessions including shortening the race by almost four hours in order to mitigate the noise impact of dozens of snow machines as well as large crowds drinking until late at night.⁷ While Snow King's initial failure to obtain approval may appear to be a temporary setback, in fact it may have significantly and adversely impacted attendance as the initial cancellation and short period between the reversal and the event's start on December 8 made travel plans more difficult and expensive. Additionally, Snow King's management failed to provide enough snowmaking as the race was only held after approximately 60 dump trucks of snow were hauled to the race area in an all volunteer effort led by the Jackson Hole Snow Devils (Bravo!). To sum up, they failed to obtain initial approval, thus shortening preparation time and likely lowering attendance, scheduled the race itself for a date that turned out to be too early for sufficient natural snow and Snow King's snow making and in its attempt to demonstrate its ability to pull off the event had to rely to a huge degree on volunteer equipment, money and labor.

Which brings us back to the issue of Snow King's relationship with "locals" and local government. At issue was rental rates for town START Bus communication gear on top of the mountain vs. Snow King rental payments on 30 acres of land at the base. From the Jackson Hole Daily's "Town Hill under scrutiny" article:

[T]he agreement gave the resort a better deal after the town decided it was in the public's interest to essentially subsidize the Town Hill, reducing its base rent from \$10,800 a year to \$1,200. The town's interest in reviewing its leases with Snow King arose when the resort requested \$8,800 a year to lease telecommunications equipment atop the mountain....

While this issue has yet to be settled, Buckrail News ran these comments on the issue at a workshop on the leases:

Snow King's continued attempts to monetize nearly everything on the Town Hill finally hit palpable pushback from at least one councilor at a workshop Monday. After getting the annual bill from Snow King for the lease of mountain top space ... councilman Jim Stanford voiced his objections at a town meeting November 6, ... "I continue to object to the

⁶ Jackson Hole Daily, "*Town denies request for snowmobile race at Snow King*", by John Spina, September 7, 2017.

⁷ Jackson Hole Daily, "*Town overturns Snocross decision*", by John Spina, September 26, 2017.

town having to pay \$8,800 a year to Snow King when Snow King pays a hundred bucks a month for 30 acres," Stanford said, referring to a \$1,200-a-year lease agreement good through 2033. "It seems to me absurd to pay this sum of money for what should be a routine courtesy.... With that act of extraordinary generosity on the part of the town, today we find ourselves in a much different scenario. Different owners, different revenue models, yet we are stuck in a lease that goes to 2023 or 2033 at a hundred bucks a month," Stanford said. The councilman also alluded to some \$3 million in public money subsidy the resort has enjoyed over the years, with less and less return.⁸

A significant issue with the locals is that while the Town leased 30 acres of extremely valuable land at \$100/month and has provided large subsidies and approved large disruptive events, Snow King for its part has restricted winter uphill access to paying customers only and seeks not only to increase rent payments from the Town but to also take over large areas of Phil Baux Park.

But beyond these controversies, we finally get to the heart of the "not the locals' fucking hill" issue as at the workshop on rental fees Mr. Golightly stated:

"This is really hard for me to say..." Golightly began, struggle [sic] for words. "Before I started working here I was warned that councilman Stanford has a personal vendetta against Snow King. I said, 'That can't be true.' I've known him for 20-plus years. We have similar friends. My wife's worked with you. But unfortunately I've noticed a pattern.... at the conclusion of almost every meeting, for whatever reason, beyond disagreement there are things like, 'we are disingenuous' or 'we are liars.' The language that is used implies an intent that is not pure. It is so difficult to sit there because it happens at the end after we sit down and we are defenseless. We can never respond. I'm never going to go into trying to evaluate the content of your heart. I will never call you dishonest."⁹

Snow King management has managed to inject this into the public debate: that while an elected public servant has a "vendetta" and that at "every meeting" Snow King representatives are called "liars", the poor victims are "defenseless" and "would never call you dishonest." First of all by saying "vendetta" Golightly **was** calling Stanford dishonest. Second, how can a Vice President of Gardner Capital Management--which holds a portfolio containing 1.7 billion dollars in solar power assets alone¹⁰-- claim to be so "helpless"? As for "we can never respond", he actually kinda did!

As detailed above, in 2017 alone: Snow King housed foreign contract workers in cramped **illegal** housing (and as reflected by Mr. Moore's "verbal" citation, may have done so knowingly), then moved them into even more cramped and basic housing

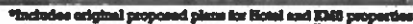
⁸ Buckrail News, "*Town, Snow King wrangle over lease agreements*", November 22, 2017.

⁹ Buckrail News, "*Town, Snow King wrangle over lease agreements*", November 22, 2017.

¹⁰ <https://www.gardnercapital.com/solar-investments/>

At any rate, it would appear that there is some basis for doubting their competence and credibility and Mr. Golightly has as a matter of record acknowledged that there IS public distrust. That this conflict exists at all reflects on Snow King's management poorly, as a large part of their responsibility is ensuring good relations with local government and local people.

But perhaps the biggest elephant in a very big room is this proposal:



¹¹ <https://jhalliance.org/2018/08/01/snow-kings-massive-base-development-plans-now-see-now-dont/>

the Base Area, the Snow King Lodge area and to the side of the Rafferty Lift. (It's all the brown colored boxes.) This development will cost A LOT MORE money.¹²

So it seems entirely disingenuous to claim that the failure to turn a profit over the last year necessitates approval of extensive on mountain construction on public land while they have perhaps been planning all along the "elephant pens" in the above photo. It would be especially disingenuous to present what is reflected in the proposal under consideration by the Forest Service in this NEPA comment and decision making process for on-mountain development over several years and only when the horse is a few strides from the finish line do they release what they are likely using to lure investors, but NOT submit that development to either public scrutiny or NEPA review as an integral part of their entire business plan. *If Snow King management is upset about the Town's reaction to an \$8,800 bill, perhaps they should realize that everyone can see what is going on with their own eyes.*

While this apparent contradiction does apply to many components of this NEPA process, these will be addressed later. The big point I want to make here is to ask people to consider whether Mr. Golightly is right and he and Snow King management has been victimized and falsely accused of being "disingenuous" and "liars"? Clearly Snow King has made a few mistakes that reflect on competence--the wrong map, the liquor license, the elephant--but Mr. Golightly himself has publicly acknowledged that their own truthfulness and credibility IS an issue. The illegal housing issue and "verbal citation" point strongly to that. It is a valid question.

Down with the Town Hill!!!

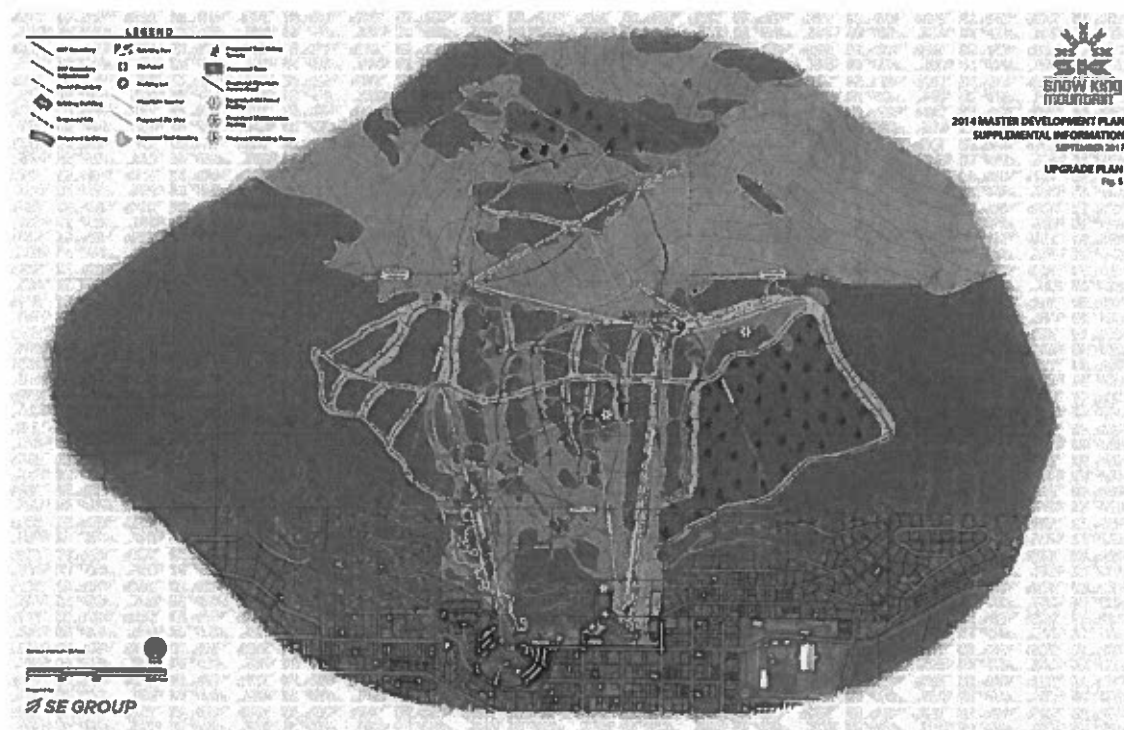
One more big picture thing: if by their own words it *is* true that Snow King cannot operate profitably at its current size and price structure, just what exactly does that mean???

To date Snow King has installed the new Rafferty Lift, cut new groomed runs, greatly expanded gladed skiing, and built two new snowmaking pump houses as well as new snowmaking piping as improvements to on-mountain ski infrastructure. Additionally Mr. Stanley directed the installation of RFID gates to eliminate what he viewed as a serious theft problem. As for season pass pricing, a 2017 pass cost \$340 before October 1 and \$399 after.¹³ A 2018 Adult Season Pass cost \$380 before October 1 and \$480 after.¹⁴ Take a look at the following map of proposed on-mountain improvements:

¹² However as a somewhat humorous/serious aside: what's the main attraction with the big square looking brown box thing just north of the cemetery?? Cemetery view?? Comes with a plot?? Do you get to walk your dog and play with other dogs off leash out there?? Is the cemetery access to ski in condos???? Is special cemetery access for condo owners & luxury hotel guests only??? But in all seriousness what kind of person or artificial entity would build or buy luxury expensive somethings right on top of a grave yard?? Let the dead lie in peace and with dignity!

¹³ <https://snowkingmountain.com/snow-king-2017-2018-season-pass/>

¹⁴ <https://snowkingmountain.com/winter-tickets-and-passes/>



While it is admittedly a bit hard to see at this size the proposal seems to reflect the following new ski infrastructure:

- A new Gondola
- A new lift that is likely longer than the New Rafferty Lift
- Two new lifts at the summit (Magic Carpets?)
- A new road to the summit
- Significant expansion of groomed runs above and east of Rafferty
- A very large glading project west of Bearcat
- A long run and traverse on the west/north boundary
- A few new trails serving the new lift south of the Summit
- A glading project on the south boundary
- Snowmaking pipes, equipment and storage capacity for the new runs on the south aspect?
- Major new in-ground and surface electrical infrastructure
- And oh yes a massive structure replacing the Panorama House and Summit lift to include a Gondola top station, restaurant, ski patrol room, observatory, bathrooms, large capacity septic etc.

Now, when Snow King management asserts that their current revenue is insufficient to make the hill "sustainable" at its current size, it is fair to assume that they base this on current 2018 pricing of \$480 per pass and daily pricing of either \$60 to ski only or \$90 to enjoy all activities.

So here's my question: *given all the infrastructure, glading/trail projects, expanded snowmaking, expanded operations area, larger staff requirements, larger*

grooming area, management costs, etc. what is a 2023 pass gonna cost?? \$1,500???

What has made Snow King the "Town Hill" has always been it's combination of proximity and affordability. It is not at all uncommon for folks to hold a Targhee or JHMR pass AND a Snow King Pass. Or for folks who can't afford on piste skiing elsewhere to hold only a Snow King Pass. The apparent problem is that there is no way Snow King can continue to be somewhat affordable and thus accessible, at least according to what Snow King management has represented time and time again. Unless Snow King is willing to funnel revenue from the extensive elephant condo/??? plan back into the Hill, which the proposal before the Forest Service doesn't contain, very substantial price increases must happen.

So in the long run it seems Snow King will be "not the locals' fucking hill" because many or even most of the locals won't be able to afford it. And I suspect that Mr. Chapman's and Golightly's big plan is to change Snow King from a "dodo bird" "small community ski resort" into some luxury Jackson resort complete with rarely occupied on slope ski-in million dollar condos.

The big problem for them is that to do so requires public land. It requires good will with the local community. And it requires honest stewardship. I can understand why locals would be upset if the big plan is to turn Snow King into a luxury ski resort in the Winter and a huge amusement park in the summer. And not keep the Town Hill.

The worst case, and very likely, scenario is that these extensive and hugely expensive on-mountain improvements may push ticket and pass prices out of either the affordability or desirability range of most local skiers and will mean winter sustainability will depend on condo owners, a relatively small group of local skiers and tourists. In 2018 employee expenses, never mind the difficulty of finding even barely qualified employees, in Jackson Hole make it very difficult to staff a business. The proposed enhancements are going to add considerable expense and difficulty in fully staffing the hill, further increasing the financial pressure. There is a considerable risk that Snow King will never become profitable and sustainable as its size, annual operating cost and debt burden overcome the demand side of the market. In addition to this size/pricing/cost conundrum, there is the fact that current management has failed to operate Snow King's winter season without a loss. This failure is ironically and perhaps dangerously relied on as their justification for approving their plans.

Thus I do believe that the question of how to make Snow King sustainable as a ski hill is a question that deserves very close attention.

Elevation and Global Warming

Anybody who skis in the Tetons knows that on almost any powder day (there have been a few exceptions like the Christmas dump a few years back) we all go to either JHMR or Targhee or human powered backcountry runs. Not Snow King. It's relatively deserted on a powder day.

The facts are that Snow King sits at a relatively low base elevation compared to Targhee and a very low summit elevation compared to JHMR, Targhee or the Teton backcountry. It also typically receives a significantly lesser measurable amount of precipitation that the other options on a per storm basis.

As for the early season, the result is that Snow King relies almost completely on snowmaking to open for the season and it rarely opens as early as hoped. The south facing slopes proposed off the summit gondola typically are very wind scoured and sun affected and thus are likely to also depend heavily on snowmaking. The good news is that between the snowmaking and grooming departments and the Ski Club, there is considerable expertise in providing high quality ski racing and training runs. The bad news is that while there is some new beginner and intermediate terrain, and perhaps more opening in the proposal, early season conditions are typically pretty icy and compact. That is due to the mountain's steep and north facing aspect. Last year the upper mountain hadn't received enough snow to open until mid January.

As for the end of the season it has become a yearly question whether the Hill Climb can even be held given the condition and sparsity of the snow pack. Skiing conditions get pretty mediocre as the snowpack goes isothermic and melts off. The Town Downhill had to be moved to JHMR last year. Avalanche conditions over the last few seasons have become much trickier as reflected in recent glide avalanches (all the way to the ground) on Belly Roll and elsewhere.

The point here is that Snow King is already facing challenging environmental conditions and the reality of climate change will mean that these will become more severe. In my mind it means two things:

1. Snow King is going to have a hard time competing in terms of ticket and pass revenue with either Targhee or JHMR because it already receives less and lesser quality snow. Snow amounts and quality are likely to degrade given climate trends and Snow King's relatively low elevation.

2. Regardless of expanding terrain, Snow King will likely need to depend even more heavily on snowmaking and will most likely not be open to training in early November or fully open by Thanksgiving in most years. It will have to move the Hill Climb earlier into March and shorten the season. This WILL adversely affect revenue.

While the Snow King proposal does open up more terrain higher on the mountain, the considerable infrastructure cost, operating expenses and debt load does create the prospect that the mountain may never become sustainable as cost may exceed demand. Climate change will profoundly affect both the winter ski season operating costs and also Snow King's ability to deliver a comparable product to similarly high priced areas, whether locally or across the Western and Eastern United States.

What may in fact provide the tipping point in Snow King's failure to attract sufficient business is not just what is likely to be very significant daily or season pass prices. It seems the already dubious and largely absent economic projection of this project ***fails to account for that fact that just getting to the slopes is really really expensive!*** It's bad enough that the King might have to charge \$120 per day or \$1,500 per season, but factoring in flights, rentals, food, hotels etc. it gets super expensive quick. The proposal will likely eliminate the King's main attraction to many visitors: it's affordable for a lot of people.

While Snow King might present excellent opportunities in the eyes of equity management types, real estate boosters, gapers and inexperienced skiers, in the eyes of experienced riders it is a great race hill, a good training hill, pretty decent on a powder day if you got nowhere else to go, and pretty fun fast conditions when the slopes soften up in February with the coming of sunshine. Otherwise it's pretty icy and

often thin. You better take your first run carefully or you're gonna get hurt. Most folks ride it with rock skis/boards. So it's not really ideal as a location for a world class big mountain/powder ski resort. Perhaps there IS a reason that in 70 odd years of operation it has never grown into a mature big mountain ski area. But it will be priced as one.

I strongly encourage the Forest Service to look at the proposal with a healthy dose of skepticism as the economic reality is that Snow King's proposal will likely result in driving necessary capital investment, operating costs and debt into a range where it will never be able to sell enough tickets and passes to run in the black. It will have lost its character as "the Town Hill". And either through that change or the likelihood of very expensive passes, local folks will choose to buy passes at JHMR where they are more likely to get \$1,500 worth of snow and terrain.

It is by no means certain that Snow King can simply build its way out of its current hole. Sometimes the best thing to do is stop digging!

NEPA Issues

Given that Snow King has not presented the apparently huge base development plans to the Forest Service and furthermore is not committing to providing revenue from those assets to either subsidize on-mountain costs or at worst ensure Snow King remains in operation as a ski hill, I urge the Forest Service to deny this proposal as it is incomplete, indefinite and inadequate in scope given the apparent and until recently undisclosed actual size, scope and expense of their full plans.

It also appears that Snow King has not settled its outstanding issues with the Town and that furthermore it has not even begun to go through the Town and County approval process for the extensive development it apparently will pursue. The development and construction of the first condo unit, which is pictured in the recently disclosed map, does seem to prove that their apparent intentions to develop the base heavily as depicted in the elephant picture are factual. Yet there is nothing in the proposal before the Forest Service which discusses these plans. And while Snow King will undoubtedly argue that the Town has given its "final approval", it has not presented the huge development and redevelopment of the base area to either the public or local planning authorities. Thus the time is not ripe for the Forest Service to consider the proposal. Furthermore it has purposely been submitted in partial and incomplete form.

The proposal does not include a range or alternatives that vary the scope, timing and intensity of additional development of infrastructure and terrain, i.e just replacement of the Summit Lift or locating a new road elsewhere, where for instance it won't accompany boundary expansion and new ski terrain to the east, west and/or south.

There is substantial risk that the proposal will not result in a self-sustaining hill and might result in substantial expanses of unused and/or abandoned terrain and infrastructure if revenues aren't sufficient to offset the considerable construction and operating costs. Snow King's failure to operate a single winter season profitably and it's track record of disorganization, licensing violations, misrepresentations, omissions and rancor cast into doubt it's ability to either pull this off in the general sense or live up to the specific terms of its proposal.

The failure of the plan presents serious harm to the environment, restricts the local's access to uphill AND downhill recreation and likely would impose significant costs

on taxpayers and government entities. These costs will be more serious if the proposed project fails.

Or it may require heavy development of the base area to create enough revenue to subsidize the continuing operation of Snow King.

There is insufficient identification and analysis of the cumulative environmental impacts of Snow King's development proposal in both the project area and the proximate and wider areas. There is insufficient identification and analysis of the socio economic impacts, in particular those attributable to the risks of failure. The proposal does not adequately cover the significant risks posed by climate change as well as the difficulty of greatly expanding their work force given the current worsening trends of lack and expense of housing and a shrinking work force.

Numerous representations made by Snow King management that it must expand to become sustainable should be viewed with considerable suspicion as it may be the case that its operational decision making, and even perhaps incompetence or worse has resulted in significant costs, actual and in "lost opportunity".

The proposal will have significant adverse impacts to recreational opportunities both in the boundaries and proximate to the area. This includes closures, charging fees to access uphill recreation, and negative impacts to the quality and character of the mountain, proximate areas and the entire view shed and ecosystem.

By omission and/or actual misrepresentation, Snow King has misrepresented material facts and hidden large aspects of its plans.

By prioritizing trampolines, bobble sales, a maze, mini golf and of course a nice new office for themselves over things like, oh, employee housing or new operational facilities for the lift operations, grooming, snowmaking and mountain ops departments Snow King has demonstrated some rather curious and dubious priorities. These choices have significantly affected financial realities as well as the overall character of the entire area. These choices do reflect their operational priorities and expertise.

And finally, it appears that the proposal will most likely mean Snow King is in the truest sense no longer the Town Hill.

It's Not The Town Hill, It's the Upside Down Hill!

There is one planning detail, an odd one in fact, that actually has been presented all along: the summit hosts a bunny slope!

Throughout the various iterations of Snow King development plans in recent years, management has depicted a magic carpet and beginner lesson area to go along with the gondola top station at the summit. Several factors made this a striking oddity. The first is that the summit area is often a very nasty place! Weather conditions are quite often windy, cloudy and stormy, while at other times it is sunny and crusty. In either case conditions are usually difficult.

The mountain itself really matters as well. Management likes to brag that Snow King is the steepest little hill in North America. This is particularly true of the top half of the mountain where every direct run from the Summit Lift is a double black diamond and the so called green route down the old road is pretty challenging in the best conditions. To say it is an intimidating place for beginners is an understatement. To say it is a safe area to place a bunny slope is questionable at best. In looking at the placement of

bunny slopes at most every if not all ski areas, those beginner areas are at the base area. Not at the summit. Safety is the first consideration. Indeed, Snow King Ski Patrol often posts signage for the summit lift that it is for "Experts Only".

Number two issue is that bunny slopes are best placed for reasons of comfort and attracting business at the base because it is a friendly and easily accessible place. The rental shops are there. Ski School is there. Its a short walk from hotels, parking, transit and food. While even the base area can get a bit stormy, typically base areas are sheltered from the worst of it and remain below the clouds. No whiteout conditions. Its easy to keep track of the kids. It is easy for Ski Patrol to keep track of new skiers.

So a good question is why put a bunny slope way up there????

The answer comes in looking at what is going on at Snow King's base area bunny slope. There is an "Amazing Maze". There is a mini golf course. There is a trampoline bungee thing. There is a magic carpet lift. Ski School is located in two trailers and not a permanent building. A lot of money has been spent upgrading electricity and installing two movable and heated toilets for those movable trailers. While extensive improvements were made to the snowmaking piping system elsewhere on the mountain, not a single pipe or hydrant was installed for the Ski School's most important beginner lesson area. That snowmaking runs off a fire hydrant. The only revenue generation in that area in winter comes from Ski School which is based out of unappealing and expensive trailers. There is no employee housing, and are no facilities for grooming, snowmaking and mountain operations (which are badly needed).

The point is that NONE of the improvements at or around the base area bunny slope are permanent pieces of infrastructure. In a sense there has been a great "lost opportunity", as Mr. Golightly puts it, to build a solid operational base area that supports winter operations and helps the Ski School in particular to attract business and generate revenue. Or put another way Snow King has put "placeholders" that occupy the space and generate some revenue but that can easily be moved or removed so as to allow large scale real estate development. The base area map showing the use of every bit of available land (see page 6 above) does depict their apparent intent to build a HUGE complex of condos.

So it does appear that all along Mr. Chapman and Mr. Stanley have planned on using that area not to build a badly needed base area for a successful ski hill but for real estate development.

The large scale development built next to Phil Baugh Park and the main base area does provide concrete evidence of Mr. Chapman's apparent intent to focus on real estate development at the base and not constructing the infrastructure that Snow King will need to support its current size as a ski area, never mind what it will need if the mountain is expanded as greatly as depicted in their on mountain plans.

Two points here. First, while Snow King management loudly complains of operating losses, it's deliberate failure to build out the base area to support a ski hill is likely responsible for a lot of lost revenue and increased operating costs. Second, it does appear that Snow King plans to move the bunny hill and the heart of Ski School instruction to the top of the mountain which is a particularly poor location.

So in its essence the proposal before the Forest Service turns the mountain on its head. It minimizes the acreage to be used at the base for ski hill operations in favor of maximizing the acreage available for real estate development

The Road to Nowhere

The new road proposal ties in with the upside down town hill plan in that it would seemingly offer an easier path down from the new bunny slope on the summit. That may be its primary purpose. Existing roads are sufficient to construct the summit infrastructure with minimal improvements and the gondola should provide sufficient logistical capacity for almost all the needs of the summit area. While the gondola would be sufficient to allow bunny slope riders to get off the hill in most instances, the road is a necessary escape route if for whatever reason the gondola is not available or even appealing to the abilities of newer skiers.

The problem is that the road will require snowmaking along its entire length to be open to skier use. Last year the upper mountain didn't open until the middle of January and it is fair to assume that if the base area becomes a big elephantine condo complex, Snow King will blow in the summit as early as possible to get the summit bunny slope going. So while I may be missing something in their plans, the new road will require a substantial amount of new piping and electrical improvements to be of any use at all and I don't see that in their proposal. The added expense is a significant one both in terms of initial infrastructure and yearly snowmaking costs. The new road as a groomed ski trail may well end up being a problem financially, perhaps a big one.

At any rate the new road only makes sense if Snow King is going to move its bunny slope and ski school to the summit. Which doesn't make sense in terms of ski hill safety, operations and profitability. *It does make total sense in clearing the way for the billion dollar elephant at the base.*

One last point about the new road: it anchors their proposal for greatly expanding the ski terrain. Looking at the map, the new road effectively ties in and provides a boundary for all the new runs. I suspect the road is deemed a 'necessary' improvement in management's eyes and the argument is something like 'we need this road so while we are doing this let us use it to define our new boundaries.' The new road is in effect a slippery slope!

Where the new road becomes a road to nowhere is that the base area plans have not been submitted for approval by the town and county and that while financing may or may not be in place, construction hasn't started. It is entirely likely that the billion dollar elephant will never receive approval, but at any rate no concrete proposal has even been submitted!! The new road's true usefulness is simply to clear the base area and perhaps create financial and political pressure to allow base development given the huge financial pressure the new road and boundary expansion will create.

So the road to nowhere isn't in fact necessary at this point.

And it may never be necessary.

Buyer Beware

Finally this thought: Snow King was pretty much the picture perfect description of a "distressed property." Mr. Chapman and other investors and various artificial entities (whole or fractional) entered into ownership or fractional equity knowing this fully well. There was undoubtedly a great opportunity both in terms of purchase price and locational opportunity. But Snow King holds nothing more than operating rights.

In all fairness to Mr. Chapman and his investors the Forest Service does owe them a fair and complete hearing of their proposal. But they are in turn obligated to be good stewards, to be ***honest and comprehensive*** when submitting their plans, and to operate their business in a responsible and sustainable way. They must submit comprehensive, accurate, workable and reasonable proposals. That is their burden.

To date, while infrastructure has been built, Snow King hasn't managed to turn a profit but it has managed to antagonize a significant portion of the local population. To obtain Forest Service approval of its plan it has argued that to continue to operate in the face of continuing losses it must be allowed to irreversibly change the character of the Town Hill and quality of both the mountain's and town's environment. There are serious questions as to how Snow King can recoup the extensive expenses necessary to their proposal. In 2017 alone, their general manager entered into an illegal rental agreement, operated an illegal bar and couldn't even submit the correct map. And apparently Snow King management and investors have all along been planning an enormously expensive and intensive redevelopment of what is the entire base area.

Can Snow King sell its investors and buyers on the hugely lucrative base plan without having their proposal for on mountain development approved first?

Can that on mountain proposal realistically survive without the elephant pens that are the real plan for the base area along Snow King Avenue?

And why hasn't Snow King been forthright in disclosing any of that?

Mr. Stanley, as mentioned above, failed to submit the proper map of the Gondola landing to the Town. It appears he may have failed to submit the proper map of the entire base area plan to the Forest Service as well. Beyond the confusion the Snow King management has sown through its admitted mistakes and apparent incompetence, it also appears they are gaming the planning process.

How the game works is that they have split their total plan into planning processes for a mega resort on the mountain and the apparent billion dollar elephant at the base. The plans for the mountain have to be approved because, as they profess, they cannot operate at a profit without expansion. It can be expected that they will say the same thing to the town and county when they are seeking approval for a massive redevelopment at the base. They have not submitted the entire plan. Though the base plan will most likely determine the success of the entire project, they have not submitted it for the purposes of the Forest Service's consideration and decision making. Most likely because it would so massively and completely change the character of the town and mountain that it would never be approved. They have attempted to cut the billion dollar elephant into pieces so as to conceal the elephant and prevent review of the whole while also creating enough financial pressure to justify the next step.

And in effect their game would preclude there ever being a meaningful review of their entire plan. At all.

Given the significant risks posed, the numerous unanswered questions, the apparently incomplete plan and undecided issues, and their track record to date, I urge the Forest Service to DENY the proposal at this time.

Sincerely,
Evan Germeles
PO Box 851, Pinedale, WY 82941

September 25, 2018

Benjamin H Read
 831 Upper Cache Creek Dr.
 PO Box 1929
 Jackson, WY 83001
 Email: bhread22@gmail.com
 307-690-0486

Members of Jackson Town Council *
~~US Forest Service~~
 Jackson, WY 83001

Dear Sirs,

I am getting in touch to comment on plans for expansions and changes to the Snow King Ski Area proposed by developer Max Chapman and others. As a long time resident (30 plus years) of the town, I support developments of a kind that make the ski area more viable economically.

On the positive side relative to what's proposed, I support plans to:

- redevelop the summit lodge along proposed lines, including the planetarium.
- relocate the novice areas to the top of the mountain, and expanding the leased or licensed areas on forest service lands that Snow King will need for the development of a pleasantly laid out area that optimizes uses of this area from a skier's perspective.
- realign the route of the summit gondola such that the loading area is further down the hill in a corner of Phil Baux Park (but not encroaching on the ball field further west).
- Build a gondola rather than chair lift to allow visitors to the summit without the need for very cold weather garb.

I oppose plans to:

- greatly expand the ski area from east to west to accommodate a switch backing road that would result in road cuts and scars that would inevitably be very visible from town. If though discreet boundary changes could be made on the eastern flanks of the mountain that would allow for more variety to slopes and more sunlight for morning skiers, that would be fine, if and only if it can be proven there are no effects on the stability of the slopes nor noise pollution to those whose houses are below. From what I have heard, the developers could arrange to bring supplies and materials to the top of the mountain from the south side of the hill across properties that are owned by the Gill family, and that would be great.
- strongly oppose charging uphill users of the hill, whether during the summer or winter, whether users are local or come from afar! This is a very important point to me. Given that the developers are asking for approvals that impact the town, and given that the lands on which these developments to take place are publically owned, a good will gesture of this kind that brings life to the hill and involves so very little money from a revenues perspective is imperative! If frankly the

* This is a copy of comments on the Snow King scoping process
 that I would like to share with members of the Town Council.
 Thank!

developers were not to welcome those who come to the hill to climb on foot, skis or bikes to the top of Snow King at no cost to themselves, I explicitly and strongly oppose all plans for expansions or modifications to Snow King!

With the understanding that the ski hill needs to do as much as it can realistically to become and remain economically viable, I am neutral to:

- the idea of a zip line or lines, but if and only if the development of these is completely hidden from those who look up from below. I'm not though that this is possible, so it should be incumbent on the developers to prove that in contrast to the alpine slide that this can be done.

Thanks very much for the invitation to comment on expansion plans and very best wishes,



Benjamin Read

From: shane rothman
To: comments-intermtn-bridger-teton-jackson@fs.fed.us; [County Commissioners](#); [Snow King Engagement](#)
Subject: Snow King Mountain On Mountain Improvements
Date: Friday, October 05, 2018 12:00:00 AM

To all whom it may concern,

The two best solutions for Snow King Mountain are to build a small tram to replace the Summit Lift, and for the ski area's lease to be administered by a public ownership model. Without these two concepts, Snow King Mountain may never be able to achieve the "balanced" and sustainable approach that we all desire.

Please STRONGLY consider all of the reasons why a small tram has superior benefits over any other lift, and make this option available as a preferred alternative.

Please consider a public ownership model as a "preferred alternative" for the eternal future. This Town Hill does not deserve endless controversy. Many of these proposals are already causing divisiveness in the community. These priceless lands were never meant to be "owned".

Thank you for your time and consideration, and thank you for extending the comment period too! I needed every minute of it.

Sincerely, Shane Rothman
Jackson WY

From: shane rothman
To: [Town Council](#); [Snow King Engagement](#)
Subject: Fwd: Snow King Dog Park
Date: Sunday, October 07, 2018 11:53:39 PM

Hello Mayor and Council,
Please consider this attached letter as public comment regarding a future Dog Park. It has been discussed for too long, and I believe that seasonal locations at the Fairgrounds and the Base of Snow King are the best option, and the best hope.

Thanks for your time and consideration!
Shane Rothman
Jackson WY
970 275 1684

Begin forwarded message:

From: Shane Rothman <bredtoshred@hotmail.com>
Date: October 7, 2018 at 11:47:55 PM MDT
To: info@pawsofjh.org
Subject: Snow King Dog Park

Hello PAWS!

I've been trying to advocate for an official summer dog park at the base of Snow King, where it's always been anyway! I know it would be tough to fence, but maybe SK would allow a temporarily fenced area nearby, like along the edge of the Ice Rink?

The main area(SKMR LLC private land) could remain as an "off leash park". SK might appreciate PAWS putting informative signs up, and helping to keep the grounds green and clean, adding a small water feature, and maybe even throw in some agility training features or something. There is also a chance that TOJ could lease or trade for this parcel during upcoming lease negotiations and finalizing plans for Phil Baux Park/Snow King Ballfield, so it would be proactive to discuss this idea with both electeds and SKMR, simultaneously.

In the winter, the timing would work out well moving it back to the fairgrounds. Maybe both of these areas aren't permanent solutions(but they could be), but they'd serve well until other land miraculously becomes available.

Just wanted to put this on PAWS' radar, in case it isn't already! Let me know if I can help make it happen! I'd also be interested in any volunteering opportunities.

Thanks!
Shane Rothman
970 275 1684

Greetings electeds

While I know you have received many, I thought I would also share the comments I submitted to the Forest Service last week regarding the proposed SK expansion. As you will see, I am not in agreement with what Snow King Resort is proposing and hope that you all share some of my same thoughts. It is my desire that we do not see the incredible expansion of what is becoming an amusement park of a town hill.

Thank you for everything that you do for our amazing Town and County.

I hope you are all well

Jeremy Minor

Snow King Mountain Resort On-Mountain Improvements Project

Mary Moore

District Ranger

PO Box 1689

Jackson, WY 83001

To whom it may concern,

I am interested in expressing my thoughts on the changes to Snow King Mountain which have been proposed by the Resort. I am a 17 year resident of the Town of Jackson, a frequent user of the public lands surrounding the Town and someone who desires to see the unique character of our Town preserved. I am concerned by all the changes being proposed by the Resort as I believe they will only turn this area into more of an "amusement park" and ultimately provide benefit to those few who are financially vested in this project while degrading the experience for those of us who still seek to find quiet, unobstructed views and possible wildlife sightings on our doorstep.

During my time here in Jackson, I have frequently used Snow King Mountain and the areas in the immediate vicinity as a place to exercise as well as a spot to take friends and family who are visiting from out of town. For these visits we have listened to live music, skinned up to the summit or strolled up the hill while admiring wildflowers and/or views of the valley. From time to time we have seen moose, deer and colorful birds and have always enjoyed the human powered experience we have embarked upon. As changes have occurred at Snow King Mountain I have felt less welcome and have used this area less and less. One such example is when the Resort began charging users to skin up the mountain in winter. Since this went into effect I have decided to seek a winter workout somewhere different and will continue to do so going forward. Along the same lines, I have ridden my bike up Snow

King many times and worry that if a downhill bike course is installed I may have to dodge bikers bombing downhill and/or ultimately lose the ability to freely pedal uphill.

I am also concerned about how these proposed changes will affect the wildlife that lives in this area. A new road, removal of more trees and construction of new lifts would mean less suitable habitat for the myriad creatures that we share this area with and further alter their already stressful lives.

I understand that Snow King Resort is trying to capture some of the tourist dollars that they see being spent out at Jackson Hole Mountain Resort but the truth seems to be that our local ski hill will never be able to compete with the world class resort that is found on the other side of the valley. I have held 14 winter season passes to JHMR and have never thought to purchase one at Snow King though realize this is not possible for everyone due to cost, lifestyle, work schedule, etc. Personally I find that the snow sports at JHMR are far superior to anything Snow King Resort could ever offer and know that many of my peers feel the same way. Based solely on the number of visitors, it is my thought that many of the tourists that visit our valley feel the same way.

Snow King Resort's attempts to become a huge money maker seem to come at the cost of the residents here in Jackson and primarily benefit tourists who visit from out of town. Our area continues to struggle with a housing and worker shortage and I wonder who will staff these new rides, lifts, restaurants, etc if they are indeed approved and then built. Currently Snow King Resort appears to import much of its workforce from outside our area. What is their plan if these workers become unavailable for whatever reason?

Ultimately I see these proposed changes as having an overall negative impact on the majority of residents in our Town and believe that they will only benefit the shareholders of Snow King Resort. It is my understanding that some of these shareholders have interests in other properties in our area (Brooks Lake Lodge) which have seen issues related to human impacts upon the land. I worry that down the line we could see similar degradations occur in/on/around Snow King Mountain.

Thank you for considering my thoughts.

Jeremy Minor

East Jackson resident

307.413.0255

windriverhiker@gmail.com

From: [Cecily Longfield](#)
To: comments-intermtn-bridger-teton-jackson@fs.fed.us
Cc: [Town Council](#); [County Commissioners](#)
Subject: Snow King Improvements
Date: Thursday, October 11, 2018 11:46:00 AM

To whom it may concern,

I'm writing in support of the proposals Snow King Mountain have made to create a ski area that will support the next generation of local, national and international skiers. I grew up in Portland, Oregon, but came out to Snow King every year as a kid and have the best memories of learning to ski there with my family.

It is a wonderful addition to the town and a great, easily accessible mountain to those that live and stay in Jackson while vacationing. Also, the proposed addition of a planetarium and observatory would be a great attraction for residents, scientists and tourists... what better place is there in the country to see stars than Wyoming?

I hope you will take my thoughts into consideration. Snow King was and always will be a special place to me and my family and I want to see its legacy continue to grow and thrive.

Warm regards,

Cecily Read

From: Natalie Connell
To: comments-intermtn-bridger-teton-jackson@fs.fed.us
Cc: [Town Council](#); [County Commissioners](#)
Subject: Snow King Improvements
Date: Monday, October 01, 2018 4:23:18 PM

Hello!

I'm emailing all of you regarding the proposed improvements at Snow King. Having been a resident of Jackson for the last ten years, it has been hard to watch the town continually change more and more, and largely become harder for normal people to live in. Though I am generally against much of the development that has been occurring, I do not feel like the Snow King improvements fit into the same category. The changes proposed (for once) are in favor of the residents of Jackson Hole being able to continue using and enjoying Snow King for generations to come. It is critical that Snow King be able to continue operating and have a viable business plan. I support most of the key points of their plan - the exception perhaps being the zip line, if indeed it is actually very loud. If it is reasonably quiet, I think a zip line would be a great addition. I feel most passionately about the expansion of mountain biking terrain/lift access, all ski racing and winter operations continuing (particularly snow making, as I skin up Snow King several mornings a week), and a climbing gym being put in the new training facility.

Thank you for seeking public comment on this issue, and I hope that a decision is made that prioritizes Jackson's year-round residents.

Sincerely,
Natalie Connell

From: [shane_othman](#)
To: [Town Council](#); [Snow King Engagement](#); marymoore@fs.fed.us; poconnor@fs.fed.us; [Steve Ashworth](#); jasonwilmot@fs.fed.us; environmental@jhnewsandguide.com; [Ben Graham](#)
Subject: Questions for SKMR/BTNF/TOJ
Date: Monday, October 15, 2018 10:31:49 AM

Hello Mayor and Council,
Thank you for all of the time spent on Snow King.

Here are some additional questions that should be asked during today's workshop. I continue to find many discrepancies in these plans, and hope that some smarter solutions can be discussed and advised. The logistics and sequencing of these projects will require extensive coordination and collaboration to achieve good results and minimize unnecessary impacts. Please consider requesting more information about the following:

Why did SK mow many acres(15+?) of sagebrush habitat on the backside recently? (October 7th?) Was the BTNF aware of this?

What has SK done to "bear-proof" their mid-Mountain(Rafferty) and Summit facilities? Have they been contacted by the BTNF?

SK has claimed that they want to "mitigate impacts to wildlife" and "improve habitat". What are some of their ideas to accomplish this?

How will novice skiers be able to descend to the base of the western portal without a beginner trail? Shouldn't this be a higher priority than a new route for novice skiers from the summit? Is the "Horse Trail" on TOJ land above the cemetery their only hope? ...Could a new beginner trail/glide path(not a vehicle road) heading west from Cougar Lift into the forest, and then switching back and cutting through the upper corner of the Pine Glade property be a solution?

Are there any plans to facilitate skier/visitor movement from east to west portal? Will they need the entire KM6 dirt parking lot area as a "staging location"? Would all foot/ski boot traffic be routed through Phil Baux Park?

What would the Cougar Lift be used for if there is a new Summit Lift with night skiing from the top? It is foreseeable that the lift and associated road cuts would become obsolete, and a hindrance. Could the "gondola/new lift" be placed in the Cougar terminal's footprint to save room on TOJ land?

Why hasn't SKMR or Parks&Rec discussed placing a new lift on the western side of PB Park/Ballfield instead? Is snowtubing the only obstacle to achieve the most wide open and functional base area?

Does the BTNF still stand by the decision that lift accessed bikes would not be allowed to the summit of SK? ...Is the backside of SKM also considered "Elk calving" habitat that would require closures until July 1st? If sagebrush is further cleared and additional moisture in the form of snowmaking is added, will usage by Elk and Mule Deer increase during all four seasons?

If their "maintenance building" is built into the slope behind the Ice Rink, will all "maintenance vehicles" be routed on East Snow King Avenue to access the East Portal? How will vehicles access this building, especially if there is a second Ice Rink built on the upper TOJ lot? Does SK have a second choice/backup plan for the location of this building?

Which projects would require extended summer closures of the ski area?

How many summer riders does SK anticipate to use their proposed gondola? What is their "comfortable carrying capacity" of Summit venues? What can be done to educate all visitors about wildlife, history, and snow/fire danger conditions before setting them loose?

Many of these questions could have been addressed during stakeholder meetings and prior Council meetings... There are still many more questions that need to be answered regarding the Resort District, so please avoid trying to rush through the review process. I know that public comment will not be taken at this Workshop, but I think the public would appreciate any reconsideration, or a future opportunity for a "Q&A" forum with TOJ, BTNF, and SKMR all present.

Thanks again for your time and consideration, and feel free to contact me at any time to discuss these matters further!

Shane Rothman

Jackson WY

Sue Lurie

3150 W. King Eider Rd. • Jackson, WY 83001

(307) 201-1415

October 4, 2018

Mary Moore, District Ranger
Bridger Teton National Forest
Jackson Ranger District

Dear District Ranger Moore:

First, a thank-you to you and to Supervisor O'Connor for extending the comment period regarding the proposed Snow King On-mountain Improvements Project (hereinafter, the Project).

Since its inception, the Forest Service has partnered with its neighboring communities around management of natural resources in ways that affect the well being of those communities. I urge the Bridger-Teton National Forest to continue that tradition and work closely with local government, deferring to the 2012 Jackson/Teton County Comprehensive Plan (hereinafter, the Plan) with respect to the Project. While granting a permit on the public lands portion might substantially help the Project developers, doing so would burden the community with significant financial and ecosystem costs.

The following statements appear in the first paragraph of the first page of the Jackson/Teton County Comprehensive Plan Executive Summary: "This Comprehensive Plan is meant to protect the health, safety, and welfare of our community and preserve our community character for future generations...Wildlife, along with natural and scenic resources, draw both residents and visitors to this special place and are at the core of our heritage, culture, and economy... To achieve our desired community character, the community must protect and enhance the ecosystem in which we live" (p. ES-2, Jackson/Teton County Comprehensive Plan, 06 April 2012). It says nothing about being, or aspiring to be, a quasi-amusement park mecca.

The Plan's vision, arrived at through a five-year public process and ratified by the community, comprises three interlinked common values: ecosystem stewardship, growth management, and quality of life. Ecosystem stewardship is considered the core common value. The Project as proposed violates all three common values and, as mentioned earlier, represents significant fiscal and ecosystem burdens for the community.

The expansion Project as proposed does not comply with the Plan's policy 3.1.d regarding nonresidential development, which states, "existing Planned Resorts should be limited to their existing footprint" (p. CV-2-7) and its objective of protecting community character as well as the identity and livability of the extant neighborhood through dramatically increased lighting, activity and noise levels. Furthermore, a quasi-amusement park atmosphere which includes zip lines and downhill bike runs is out of character and tradition regarding the town's ski hill.

While resort officials were reported in a recent Jackson Hole News & Guide article as stating that the road is an integral piece of their broader plan to make Snow King more accessible to beginners and make the operation a sustainable, year-round business, there does not appear to be any discussion of its impacts on the immediate environment. Protection of wildlife resources is prominent in the Plan. Development over the past decades has considerably affected permeability and habitat for a large complement of species that use the both the front and back slopes of Snow King. The proposed expansion represents wide-ranging destruction to areas for refuge and feeding. In particular, extensive development on the back side of the ridge will

Rec'd
10-18-18

cc: T.S.

dramatically disturb important winter range. The proposed road across the front slope, and the activity it will accommodate, will disrupt wildlife refuge and movement in all seasons. The potential and intent for the road to be highly used is reflected in an ad in the Jackson Hole News & Guide October 3, 2018:

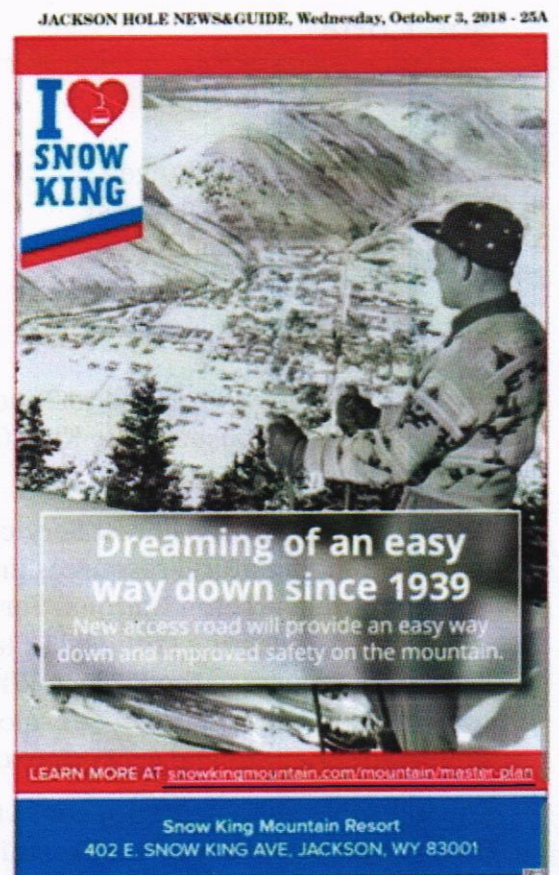
This condition will move the community away from, rather than toward, its commitment to protect and enhance the local ecosystem in terms of its wildlife resources. It will also move Snow King away from the Plan's intent for Snow King as a subarea of the Town Periphery district; specifically: "6.3: *Snow King Slope*: This PRESERVATION Subarea will continue to serve its role as the "Town Hill", providing a variety of summer and winter recreational amenities to the community. In addition, the subarea has wildlife habitat and scenic values that will need to be balanced with recreational uses" (p. IV-52, emphasis mine).

There is another critical issue regarding a long, deep road cut into the front slope. There is readily detectable evidence of historic slumping. Skiers and others familiar with Snow King know that there are trees with bowed trunks running the full width of the front slope, indicating downslope movement. The Plan is clear on the need to limit development in hazardous areas with steep slopes. Policy 3.4.c: *Prohibit development on steep slopes*, states that "the level of disturbance required to develop on steep slopes has a disproportionate impact on natural resources...Development on steep slopes will be avoided to the greatest extent possible" (p. CV-2-12). Furthermore, the Plan states, as part of its *Resource Protection* requirements, that, "Development is prohibited on slopes steeper than 25 percent" (Appendix B-11).

There needs to be a thorough geotechnical evaluation of the proposed road from a credible source regarding potential consequences of cutting into the slope. In fact, there should be a full geotechnical examination of both the front and back slopes before any further development whatsoever is approved. The 2014 landslide on West Broadway should serve as a cautionary story about not thoroughly analyzing the potential effects of disturbing unstable slopes that are a fact of life in this valley. I suggest that the Forest Service collaborate with the Town of Jackson and the developer to jointly decide on a geotechnical consultant to perform a thorough analysis, which should be paid for by the developer, as it is the desire of the developer, certainly not the Town of Jackson, and hopefully not the Forest Service, to undertake a project that could represent serious liability by subjecting users to grave harm and have catastrophic consequences for homes at the bottom of the slope below the proposed road.

The proposal to have snowmaking equipment on all runs will require large amounts of water plus the energy to pump it up the slopes and disperse it. The Town of Jackson being able to charge fees to cover costs is not the issue. The resources required for expanded snow making and other elements of the proposed development will be resources not available to the town. That is just one example of how a much-expanded facility may affect the community. There

JACKSON HOLE NEWS&GUIDE, Wednesday, October 3, 2018 - 25A



I ♥ SNOW KING

Dreaming of an easy way down since 1939

New access road will provide an easy way down and improved safety on the mountain.

LEARN MORE AT snowkingmountain.com/mountain/master-plan

Snow King Mountain Resort
402 E. SNOW KING AVE. JACKSON, WY 83001

needs to be a full analysis of how each of the elements of the Project involving use of Forest Service land may affect resources needed to serve the Town of Jackson now and in the future.

To protect the historic character of Snow King and the surrounding neighborhoods, minimize fiscal and other impacts to the Town of Jackson and protect Jackson's extraordinary wildlife resources, I hope the Forest Service, in preparation of its environmental analysis, will create an alternative that represents no net increase in the existing boundary and an alternative that represents no net increase in the existing footprint in addition to the requisite no action alternative.

Thank you,

A handwritten signature in blue ink, appearing to read "Sue Lurie", with a stylized flourish at the end.

Sue Lurie

From: [Mike May](#)
To: [Town Council](#)
Cc: marymoore@fs.fed.us
Subject: snow king mowing kerfuffle
Date: Thursday, October 25, 2018 12:20:44 PM

Dear Mayor, Town Councilors & District Ranger Moore,

I almost titled this email "today's episode in not being able to get out of your own way".... and as such I'm writing about yet another Snow King mis-step.

https://www.jhnewsandguide.com/news/environmental/article_d3f1b8c0-2c42-5302-8803-dc9b991f9af2.html

While I'm disappointed in the action, I'm more troubled by the tone taken by Snow King management, in particular GM Ryan Stanley, in regard to their unauthorized mowing on the backside of the mountain.

The hubris displayed has been typical of Mr. Stanley and his obvious disdain for process, policy and rules should be an absolute red flag for us all. They are making a huge ask of this community - they are looking for access to public lands for private profit - and this is the sort of "good faith" they show us in return? To that I can only say, caveat emptor!

It's also worth noting that the response illustrates an obvious lack of knowledge of their own hill. I've skied that line. It's not "in" often, it's fantastic when it is and it's decidedly more sagebrush than grass.

We all deserve better, including the wild creatures that live in and around Snow King, and I ask that you hold them accountable.

Respectfully, Mike May Jackson, Wyo.

From: [Chris Owen](#)
To: [Snow King Engagement](#)
Subject: Comment on Proposed Road
Date: Monday, November 05, 2018 11:05:00 AM
Attachments: [Upper Leeks Canyon_gpx.msg](#)
[Leeks Canyon Elevation Profile.png](#)
[Leeks Canyon_gpx.msg](#)
[Winter Map 17-18_.pdf.msg](#)

Hi, I would like to make a comment on the proposed access road to the summit of Snow King and the alternative of the Leeks Canyon road. I read several incorrect statements in the comments from various organizations about the Leeks Canyon road, including that it has no switchbacks, it has 3, and that the average grade was 11% with one pitch of 14%. This is also not true, and was a common misconception during the stakeholder process. Attached are the gpx files and elevation profile of the Leeks Canyon road that we gathered during the trail assessment with the BTNF. The road averages 13.42% grade with the first mile between the private property to the junction being very mellow. The second half of the road above the junction has an average grade of 17.36% with several pitches above 25%. The road itself is located in the center of the drainage and has nowhere for water to drain other than down the road. This area is also currently part of the winter wildlife closures, shown in purple on the attached winter map. In addition it passes through DFC 12, a desired future conditions area of the BTNF managed as

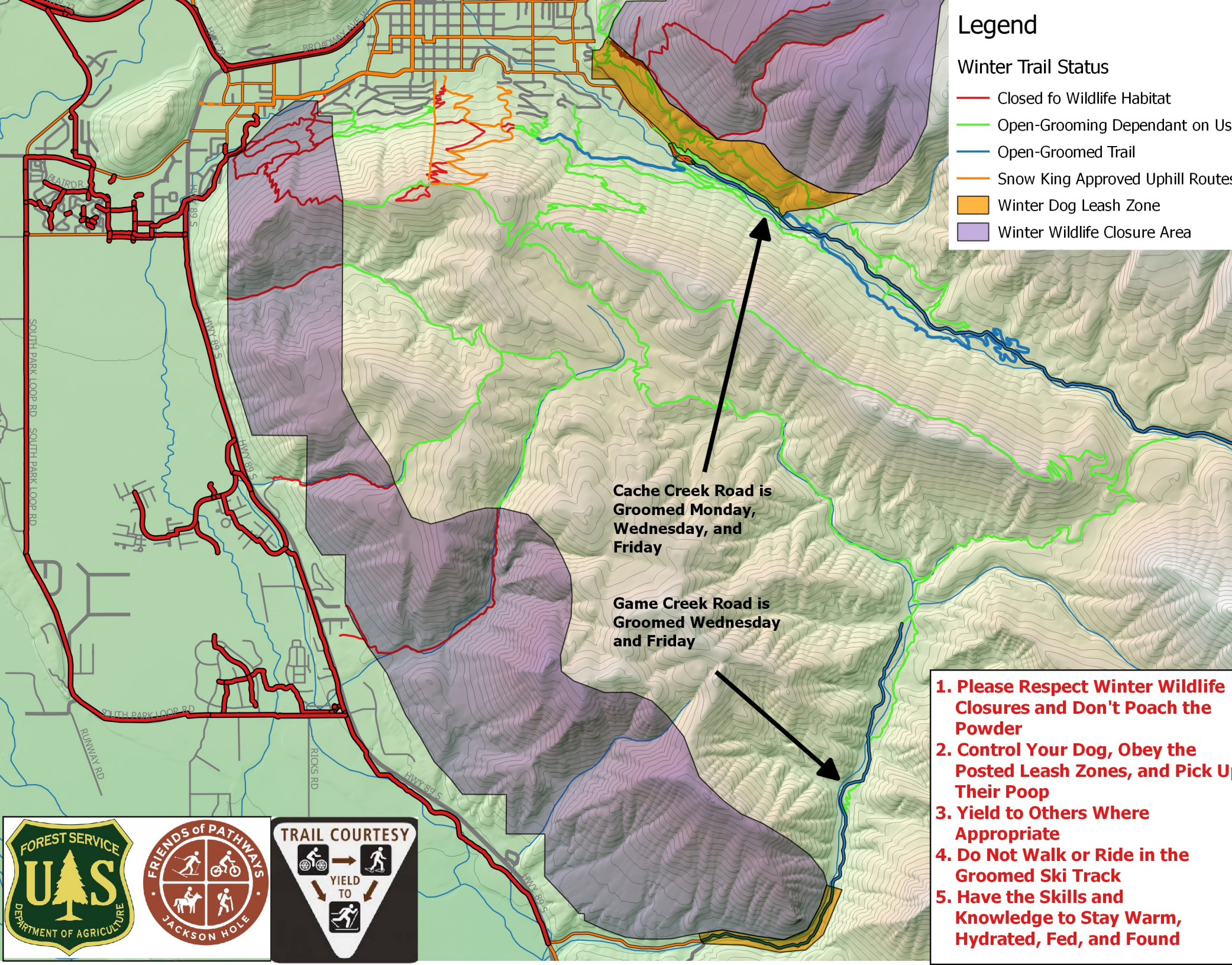
"Backcountry Big Game Hunting, Dispersed Recreation, and Wildlife Security Areas - An area managed for high-quality wildlife habitat and escape cover, big game hunting opportunities, and dispersed recreation activities."

Thank you for taking the time to listen to all of the comments from the public and for having good information and outreach meetings throughout this process.

Chris

--

Chris Owen
Trails Program Manager
Friends of Pathways
307-733-4534



Legend

Winter Trail Status

- Closed fo Wildlife Habitat
- Open-Grooming Dependat on Use
- Open-Groomed Trail
- Snow King Approved Uphill Routes
- Winter Dog Leash Zone
- Winter Wildlife Closure Area

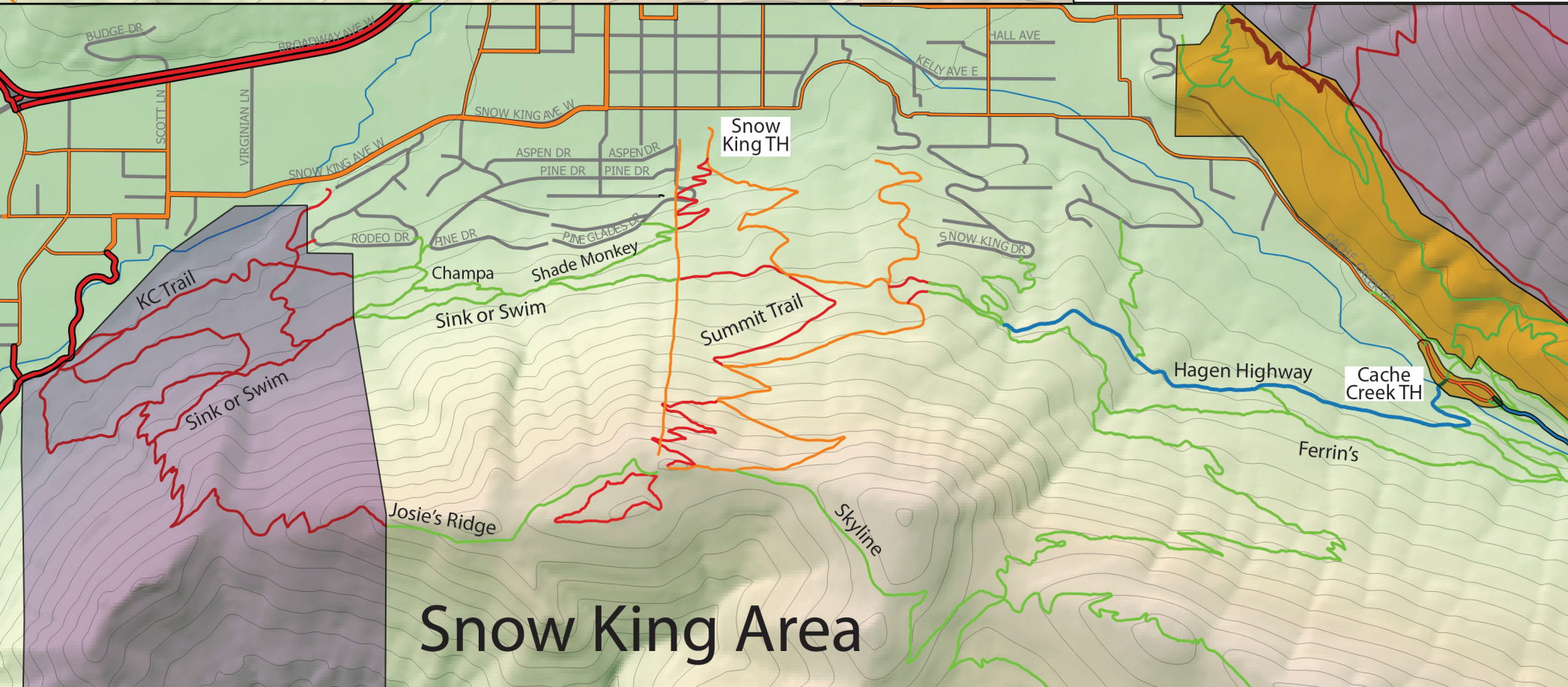
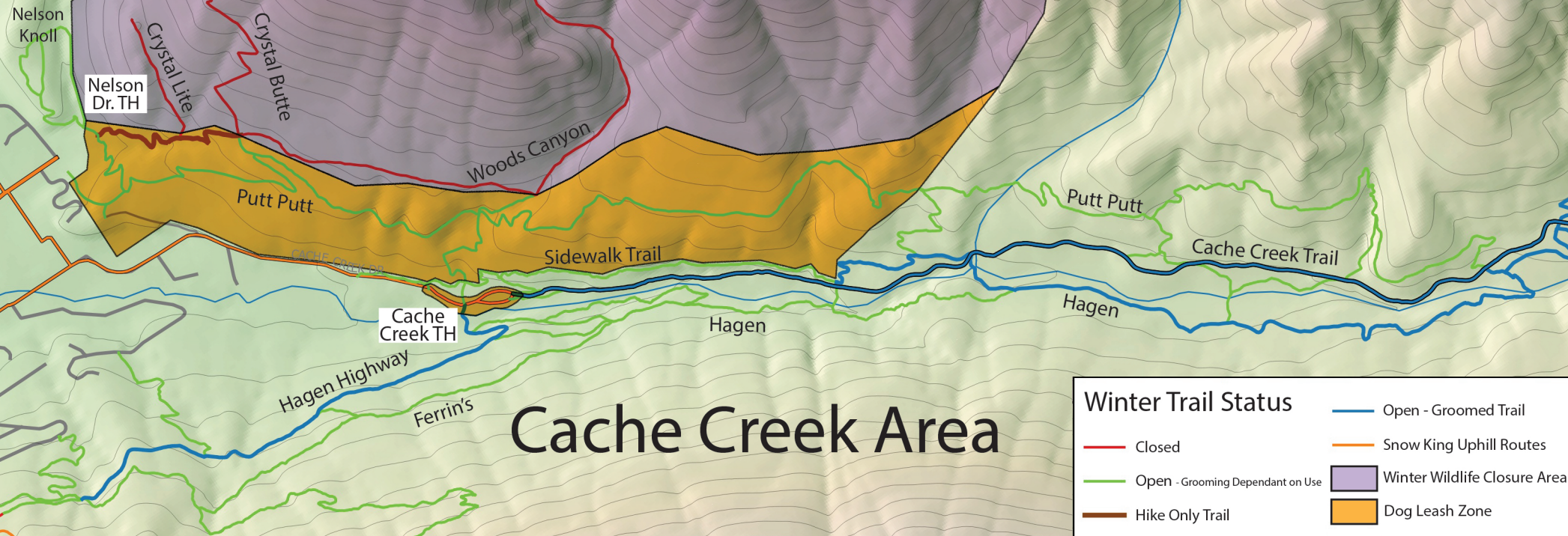
Bridger-Teton National Forest Cache - Game Area

General Etiquette for Groomed Winter Trails

- Bicycles yield to all users including bikes traveling uphill
- Work with others when passing as the snow is often deep just to the side of the trail
- Do NOT walk or ride in the classic ski track
- Allow the trail time to "set up" after grooming
- Be EXTRA ALERT for Wildlife! If you encounter wildlife near the trail consider turning around or using an alternate trail
- Contact Friends of Pathways or PAWS to help support trail grooming and education efforts
- Be an ambassador for your sport, help promote good behavior, and remember we all work together to compact the trails in the winter

- 1. Please Respect Winter Wildlife Closures and Don't Poach the Powder**
- 2. Control Your Dog, Obey the Posted Leash Zones, and Pick Up Their Poop**
- 3. Yield to Others Where Appropriate**
- 4. Do Not Walk or Ride in the Groomed Ski Track**
- 5. Have the Skills and Knowledge to Stay Warm, Hydrated, Fed, and Found**





Winter Trail Status	
— Closed	— Open - Groomed Trail
— Open - Grooming Dependant on Use	— Snow King Uphill Routes
— Hike Only Trail	 Winter Wildlife Closure Area
	 Dog Leash Zone

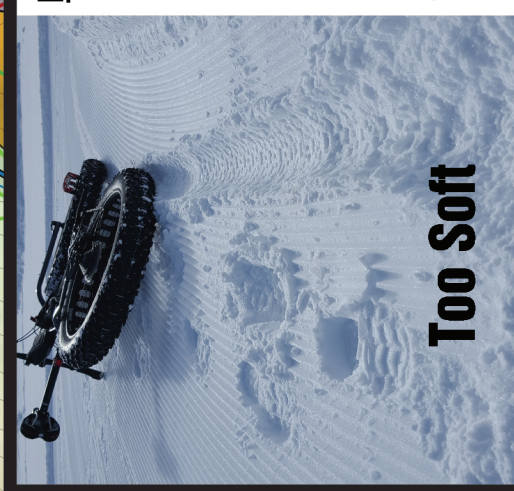


Just Right

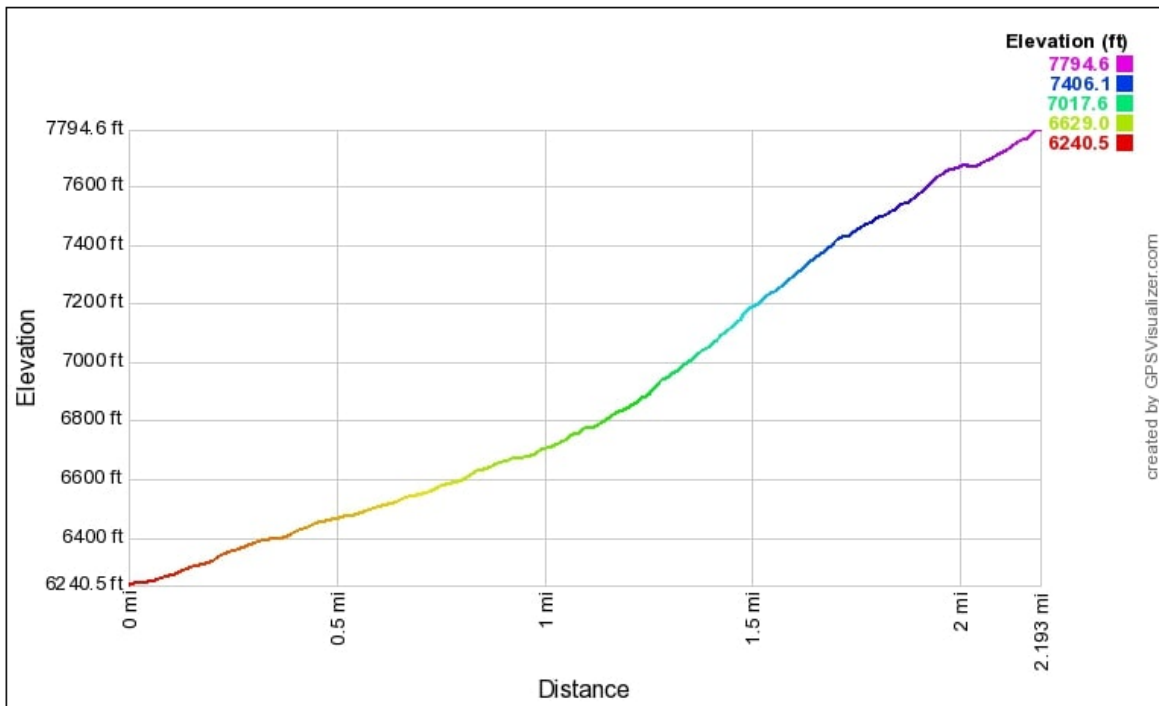
Don't walk or ride on the trails if they are too soft.

Alternative Trail Options:

- Paul Merritt Pathway (South of Jackson)
- South Park Loop
- Emily's Pond Levee Trail
- Stilson
- Togwotee Pass Area
- Turpin Meadows



Too Soft



From: Carter Cox
To: comments-intermtn-bridger-teton-jackson@fs.fed.us
Cc: [Town Council](#); commissioners@tetoncountywy.gov; [Snow King Engagement](#)
Subject: Attention: Snow King On-mountain Improvements Project
Date: Thursday, October 04, 2018 1:23:16 PM
Attachments: [Snow King Comments.docx](#)

Dear Forest Service, Councilors, and Commissioners,

Thank you for the time and effort you are putting into the Snow King On-mountain Improvements Project and potential impact for our community. Please see my attached comments.

Best,
Carter Cox

Wilson, WY

Carter Cox
caracartercox@gmail.com

M E M O R A N D U M

November 5, 2018

TO: Jackson Town Council

FROM: Matt Kim-Miller

RE: Proposed Snow King Master Plan Amendment

The Snow King Resort Master Association (SKRMA) has proposed an amendment to the 2000 Snow King Planned Resort Master Plan. I researched and analyzed the amendment on behalf of the Jackson Hole Conservation Alliance. This memorandum reviews: (1) the requirements for an amendment of the master plan, (2) the scope of the currently-proposed amendment, and (3) matters not contained in the master plan amendment that should be addressed in an amendment.

As described in the first section of this memo, in order to meet the required findings for the amendment, an analysis of the entirety of the current and projected buildings and uses at the resort needs to be made. For the first 10 years or so of the master plan's life, the development generally fit the master plan. When there was a desire in 2003 to remove a proposed beginner ski lift and a ski run along the east side of Love Ridge and replace proposed "cabins" in that area with condos, the master plan was amended to do that.¹ From about 2010 forward, the development on the hill hasn't matched the dimensional limitations or projected development locations as set forth in the master plan: the Grand View Lodge, the coaster, the new restaurant and ticket buildings—none of those were specifically contemplated by the master plan. Part of this new amendment, very properly, incorporates those previously constructed buildings so that they show on the master plan.

The master plan functions as both a broad and narrow set of entitlements. Broadly, the resort area has been granted the right to build 915,000 sq.ft. of improvements and a cap on short-term rental uses; narrowly, the plan provides dimensional limitations—heights, floor area limitations, setbacks, landscape ratios. A primary operative part of this master plan amendment updates the dimensional limitations and uses for parcels 53, 57 and 58 so that the projected use and dimensions match what the owners of those parcels think is going to happen on those parcels. That revision to the master plan makes sense, but these specifically targeted parcels are a primary focus of the amendment.

The amendment, however, completely omits the critical district parcels that have large amounts of to-be-built improvements: the KM6 parcel and the hotel parcel. The resort-wide studies of infrastructure, parking, circulation and traffic are not updated in this amendment, and the KM6 and hotel parcels will drive the resort's needs for those development aspects. Unless these keystone parcels are made part of a master plan amendment, this targeted amendment process fates the Town to have the same ad-hoc development as has

¹ This resort master plan amendment was in conjunction with the Love Ridge II Final Development Plan.

occurred in recent years on a number (though not all) parcels in the plan: the coaster and the new restaurant and ticket buildings were proposed and approved without an analysis of how that new development affects traffic patterns and needed infrastructure in the resort district, and without being evaluated to see whether they fit the master plan's narrow, dimensional limitation concepts.

When a developer does come forward with plans for a hotel expansion or a commercial development for KM6 parcel, it will be (as all development proposals are) on a pressing basis, and it will be argued, to be sure, that it is not then the time to update the overall studies in the plan in order to allow the much-needed development to progress. The updates to parcels 53, 57 and 58 are necessary and will be beneficial to the owners of those parcels, because it will give those parcels good definition of their rights—the owners will know exactly what can be built on those sites. But, resort districts work because they are planned on a comprehensive basis, and this key concept allows district-wide zoning to occur without running into concerns of spot zoning. The master plan has been in existence for almost 20 years, and it is time for a thorough update.

1. Requirements to Amend. As described in the staff memos for this application, any amendment to the master plan must meet the required findings for the original adoption of a Planned Resort, as well as both the requirements for a rezoning and the requirements for adoption of a planned unit development.² Meaning, there are many required findings, and the amendment cannot be passed without making those findings. These required findings are for the resort as a whole, not just specific segments.

A. Requirements for All Planned Resorts. The general planned resort required findings in the LDRs include that the original master plan and any amendment must:

- include **design guidelines** that describe the bulk and scale of improvements, including a site plan that address access to the recreational amenities and do things like “concentrate activities and human interaction into identifiable spaces, such as a plaza or mall.” LDR 4.3.1.F.7.
- include a **transportation element** to manage traffic across the resort, including trip projections, peak demand projections and a plan to provide sufficient parking “to accommodate the resort’s projected demand including parking for visitors and lodging guests.” LDR 4.3.1.F.8.
- include a **capital improvements element** that “identifies service providers, analyzes impacts and proposes a capital improvements plan for facilities and services needed by the resort.” LDR 4.3.1.F.9.
- include a **land use element** that is “consistent with both the applicant’s design theme and the character objectives for the resort.” LDR 4.3.1.F.10.
- include a **phasing plan** that includes: “All structures, land use activities, mitigation strategies and infrastructure expansions proposed, including such activities and improvements on public lands, shall be included in the phasing plan.” LDR 4.3.1.F.11.

² LDR §§ 4.3.1.C, 4.3.1.E.6, 4.3.1.E.8.a, 8.7.2, 8.7.3.

Point being, these required findings mandate a holistic view of the master plan area. It is impossible to have an amendment that just addresses small corners of the resort area—the original plan *and any amendment* must address the plan for the area as a whole under the required findings in the LDRs.

The master plan amendment updates many of the east portal improvements that have occurred, and projects the improvements that are to come in the Phil Baux Park vicinity, but the amendment does nothing to address the to-come improvements on the KM6 parcel, or things like, what happens to beginner skiing when the magic carpet area is replaced with 250,000 sq.ft. of improvements.³

Nor does the amendment update or address the diversity of ownership that has occurred in the past 6 years. SKRMA, as an entity, had a small role when the entire project was owned by one group. Now that there is separate, unrelated ownership for most all of the parcels, there is a need for interlinked transportation and infrastructure: SKRMA’s role needs to be better defined, as it relates to all of these required findings.

B. Snow King-specific Requirements. In addition to the above requirements (that are applicable to all resort districts) the specific Snow King master plan segments of the LDRs have a number of relevant, specific requirements:

- “Convention center facilities shall be provided necessary to serve a year-round convention market, including community needs for convention space. Commercial services provided, in addition to convention facilities, shall be essential services to on-site guests and supplemental neighborhood services. The commercial space shall be sized and designed for serving the needs of on-site guests of the resort and nearby residents.” LDR 4.3.2.D.
- The master plan must have a character and design that has a “layout that blends the edges of the resort into the neighborhood” and has “Continued provision of the amenities of ‘town hill’ skiing” and that connects to the town square. LDR 4.3.2.B.

As discussed below, the master plan amendment deletes some of the convention-center focused language in the master plan. The amendment does not replace that concept, nor does the amendment seek to amend the above provision of the LDRs.

- the “Statement of Purpose” section in the amendment deletes the statement that “the heart of our lodging business is meetings and conferences, and as such, the proposed new Convention Center is located in the center of our complex,”
- the “Statement of Purpose” section in the amendment also deletes the statement that “Jackson has long wanted a full-service, year-round convention center to complete an array of various services. This proposed Master Plan provides just such a convention center in a manner that will benefit the entire downtown area.”
- the land use plan deletes the statement that “Some small conference space has been allocated to the Pine Lodge and Mid-Mountain facilities.”

³ The beginner skiing relocation is a part of Snow King Recreation’s Forest Service plan. Where the recreation improvements are part of the resort district, they should be incorporated into the Town’s master plan, and evaluated by the Town.

These deletions may make sense for the owners of the hotel and KM6 parcels, but it leaves a vacuum in the planning and vision that are part of the master plan that is not replaced with a description of what will happen in the next two decades of the plan's life.

C. Parcel-by-Parcel Allocations. As part of any amendment, the remaining entitlements must be addressed—i.e., we have to know what remains to be built, if we are to understand the newly-proposed development and changes. The new amendment does not address parcel by parcel entitlements, at all. Based on staff presentation to the Planning Commission, staff believes that approximately 563,338 sqft remain to be constructed in the master plan area and that 1,095 APOs remain.⁴ But in reading the amended master plan, no one would know that fact. A remaining APO amount of 1,095 mean that up to 547 hotel rooms remain to be constructed, or up to 274 short-term rental units remain to be constructed.

In order to define what can be constructed on the remaining portions of the resort area, it is necessary to reflect the various recorded allocations of APOs and square footage—the draft master plan does not do that.⁵ Since 2000, a number of documents have been recorded as part of property transfers from the original owners of Snow King, allocating buildable floor area and APOs. Meaning, floor area and APOs have been divvied up among parcels (as is permitted under the master plan), but these allocations are not reflected in the master plan amendment. This is an easy, but significant add that is necessary for clarity—these transfers should be described and charted in the master plan. Nor does the master plan fully describe the construction that has occurred since 2000—a description of that development was part of the direction of the Memorandum of Understanding described below. A revised site plan showing improvements since 2000 is included (pp. 74 and 77-8 of the amendment), but the details of these buildings have not been included. Per staff's presentation to the Planning Commission, approximately 351,662 sqft has been constructed and 1,113 APOs have been used. But, reading the master plan, as amended, one would have no idea of what relative allocations have been made among the parcels.

D. The 2017 MOU—What It Requires; What It Intentionally Omits. The Town and SKRMA entered into a Memorandum of Understanding in November 2017 that provides that SKRMA will undertake amending portions of the master plan to do things like (a) illustrate the current configuration of existing development, (b) define permitted development for Lots 53, 57 and 58 and the “East Portal”, (c) address the West Portal and Phil Baux Park, and (d) update the housing and community element of the master plan. The MOU's year-long term has, as of a few days ago, expired.

As part of that MOU, the Town and SKRMA agreed that the hotel parcel and the KM6 parcel, are “expressly excluded from the amendment process.” The hotel parcel is “Sub-area 1” in the master plan and the KM6 parcel is “subarea 2” in the master plan—those subareas are shown on

⁴ “APO” means “Average Peak Occupancy” and is used to calculate the permitted number of lodging units, i.e., hotel/motel units and other short term rental units. A hotel/motel unit counts as 2 APOs. A dwelling unit used for short-term rental counts as 4 APOs.

⁵ These transfers and related agreements are shown in document numbers (as recorded with the Teton County Clerk): 754335 (Pine Lodge Lots); 821165 (hotel); 881535 (Tract A, where the Rafferty lift is located); 881537 (lots 53 and 58) and 891174 (KM6).

Exhibit A to this memo. The hotel parcel appears to have the right to construct an additional 50,000 sqft of permitted square footage and 200 APOs (allowing another 100 hotel units or 50 short-term rental units) and the KM6 parcel appears to have the right to construct 250,000 sqft of improvements and has 600 APOs (allowing 300 hotel units or 150 short-term rental units).⁶

But, exclusion of the hotel parcel and the KM6 parcel from the amendment process ignores the key, undeveloped portion of the resort, which will drive traffic, parking needs, and infrastructure needs. **Leaving out the hotel and the KM6 parcel ignores the central question of the master plan—what is the goal of the master plan, if it is no longer going to be driven by a large convention center?** This omission is particularly acute given the portions of the amendment that seek to delete the convention center's role in the plan.

The focus of the 2000 master plan was enabling convention space, but that has changed, as can be seen by the following two data points:

From 2000: As stated by Mr. Manuel Lopez at the August 9, 2000 meeting where the master plan was originally presented:

Remember, meetings is the goal of the business. I'm at the end of the road and I get very few walk ins. So, I don't know what the percent is, but it's like 80 some percent is [meeting generated hotel room occupancy]. Individual travelers that we get [are] miniscule compared to meetings. So meetings is the goal of our business. And we have to think in terms of what they want. They are our main customers.⁷

Currently: As stated in the Snow King Mountain Resort's September 28, 2018 submission in response to matters discussed at the September Planning Commission meeting:

[T]he focus [in 2000] was on development of a conference and convention business to drive economic prosperity for the community. A substantial portion of this desired conference space has not been developed with the Grand View Lodge and in addition, times have changed. Feedback we have received is that the community no longer desires additional conference space beyond what is existing.

The Teton County Comprehensive plan suggests that District 2 is where commercial development should be targeted. Instead of having the focus of the Snow King Master Plan be on development of conference and Convention space (which to a large degree has already been developed at Grandview) we suggest that the purpose shift to driving the goals for District 2 from the Comprehensive plan. We would be willing to propose that change, or leave it as it currently is based on the input we receive from the Planning Commission, Planning Staff, Town Council, and Public Comment.

⁶ See document 821165 recorded in 2012 and document 891174 recorded in 2015 with the Teton County Clerk.

⁷ Transcriptions of this meeting are by the author of this memo.

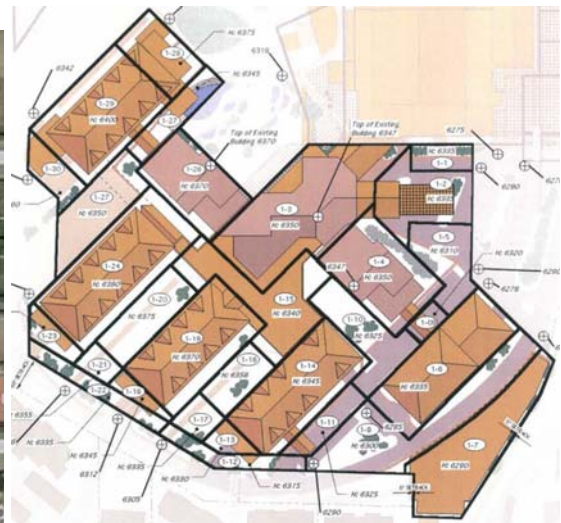
As shown by these two quotes, the driving goal for the master plan's developable core has shifted from convention space to something else, that is TBD. A change that recognizes the shift in Jackson's market, development and needs is likely a good thing, but the change needs to be described in order for it to be evaluated by the Town Council.

The second section of this memo describes the concrete proposals that have been made in the amendment, and which need to be evaluated against the above required findings.

2. The Scope of the Currently-Proposed Amendment and the Role of the Convention Center Space.

The master plan amendment is largely four things: (i) an update of site plans, (ii) a better definition of allowable recreational improvements within the master plan's area, (iii) an update of the role of SKRMA, and (iv) a refinement of the housing plan and description of the community services elements for the resort.

A. Update of Site Plans. As described above and as contemplated by the MOU, the amendment updates certain of the site plan depictions in the master plan, but the amendment does not update the entitlement allocations or the permitted development on the parcels, particularly the hotel and KM6 parcel. As an example, below is a depiction of the current hotel parcel, and a depiction of the master plan's site plan for the hotel parcel (p.75 of the amendment). The master plan shows 5 additional development wings, and essentially no surface parking on the hotel parcel. But, it appears from recorded documents that the hotel has been allocated rights to build another 50,000 sq.ft. and 200 APOs of short term rentals. These allocations appear to be insufficient to build out these various new hotel buildings shown in the site plan for the hotel. The example development that is page 76 in the original master plan was not updated, even though it does not fit the development that has occurred, or, as appears from the amendment, is contemplated and possible on the hotel site.



B. An Update of Allowable Recreational Improvements and Development for Parcels 53, 57 and 58. One of the amendment's primary operative changes is a revision of the permitted recreational activities to match things that have been built out (the coaster, the maze, etc.) and recreational amenities that are contemplated (the gondola, additional food and beverage

facilities). See pp. 270 and 271 of the redline amendment. And the master plan describes certain improvements that are not part of the master plan—a contemplated additional sheet of ice, a zipline and gondola, a training facility, etc. The amendment also updates the depictions and the dimensional limitations for parcels 53, 57 and 58—providing specifics as to the permitted height and basements, clarifying a number of questions that had arisen in times past as to these parcels and permitted development on these parcels. As described above, the amendment deletes a number of convention-center references.

C. An Update of SKRMA’s role. In the section of the master plan as to development phasing and SKRMA, the amendment provides some additional details on SKRMA’s role. SKRMA is to: (i) serve as a conduit for development applications, (ii) assess dues and fees for “landscaping, roads, utilities, employee housing, parking, pathways, recreation, common signage, transportation, and any other aspects associated with the proper and successful implementation of this Master Plan and its goals and objectives” (this being the revised language in the amendment), (iii) carry out the transportation demand monitoring plan, (iv) oversee the administration and development plans of the resort, and (v) to ensure that resort commitments within the master plan are transferable to all new future owners of property within the district. The plan clarifies that “All areas and developments within the resort district will be required to participate as members of SKRMA.” and that “SKRMA will partition fees associated with the maintenance of common roads, sidewalks, and areas to existing condominiums.” Certain roles of SKRMA were deleted: under the current plan, SKMRA had the responsibility for “development of marketing materials, operation of common elements, security systems and personnel, information booths, special events, central check-in areas and other common activities,” but those functions were deleted in the amendment.

D. Housing and community services elements. The plan amendment provides a good deal of updated provisions in these two sections, reflecting changes that have occurred within the district and better defining each parcel owner’s individual obligation to satisfy housing requirements generated by each owner’s development.

3. Matters Not Addressed by the Amendment. The amendment doesn’t address, however, the following items.

A. SKRMA’s Role Needs to be Clarified. The amendment retains the concept that “Ultimately, SKRMA will act as a pseudo improvement district”—but the master plan does not actually define common infrastructure that SKRMA will have a role in requiring and maintaining, as a pseudo improvement district. The redefined role of SKRMA discusses common infrastructure, but in a revised master plan, that common infrastructure is not well defined. Is the common infrastructure the road along the east side that serves condos, the hotel and the Grand View Lodge? Is it to include improvements on the KM6 parcel that are still-to-come and are to provide access between the east and west portions of the resort? Does it have a role as to common parking areas and any amenities that exist or may exist in the future? Does it include recreational amendments? The amendment provides some additional description of SKRMA’s role, but, I would ask this question: is it possible, by reading the amendment, to describe what SKRMA is to do, in a couple *concrete* sentences, instead of in relation to broad planning goals? There are many models for resort base associations, depending on the required

scope. We can look in our own backyard at the Teton Village Association as a model, where the TVA has broad authority over transportation and common infrastructure, such as roads. TVA has a robust role in the Village's masterplan, with express obligations in relation to infrastructure and traffic management. But the Snow King plan has very limited detail as to the common infrastructure that is, undeniably necessary, part of the development. Parking is a key example. Parking for ski operations occurs on the hotel parcel and the KM6 parcel, without, to our knowledge, any cross-parking easement or rights. The KM6 parcel is planned to support parking for the resort as a whole when it is built out, but there is no cross-parking easement or rights established in the plan.

The amendment needs to define the common infrastructure for the resort district and then define what SKMRA needs to do to maintain that infrastructure, in order to enable and rationalize the progress of development. The revised plan discusses assessments as a funding mechanism, but without a description of the common infrastructure, the assessment structure is unclear.

B. The Plan's Convention Space Focus Needs to be Updated. As described above, any amendment of the master plan requires a comprehensive review. It is impossible to meet the global findings for the master plan amendment if the plan, as a whole, is not updated, as a whole. The change in the convention center-centric nature of the plan is an example of how the whole plan needs to be updated.

As we understand it, the Grand View Lodge has 7,500 sq.ft. of convention space, including two event rooms, a 2,640 sq.ft. Grand View Ballroom and a 2,195 sq.ft. Cache Creek room.⁸ But the Master Plan's example development still contemplates 63,000 sqft of convention and meeting space on the KM6 parcel (out of the 250,000 sqft of development contemplated for that 5 acre parcel). That example development from the master plan is shown on Exhibit B to this memo. Repurposing 55,000 square feet of convention space (not to mention any potential repurposing of the 86,000 sqft of lodging in the example for the KM6 parcel) needs to be addressed in a master plan amendment.

The 2000 master plan was all about enabling convention space. That has changed. Thus, the master plan needs to be amended. As stated by Mr. Manuel Lopez at the August 9, 2000 meeting where the master plan was originally presented:

Before we go into calculating housing impacts, traffic, parking, pervious surfaces and impervious surfaces—all that stuff—we had to come up with some idea of what an example development may be like. And, . . . the only thing certain about this example development is that it will never be this way. It will never be that. What I mean is that things are going to change. What I'm presenting is like a 25 year plan. Well, in between now and 25 years from now—well, I'm not going to be here—a lot of things are going to change. And, we can project things, but things are going to change. But you have to start from somewhere and this is our best shot of what the present day uses—if we were to build this thing right now—what our best shot at the present day uses are. And that's a very long and

⁸ The Snow King Hotel has, as we understand it, approximately 10,000 sq.ft. of conference and assembly space, including a 5,320 sq.ft. Grand Teton Room.

tedious table. But it goes through all the potential uses and what the square footage areas, by sub-area, could be.

It was true in 2000 and it is true now: master plans change and inherently need flexibility to allow the evolution of development within the site to meet then-current needs and markets. But they also must describe a vision for the resort, in order for the Town Council to have any chance to be able evaluate whether the land use plan, traffic plan, parking plan, etc. make sense.

Prior to the adoption of the 2000 master plan, convention space at the site had been capped at 28,000 sq.ft. Part of the 2000 master plan's goal was to remove the cap on convention space. Again, as stated by Mr. Lopez in the August 9, 2000 meeting:

Another point that I have is that if I can build 890,000 square feet and the limit on the convention space is 28,000, that leaves me with more room to build more rooms or more houses or more whatever. And those other uses are more detrimental, I think for the Town, or have more impacts than a convention center. So, why limit me in something that I think is good. And there is no clear purpose served by having a maximum cap on the conference facilities. I argued this point 3 years ago. It was toward the end of the process. When it went to the Town Council it didn't have the limitation, it was done in the last readings. But, I got shot down.

The 2000 master plan needs an update, but it needs an update as a whole. The parking and traffic analyses don't work to analyze the developments that have happened in the past few years, much less the still-to-come development.

C. The Plan's Parking Plan to be Updated. The existing master plan contemplates 640 underground parking spaces (plus another 105 alternate spaces) that are to be shared for all uses at the site. This is based on a parking plan that is from 1999.

As stated by Mr. Manuel Lopez at the August 9, 2000 meeting:

The biggest problem, let's call it, in this whole thing, is the parking. Underneath here, there is a big parking lot. . . . And financing that parking lot is the biggest nut that I have. Because, obviously, you cannot build a convention center and all the buildings above until you build the whole parking. And you want to build the parking lot big enough—it's the only chance you're going to have to build the parking space. And it's the only place, I think, in Town, where you can hide the parking. We have a scheme here that you will not see any of the parking.

Below is the parking chart from p. 122 of the master plan.

	Summer Number of Spaces	Winter Number of Spaces
AREAS AVAILABLE FOR SHARED PARKING		
New Hotel and Condominium Wings - Underground	240	240
- Surface	215	150
KM6 Area - Underground	640	640
KM6 Area (Add. Alternate) - Underground	105	105
Ice Rink & Ballfield - Surface	169	140
Periphery Buildings - Surface	46	0
Shared Parking Subtotal	1415	1275
AREAS NOT AVAILABLE FOR SHARED PARKING		
Periphery Buildings - Underground	88	88
- Covered	40	40
Love Ridge - Underground	106	106
- Covered	5	5
Existing Condominiums	126	126
Maintenance Building	3	3
Non-shared Parking Subtotal	368	368
Total Proposed Parking Available	1783	1643

These parking needs and concepts need to be evaluated to determine whether they are realistic. Estimating that an underground parking space is around \$40,000 per space in Jackson, where construction costs are relatively high, that is over \$25,000,000 of parking cost.⁹ Is that realistic in an area of diverse ownership—what happens if each parcel decides that it will only park itself, what happens when the current ski lift parking on the KM6 parcel goes away? These are questions that can only be answered if the plan for KM6 is part of the amendment.

Other updates to the plan. As stated in the staff memo dated September 28, 2018 (which was prepared for the Planning Commission’s October 3, 2018 meeting), there are a score of staff suggestions for updates and revisions to the plan amendment, as well as revisions suggested by the Planning Commission. The master plan should be revised to address these matters and then re-presented to the Town.

Conclusion. This master plan amendment is primarily a surgical tune-up to provide specific entitlements for a few lots in the project, so they can be better and more efficiently developed. That is a rational goal as to those parcels. The master plan does update housing and community benefit provisions as well. But, but plan amendment does not go far enough, and doesn’t meet the LDR requirements that there be global findings and global plans.

- The amendment needs to be a comprehensive update, in order to meet the requirements of the LDRs.
- There is an expressed intent to remove or reduce the unbuilt convention center space, but the amendment does not replace that deleted concept.

⁹ “Across the 12 cities, the average cost per [underground] space ranges from a low of \$26,000 in Phoenix to a high of \$48,000 in Honolulu, with an overall average of \$34,000 per space.” Donald Shoup, The High Cost of Minimum Parking Requirements, Parking: Issues and Policies (Transport and Sustainability), Volume 5, 87 at 89 (2014). <http://shoup.bol.ucla.edu/HighCost.pdf>.

- A good deal of development in the district has followed expectations or amendments to the plan's expectations—Love Ridge, for example. But the recent recreation-focused improvements are items that were not contemplated at any level of detail in the master plan. The recently-constructed and still-to-come recreational improvements, as well as the still-to-come hotel and KM6 parcel development, need to be thoughtfully integrated into the transportation, traffic, infrastructure and parking plans. And this amendment has not yet done that.

EXHIBIT A
MASTER PLAN SUB-AREAS

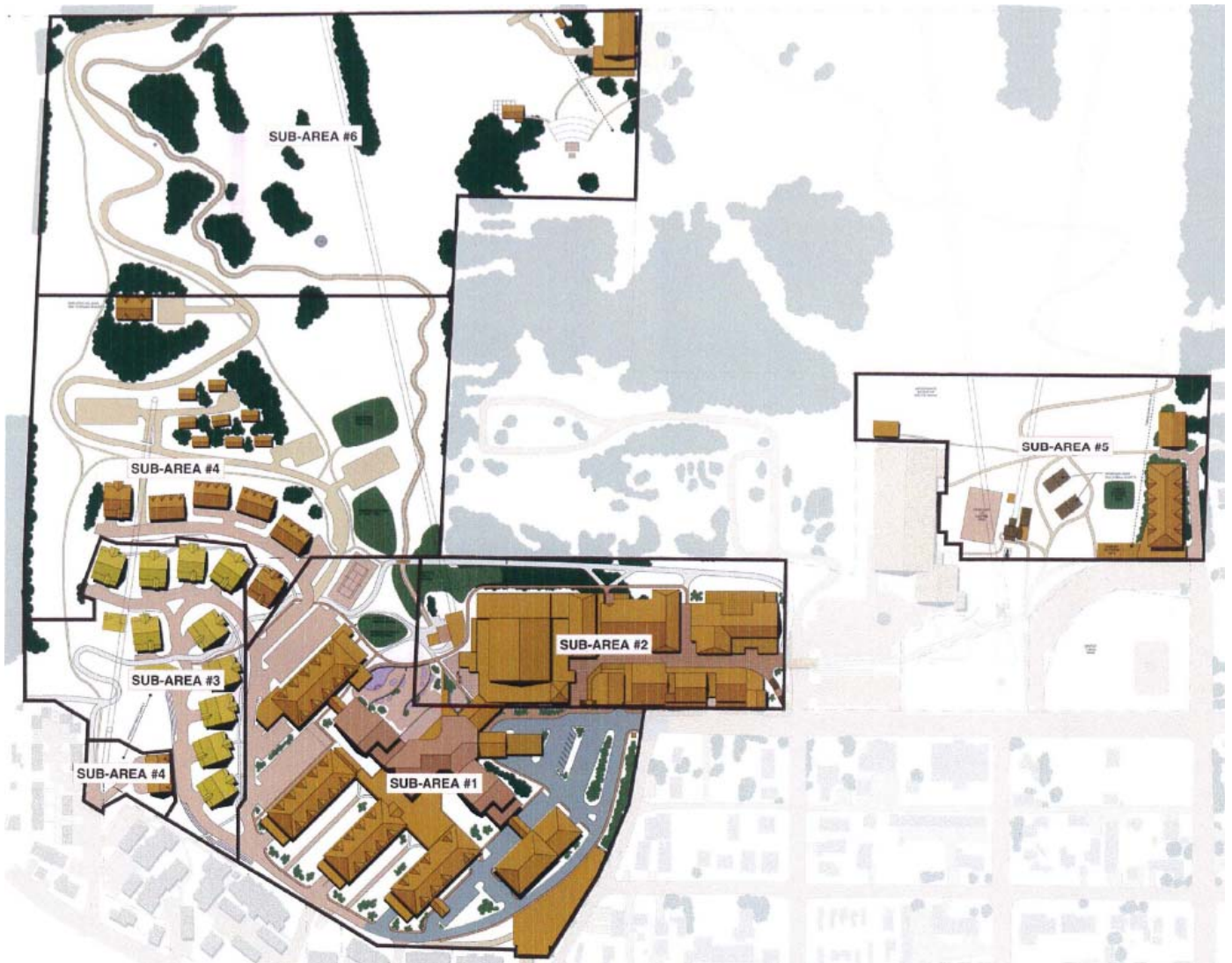


EXHIBIT B

EXAMPLE DEVELOPMENT FROM PAGE 52 OF THE MASTER PLAN

EXAMPLE DEVELOPMENT

Land Use by Sub-Area	Sub-Area 1 Hotel	Sub-Area 2 KM6	Sub-Area 3 Love Ridge	Sub-Area 4 Love Ridge Vicinity	Sub-Area 5 Pine Lodge	Sub-Area 6 Mid- Mountain	TOTAL For All Sub-Areas
Condominium Units (Number)	10	15	40	28			93
Hotel Room (Number)	698	100		32	60	28	918
Total Units	708	115	40	60	60	28	1,011
Statistics: Lodging SF/Guest	234	330	481	398	225	255	276
Total Guests (Number)	1,436	260	160	176	120	56	2,208
Above-Ground Uses (Square Feet)							
Lodging	336,000	86,000	77,000	70,000	27,000	14,000	610,000
Lobby / Reception	12,000	6,000			1,000	2,000	21,000
Conference / Meeting	9,000	40,000			2,000	3,000	54,000
Assembly	1,000	23,000					24,000
Commercial: F & B	27,300	11,000				3,000	41,300
Commercial: Unassigned	11,200	42,000	4,000		10,000		67,200
Commercial: Theaters		9,000					9,000
Health Club, Daycare, Ski School, Etc.	17,000						17,000
Services: Back of House & Storage		17,000					17,000
Services and Circulation	8,500				5,000	1,000	14,500
Support & Mech	2,000						2,000
Services - Offices	3,000						3,000
Support - Public		6,000					6,000
Office		4,000					4,000
Outdoor Recreational Uses	25,000						25,000
Total Above-Ground Building Area	452,000	244,000	81,000	70,000	45,000	23,000	915,000
Underground Uses (Square Feet)							
Back of House		18,000					18,000
Support, Mechanical, Maintenance	18,000	28,000					46,000
Services - Loading / Circulation	84,000						84,000
Loading Dock Area	6,000	22,000					28,000
Kitchen Storage Services					4,000	7,000	11,000
Maintenance / Services	20,000						20,000
Storage and Misc.				5,000			5,000
Support Services - Public		2,000					2,000
Underground Conference		22,000					22,000
Underground Assembly		9,000					9,000
Lockers -- Health Club	20,000						20,000
Total Underground Building Area	148,000	101,000	0	5,000	4,000	7,000	265,000
Ground Surface Area (SF)	551,000	284,000	217,000	611,600	282,900	770,000	2,716,500
Floor Area Ratio (FAR)	0.82	0.86	0.38	0.12	0.16	0.03	0.34



June 28, 2018

Max C. Chapman Jr
President
Snow King Resort Master Association

Tyler Sinclair
Town of Jackson Planning Director
PO Box 1687
Jackson, WY 83001

Dear Tyler,

On behalf of the Snow King Resort Master Association (SKRMA) Board we would like to submit for review a proposed amendment to the Snow King Planned Resort District Master Plan. We greatly appreciate the time and effort you and the Town of Jackson have put into providing public feedback for this proposal and for your participation in the Snow King Stakeholder Process. We look forward to continue working with you for this review process over the coming months.

Sincerely,

Max C. Chapman Jr.

LETTER OF AUTHORIZATION

Snow King Resort Master Association, "Owner" whose address is: 10 East
Snow King Avenue Jackson, WY 83001

(NAME OF ALL INDIVIDUALS OR ENTITY OWNING THE PROPERTY)

, as the owner of property
more specifically legally described as: PT NW 1/4 SW 1/4, SEC. 34,
Twp. 41, Rng. 116 @ Tract B

(If too lengthy, attach description)

HEREBY AUTHORIZES Ryan Stankley as
agent to represent and act for Owner in making application for and receiving and accepting
on Owners behalf, any permits or other action by the Town of Jackson, or the Town of
Jackson Planning, Building, Engineering and/or Environmental Health Departments
relating to the modification, development, planning or replatting, improvement, use or
occupancy of land in the Town of Jackson. Owner agrees that Owner is or shall be deemed
conclusively to be fully aware of and to have authorized and/or made any and all
representations or promises contained in said application or any Owner information in
support thereof, and shall be deemed to be aware of and to have authorized any subsequent
revisions, corrections or modifications to such materials. Owner acknowledges and agrees
that Owner shall be bound and shall abide by the written terms or conditions of issuance of
any such named representative, whether actually delivered to Owner or not. Owner agrees
that no modification, development, platting or replatting, improvement, occupancy or use of
any structure or land involved in the application shall take place until approved by the
appropriate official of the Town of Jackson, in accordance with applicable codes and
regulations. Owner agrees to pay any fines and be liable for any other penalties arising out
of the failure to comply with the terms of any permit or arising out of any violation of the
applicable laws, codes or regulations applicable to the action sought to be permitted by the
application authorized herein.

Under penalty of perjury, the undersigned swears that the foregoing is true and, if signing
on behalf of a corporation, partnership, limited liability company or other entity, the
undersigned swears that this authorization is given with the appropriate approval of such
entity, if required.

OWNER:

Max C. Chapman
(SIGNATURE) (SIGNATURE OF CO-OWNER)

Title: Officer / President

(if signed by officer, partner or member of corporation, LLC (secretary or corporate owner) partnership or
other non-individual Owner)

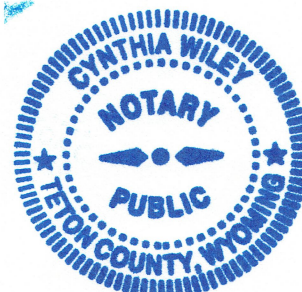
STATE OF WYOMING)
)SS.
COUNTY OF TETON)

The foregoing instrument was acknowledged before me by MAX C. CHAPMAN this 28th day of
JUNE, 2018.

WITNESS my hand and official seal.

(Seal)

6.18.21
(Notary Public)
My commission expires:





PLANNING PERMIT APPLICATION
Planning & Building Department
Planning Division

150 E Pearl Ave. | ph: (307) 733-0440
P.O. Box 1687 | fax: (307) 734-3563
Jackson, WY 83001 | www.townofjackson.com

For Office Use Only

Fees Paid _____
Check # _____ Credit Card _____ Cash _____
Application #s _____

PROJECT.

Name/Description: Snow King Resort Master Association - Resort District Amendment
Physical Address: 10 East Snow King Avenue Jackson, WY 83001
Lot, Subdivision: PT NW 1/4 SW 1/4, SEC. 34, TWP. 41, R. 16, T. 116, Tract B PIDN: Dead 090086

OWNER.

Name: Snow King Resort Master Association, c/o Ryan Stanley Phone: 307 201 5004
Mailing Address: P.O. Box 1846 Jackson, WY ZIP: 83001
E-mail: ryan@snowkingmountain.com

APPLICANT/AGENT.

Name: Snow King Mountain Resort LLC c/o Ryan Stanley Phone: 307 201 5004
Mailing Address: P.O. Box 1846 Jackson, WY ZIP: 83001
E-mail: ryan@snowkingmountain.com

DESIGNATED PRIMARY CONTACT.

☐ Owner ☒ Applicant/Agent

TYPE OF APPLICATION. Please check all that apply; see Fee Schedule for applicable fees.

Use Permit

☐ Basic Use
☐ Conditional Use
☐ Special Use

Physical Development

☐ Sketch Plan
☐ Development Plan

Interpretations

☐ Formal Interpretation
☐ Zoning Compliance Verification

Relief from the LDRs

☐ Administrative Adjustment
☐ Variance
☐ Beneficial Use Determination
☐ Appeal of an Admin. Decision

Development Option/Subdivision

☐ Development Option Plan
☐ Subdivision Plat
☐ Boundary Adjustment (replat)
☐ Boundary Adjustment (no plat)

Amendments to the LDRs

☐ LDR Text Amendment
☐ Zoning Map Amendment
☐ Planned Unit Development
☒ Other: Resort District Amendment

PRE-SUBMITTAL STEPS. Pre-submittal steps, such as a pre-application conference, environmental analysis, or neighborhood meeting, are required before application submittal for some application types. See Section 8.1.5, Summary of Procedures, for requirements applicable to your application package. If a pre-submittal step is required, please provide the information below. If you need assistance locating the project number or other information related to a pre-submittal step, contact the Planning Department. **If this application is amending a previous approval, indicate the original permit number.**

Pre-application Conference #: _____ Environmental Analysis #: _____
Original Permit #: _____ Date of Neighborhood Meeting: Wednesday April 18, 2018

SUBMITTAL REQUIREMENTS. Please ensure all submittal requirements are included. The Planning Department will not hold or process incomplete applications. Partial or incomplete applications will be returned to the applicant. Provide **one electronic copy** (via email or thumb drive), and **two hard copies** of the submittal packet.

Have you attached the following?

- _____ **Application Fee.** Fees are cumulative. Applications for multiple types of permits, or for multiple permits of the same type, require multiple fees. See the currently adopted Fee Schedule in the Administrative Manual for more information.
- _____ **Notarized Letter of Authorization.** A notarized letter of consent from the landowner is required if the applicant is not the owner, or if an agent is applying on behalf of the landowner. If the owner is a partnership or corporation, proof that the owner can sign on behalf of the partnership or corporation is also required. Please see the Letter of Authorization template in the Administrative Manual for a sample.
- _____ **Response to Submittal Requirements.** The submittal requirements can be found on the TOJ website for the specific application. If a pre-application conference is held, the submittal requirements will be reviewed at the conference followed by a written summary. The submittal requirements on the TOJ website are intended as a reference to assist you in submitting a sufficient application.

FORMAT.

The main component of any application is demonstration of compliance with all applicable Land Development Regulations (LDRs) and Resolutions. The submittal checklists are intended to identify applicable LDR standards and to outline the information that must be submitted to sufficiently address compliance with those standards.

For some submittal components, minimum standards and formatting requirements have been established. Those are referenced on the checklists where applicable. For all other submittal components, the applicant may choose to make use of narrative statements, maps, drawings, plans and specifications, tables and/or calculations to best demonstrate compliance with a particular standard.

Note: Information provided by the applicant or other review agencies during the planning process may identify other requirements that were not evident at the time of application submittal or a Pre-Application Conference, if held. Staff may request additional materials during review as needed to determine compliance with the LDRs.

Under penalty of perjury, I hereby certify that I have read this application and associated checklists and state that, to the best of my knowledge, all information submitted in this request is true and correct. I agree to comply with all county and state laws relating to the subject matter of this application, and hereby authorize representatives of Teton County to enter upon the above-mentioned property during normal business hours, after making a reasonable effort to contact the owner/applicant prior to entering.

Signature of Owner or Authorized Applicant/Agent

Name Printed

Ryan Stanley

Date

Title

June 28, 2018

Vice President



June 28, 2018

Ryan Stanley
Vice President
Snow King Mountain Resort
Jackson, WY 83001

Tyler Sinclair
Town of Jackson Planning Director
PO Box 1687
Jackson, WY 83001

RE: Findings for Approval

Dear Tyler,

Follows are the findings of approval for applicable sections of the Teton County Land Development Regulations required for submittal of an amendment to the Snow King Planned Resort District Master Plan.

8.7.3 Findings for Approval:

1. The extent to which the PUD enhances the implementation of the desired future character for the land of the proposal beyond what could be achieved by base zoning:
 - This amendment helps implement key components of the Comprehensive Plan. One of the Comp Plans Goals is to focus commercial activity in the Downtown core around the Town Square and at Snow King. This amendment will ensure commercial development occurs in this desired location. Additionally, this amendment memorializes more stringent workforce housing mitigation requirements that will ensure that more workforce housing is built. This will help achieve the community and comprehensive plan goal of housing 65% of our workforce locally.
2. The findings for the applicable PUD option found in Article 4. - 4.3.1.D defines the findings for approval as
 1. Consistency with the Comprehensive Plan - See above
 2. Consistency with the purpose and intent of 4.3.1.A
 - Encourage recreational Activities - This Master Plan Amendment includes Gondolas, trails, Expansion of Park use, and a mountain training facility.
 - Provide flexibility for planning and developing recreational resort facilities - This Master Plan Amendment allows flexibility and creativity that is reflective of an extraordinary public process that allowed us to meld community wishes into the proposal. It allows us to serve visitor and local's experiences.
 - Create a collaborative process between landowners and local government - This process has set a standard for collaboration to date, and the Amendment ensures that collaboration will continue as future applications for construction will require further public input.
 - Permit resort development that expands winter and shoulder economic seasons - Our amendment is directly aimed at all seasons, but the gondola (centerpiece of the amendment) will ensure the ski area's viability to transport skiers for generations to come and will impact winter economic conditions for the town.
 - Ensure that resort plans incorporate a mix of land uses - Mountain Biking, hiking trails, climbing, mountain training, and skiing are all included. Additionally, sidewalks and pedestrian friendly components are built in to the plan already. The amendment adds seasonal workforce

housing on site to alleviate traffic from employees not needing to commute to work. Finally, the amendment calls out a pilot shuttle to cut down on traffic

- Ensure resort plans are consistent with the comp plan. - See above
 - Enable long range planning for infrastructure and predictability - This amendment sets out maximum size of potential development, and gives ability for investing for long range infrastructure development with items like the proposed gondola and workforce housing.
 - Ensure a balance between tourism and community - This amendment has strong tourism and community based proposals. The mountain Training facility came from local input. The gondola will serve tourists and local kids and parents learning to ski, racing or recreating. Trails will be used by both locals and visitors, with a lean towards locals traffic.
 - Produce resort plans that make significant contributions towards protecting attributes of the community - This amendment will ensure the viability of the state's oldest ski area, and ensure that Jackson has a function ski are in town for generations to come. This will be the recreation hub for the community.
3. Affordable and Employee Housing - This plan will move us to the current LDR's and adds seasonal workforce housing that is beyond the requirements.
 3. NA
 4. 8.7.1 findings lay out
 1. Is consistent with LDR's - This amendment is consistent with the LDR's
 2. Improves consistency with LDR's -This amendment moves us to current LDR standards in the way we describe building massing and workforce housing mitigation.
 3. Provides flexibility for landowners in character - This amendment allows flexibility for landowners to develop amenities and assets that facilitate recreation and further the comp plan.
 4. Is necessary to address changing conditions, public necessity - An aging summit lift and old workforce housing mitigation standards are among many other factors that necessitate this amendment.
 5. Improves Implementation of the comp Plan - See above
 6. Is consistent with Town Ordinances - This amendment is consistent with Town Ordinances.
 5. NA

Sincerely,



Ryan Stanley



June 28, 2018

Ryan Stanley
Vice President
Snow King Mountain Resort
Jackson, WY 83001

Tyler Sinclair
Town of Jackson Planning Director
PO Box 1687
Jackson, WY 83001

RE: Summary of 2018 Snow King Planned Resort District Master Plan Amendment

Dear Tyler,

Follows is a brief summary of the proposed changes to the Snow King Planned Resort District Master Plan.

General Changes:

- Maps and associated text have been updated to reflect development that has occurred since the original Master Plan was created in 2000.
- Added employee housing complex, mountain sports training facility, and maintenance shop to proposed master plan map.
- Indicated platted condominium/housing lots 53, 57, and 58 on maps.
- Included a second sheet of ice and expansion of the existing Lodge Room to the maps for visual presentation recognizing that they fall outside the area governed by the master plan.
- Proposed a gondola, zip-line landing, and changes to parking in the Phil Baux Park area, while showing increased green space, a concert pavilion, public art, and landscaping improvements. These proposals fall outside the area governed by the master plan.
- Sub-Areas 6 & 7 were removed from maps. Sub-areas were updated to be consistent with use within the sub area i.e. condo, hotel, recreation. Sub area 7 was removed from maps due to the limited part it plays in the master plan but remains referenced in text.
- Limited text updates were made to reflect general community developments and changes since 2000.
- References to a Mid-Mountain Lodge which was approved in the Master Plan have been deleted. This 25,000 square foot Lodge is proposed to be removed in exchange for support of a gondola and zip-line landing in the leased parking lot area of Phil Baux park.

Changes by Chapter:

- I. Statement of Purpose and Existing Conditions
 - Updated references to importance of conference business.
 - Updated reference to Pine Lodge (now One Town Hill Condominiums).
 - Updated references to Sub-Area 7.
 - Updated maps to include satellite imagery of existing conditions and ownership changes since 2000.
 - Updated ski area map and added map of accepted USFS Master Plan for the ski area.
- IV. Master Site Plans
 - Updated Proposed Master Plan Map & Sub-Area Maps.
- V. Land Use Plan
 - Updated references to a large daycare operation.
 - Updated uses permitted within the recreation land use zone.
 - Added a paragraph on uses not governed by this Master Plan.
- VI. Design Guidelines
 - Changes to section on roof materials and design.
 - Changes to reflect removal of sub-area 6 & 7 from maps.
- VII. Dimensional Limitations
 - Added specific considerations for sub-areas 3, 4, and 5 with respect to dimensional limitations.
 - Clarified FAR definition to reflect usage within the Master Plan.
 - Updated Sub-Area Maps.
- VIII. Housing Element
 - Updated housing mitigation plan to change from a static mitigation rate to one that mirrors current Land Development Regulations.
 - Added reference to proposed employee housing complex on Vine St.
 - Updated housing requirements to be in-line with other ski resort housing requirements in Teton County.
- IX. Transportation Elements
 - Updated section on street improvements to include reference to proposed improvements in the area of Phil Baux Park.
 - Added requirement for parking analysis associated with transportation demand monitoring requirement.
- XI. Phasing and the Snow King Resort Master Association
 - Updated SKRMA requirements and role within the Resort District.
- XII. Community Services Element
 - Added proposals for mountain sports training complex, support for a second sheet of ice, and Lodge Room enhancements.
 - Updated references to the community service elements that Snow King currently provides that were not noted on the prior master plan.
 - Added information on winter/summer uphill travel policies.
 - Updated trail system access support references.



- Updated references to how Snow King directly supports and caters to community non-profits.

Sincerely,

A handwritten signature in blue ink, appearing to read "Ryan Stanley", written over a light blue rectangular background.

Ryan Stanley



June 28, 2018

Ryan Stanley
Vice President
Snow King Mountain Resort
Jackson, WY 83001

Tyler Sinclair
Town of Jackson Planning Director
PO Box 1687
Jackson, WY 83001

RE: Background Summary of Previous PUD & Amendments

Dear Tyler,

The Snow King Resort Planned Resort District was approved in 2000 and created to further the comprehensive plan that was in existence at the time and promote economic and recreational activity for locals and visitors. Since the approval of the Snow King Planned Resort District, one amendment was made to the housing chapter, and a number of developments occurred within the district. A comprehensive list of all approved building developments is on file with the Town Planning Department; however, broadly speaking these developments include the construction of the Grand View and Love Ridge condominiums, One Town Hill condominium complex, the Rafferty Center complex, miniature golf course, maze, and mountain coaster. An update was also made to explicitly allow zip-lines and mountain biking within the resort district.

Sincerely,

Ryan Stanley



Snow King Mountain Resort Phase 2

Stakeholder and Community Feedback Guide Master Plan Phase 2

Gondola Landing

Originally Proposed: Landing 8-person gondola in Town of Jackson property on existing parking lot

SKMR Proposed Base Area Master Plan Amendment: Landing 8-person gondola in Town of Jackson property, in the existing parking lot of the baseball field, creating additional green space, landscaping and other upgrades paid for by Snow King Mountain Resort.

Based on community feedback at engagement meetings and overwhelming support from the stakeholder group, we heard that additional green space is needed in our community. Snow King's plan would improve green space and landscaping and enhance/add other amenities such as a pavilion/concert stage based on community and Town direction.

Landing the gondola on Town of Jackson property and upgrading the public's space was supported by every stakeholder in the 16-person Snow King stakeholder group. Snow King Mountain Resort (SKMR) is committed to paying for additional changes in this area including green space, landscaping, a concert venue, public art, etc. SKMR will continue to work with Town officials, Parks and Recreation, and community stakeholders to finalize plans for this area.

SKMR continues to be open to re-negotiating these leases with the Town for the future use of this property. We heard from the Town, community members and stakeholders this was an important issue, and SKMR looks forward to arriving to an agreement that is equitable to both parties.

Access Road

Originally Proposed: Access road across front of mountain to provide critical service providers and mountain employees access to the summit. Current road is not safe for vehicle travel.

SKMR Proposed Base Area Master Plan Amendment: SKMR explored numerous access configurations including Leeks Canyon and alternate routes on the face of the mountain to expand beginner ski terrain and facilitate appropriate grades for road design and safety. Community feedback, the majority of Snow King stakeholders, and a majority of community engagement attendees supported the original location of the proposed access road due to the safety and beginner skier features.



SKMR is committed to revegetating the existing road once it is replaced to bring that area back to its original state. In addition, SKMR will utilize best road construction practices to minimize visual impact upon the ski slopes. SKMR will work hand-in-hand with local nonprofit trail groups to establish a new hiking trail to the summit with minimal disturbance to vegetation.

Ice Rink

Originally Proposed: Ice rink not originally included in 2017 Master Plan.

SKMR Proposed Base Area Master Plan Amendment: Based on community feedback, SKMR will show a second sheet of ice, located to the North of the Snow King Events Center, to the Base Area Master Plan Amendment, in the event that the Town of Jackson or other groups seek to develop additional ice facilities. Many local nonprofits and their supporters have mentioned in emails, letters and engagement workshops that a second sheet of ice is critical to the future of hockey, figure skating and other ice sports in the valley.

Mountain Sports Complex

Originally Proposed: Not originally included in 2017 Master Plan.

SKMR Proposed Base Area Master Plan Amendment: SKMR heard through the community process from several user groups that a climbing gym, climbing wall and training facility were needed in the downtown area. Based on this feedback, SKMR is adding the proposed Mountain Sports Complex to the Base Area Master Plan Amendment to explore serving these user groups better.

The Mountain Sports Complex would serve local nonprofits, school groups, and the climbing community by providing year-round indoor training facilities. SKMR has heard from these athletes and their parents that a state of the art indoor sports complex would have broad support and benefit the community.

West Boundary

Originally Proposed: In the 2014 plan, there was substantial expansion to the west.

SKMR Proposed Base Area Master Plan Amendment: SKMR shrunk this expansion considerably in its Base Area Master Plan proposal to the USFS. SKMR had many meetings with neighbors and listened to their concerns regarding the original expansion. In an effort to be good neighbors and work with our community members, SKMR is currently proposing reducing the expanded ski area again to create an even smaller “operational boundary” than proposed in the 2017 USFS master plan.



East Boundary

Originally Proposed: In the 2014 plan, there was substantial expansion to the east.

SKMR Proposed Base Area Master Plan Amendment: SKMR shrunk this expansion considerably in its 2017 Base Area Master Plan. SKMR had many meetings with neighbors and listened to their concerns regarding the original expansion. In an effort to be good neighbors and work with our community members, SKMR is currently proposing reducing the expanded ski area again as part of the USFS project proposal to create an even smaller “operational boundary” that provides the critical component of a safe access road to the summit.

Zip Line

Originally Proposed: Originally, three (3) zip line experiences were proposed for the 2017 master plan. Two (2) zip line tours and one (1) zip line on the face of the mountain would provide visitors with a selection of exciting adventures. One of the proposed designs included a zig-zagged feature on the face of Snow King Mountain.

SKMR Proposed Base Area Master Plan Amendment: Snow King received much community and stakeholder feedback on the proposed zip lines. SKMR has omitted both zip tours including the design that zig-zagged on the face of the mountain.

Community feedback at the last engagement open house showed that the majority of folks approved of one zip line on the mountain. Stakeholders discussed this proposed amenity at length. Stakeholders and the community differed on whether it should run parallel with the proposed gondola or be located on or near the Rafferty Lift.

SKMR will propose a single zip line running parallel to the gondola in the Base Area Master Plan, as a zip line located by the Rafferty Lift would require substantial clear cutting of trees and the location adjacent to the gondola will not.

Summit Multi-Use Building

Originally Proposed: A restaurant facility at the top of the summit to serve locals and visitors.

SKMR Proposed Base Area Master Plan Amendment: SKMR is proposing a restaurant facility to serve locals and visitors at the top of the Summit Lift, showcasing breathtaking views of the surrounding areas.

SKMR is proposing locating their Mountain Sports School at the summit to bring children and adults learning to ski out of the shadows and into the sunshine. Snow King Ski Patrol will also have space within the building. In addition, the building would be designed to host meetings and events and house a planetarium that could present images from a proposed observatory.



SKMR is committed to using best green and sustainable practices while building and operating this facility.

Planetarium and Observatory

Originally Proposed: Planetarium and observatory in partnership with local nonprofit Wyoming Stargazers.

SKMR Proposed Base Area Master Plan Amendment: SKMR has received overwhelming support for these proposed features and are excited to work hand-in-hand with Wyoming Stargazers to develop these amenities for our community. A planetarium and observatory were unanimously supported by our stakeholder group and received significant positive feedback from the community.

SKMR will work with local nonprofits and community groups to host educational programs and events at the planetarium and observatory. SKMR is excited to make this scientific outreach available to all in our community who want to learn about the cosmos.

Back Side of the Mountain

Originally Proposed: Lift access, mountain bike park and south side skiing on the sunny aspect of the hill.

SKMR Proposed Base Area Master Plan Amendment: SKMR heard from both stakeholder group and community members who would like to see a yurt camp on the back side of the mountain in the currently permitted area. SKMR listened and will be proposing to add this community benefit for the Scouts, Wilderness Adventures and other nonprofit user groups to the 2017 Master Plan.

Others benefits on the back side of the mountain will include lift access, mountain bike park and south side skiing on the sunny aspect of the hill.

Front of Mountain Trails

Originally Proposed: Bike trails and hiking trails on the front side of the mountain.

SKMR Proposed Base Area Master Plan Amendment: SKMR received feedback from stakeholders that hiking and walking trails need to be realigned and reinforced for all season users. SKMR will seek the input of nonprofit pathway groups to improve the design while using best practices to limit vegetation disturbance.

SMKR received substantial support for bike trails with lift access that included beginner, intermediate and uphill only traffic. SKMR will continue to work with local biking organizations and stakeholders to develop a system that is user friendly for all age groups and skill levels.



SKMR will continue to engage the community for their input in the design of these features on the mountain. SKMR goal is to see a system of hiking/walking/biking trails for all users and levels on the mountain, and work with local nonprofits to ensure their sustainability and limited footprints.

Lots 53, 57, and 58

Originally Proposed: Mirror the use on surrounding properties for condo and short-term rentals.

SKMR Proposed Base Area Master Plan Amendment: SKMR heard from the community and stakeholder group members that these lots should also contain zoning for workforce housing. On-site workforce housing along with condo and short-term rental use was discussed for all (3) of these lots.

SKMR would like to see the lots zoned for condos and short-term rentals as well as workforce housing. SKMR would adhere to the current housing mitigation at the Town and County level when these lots are designed and built.

Housing

Originally Proposed: Continue with 1997 Master Plan requirements.

SKMR Proposed Base Area Master Plan Amendment: Comply with housing mitigation that mirrors current Town and County LDRs. In addition, build a seasonal worker complex for employees of SKMR and Snow King Hotel. This housing would primarily be for seasonal workforce.

On-site housing will provide SKMR with valuable seasonal employees while limiting the transportation burden of multiple employees driving into work across town.

Snow King Mountain Commitments

SKMR Proposed Base Area Master Plan Amendment: The following items were added based on stakeholder and community feedback:

- Guarantee a minimum number of weekly hours SKMR operates
- Propose an affordability standard for winter season pass and winter lift tickets
- Maintain access for current user groups

SKRMA Commitments

SKMR Proposed Base Area Master Plan Amendment: The following items were added based on stakeholder and community feedback:

- SKRMA will provide an annual update as requested on the composition of the board and status of the organization to the Town of Jackson.



- SKRMA will undertake parking studies in addition to required Transportation Demand Management Monitoring.
- SKRMA will update housing requirements for the resort district to current LDRs of the day.
- All members of the resort district will contribute to SKRMA through the existing contribution structure.



Snow King Mountain Resort Phase 2

Snow King Mountain Resort Proposed Town of Jackson Commitments

- Gondola on Town of Jackson Property
- Zip Line Landing on Town of Jackson Property
- Clarity on Use for Lots 53, 57, and 58
- Support for the U.S. Forest Service Proposal Including a Proposal for Permitted Area on South Side

Based on the Above Commitments, Snow King Mountain Resort (SKMR) Proposes the Following Community Benefits Associated with Snow King Base Area Master Plan Amendment:

Amend SKMR Master Plan to Update Our Housing Mitigation Rates to Reflect Current LDRs

As the Town and County update their housing mitigation requirements, SKMR will support their agreed upon regulations and adhere to the current Land Development Regulations (LDRs) when developing new construction.

In Addition to Updating Housing to Current LDRs, Construction of Additional Employee Housing

Snow King is committed to building onsite housing for roughly fifty (50) seasonal employees on Vine Street. This multi-use building will store heavy winter equipment on the first floor, house employees on the second and third, and provide a green space for employees to enjoy. Seasonal housing will also be offered to Snow King Hotel employees as well, providing on-site housing where employees can walk to work. Located in close proximity to a START bus stop and the downtown, this on-site housing will incentivize alternative transportation means for employees.

Additional Ice Rink

Hockey and figure skating programs for adults and youth continue to grow in our community. We have heard from stakeholders that an additional ice rink is needed for practices and ice time as schedules are currently very cramped. SKMR will support the addition of a second sheet of ice on the North side of the Snow King Events Center to help alleviate some of the pressure on our community's only indoor ice rink.

Mountain Sports Training Complex

Snow King Mountain is proposing adding a Mountain Sports Complex to the Snow King Base Area Master Plan Amendment. This complex would have first class climbing wall reflective of the climbing history in Jackson Hole. Climbing advocates have passionately discussed the need for a climbing gym in town and Snow King has been in discussions within the climbing community to address the demand and



design. The Mountain Sports Complex would also serve as a training facility for the JHSSC, providing winter athletes a place for instructor led classes, and access to the climbing facility. Snow King is committed to fostering and supporting the JHSSC and hopes to work with them on making this project a reality.

Enhanced Ski Club Facilities

Snow King will work with the JHSSC over the coming years to enhance administrative and locker room facilities on the second floor of the lodge room.

Planetarium and Observatory

Working hand-in-hand with local nonprofit Wyoming Stargazers, Snow King is planning to add a planetarium and observatory to the summit of Snow King Mountain. Our valley continues to be on the forefront of dark sky initiatives and keeping our brilliant stars visible to locals and visitors alike is something to be celebrated. The planetarium and observatory will provide educational outreach opportunities to locals, visitors, nonprofits and school programs.

New Infrastructure

Snow King Mountain's infrastructure continues to age and current owners are invested, and excited, to replace aging lifts, facilities and amenities with state of art investments that will continue to serve this community for generations to come. The Summit lift is approaching 40 years old and it is in desperate need of being replaced. Proposed Phase 2 plans will have this aging lift replaced with an 8-person gondola. Gondolas are a safer mode of transportation for people of all ages and abilities, in a variety of weather conditions. This will allow Snow King Mountain to become more accessible to a wider audience while also allowing for a future ski school to provide safe, reliable transportation to ski school children, instructors and their families.

Green Space Improvements to Town of Jackson Property

Snow King Mountain Resort's Base Area Master Plan Amendment proposes the gondola landing on the Town of Jackson property in the current parking lot of the baseball field near the Cougar lift. Snow King's proposed plans for that area include the gondola landing, green space improvements, and infrastructure improvements – all of which would be 100 percent paid for by Snow King. These proposed improvements would yield more green space for the community to enjoy, space for field sports, concerts, and public gatherings of all types. Snow King is committed to working with the Town of Jackson and Parks and Recreation to improve this property based on community involvement and direction as well as direction from the Town on how they would like to see this parcel developed for a variety of users.

Additional Parking

Snow King will continue to address parking needs every year based on use and work with the Town of Jackson to efficiently serve parking needs at the base of the mountain. Since we are proposing to relocate some of the parking on Town of



Jackson land, and know that there will be a need for additional parking, Snow King is proposing the use of dirt lots for additional parking. Snow King will continue to work with nonprofit organizations, local year-round mountain users and visitors to use alternate modes of transportation and carpools. Snow King is also rolling out a pilot program this summer to shuttle locals and visitors from all over town to alleviate traffic and parking concerns.

Pilot Shuttle Program

This summer Snow King will pilot a free activity shuttle to various downtown locations. The Snow King Activity Shuttle will pick up visitors from hotels as well as locals/visitors and transport them to and from Snow King. Parking, traffic and single use vehicle occupancies are a problem in our community, especially in the summer. Snow King wants to encourage visitors to use this program to alleviate some of our transportation issues while providing a useful service to our downtown area.

Continued Maintenance of Trails

Snow King Mountain Resort will continue to maintain all trails on their leased property for the benefit of community users and visitors.

Working with Pathway Organizations

Snow King will work with local nonprofits like Friends of Pathways and Mountain Bike the Tetons to design a separated trail/pathway system for bike and pedestrian use. We are committed to hearing from users and stakeholders to design a system for beginners to advance users that the community will benefit from.

Ski Hill for All, for Future Generations

Snow King wants to be a mountain for all, with activities for every age range and ability. Our plans for the future center around creating a small-town ski area that can be sustainable and viable for generations to come. As one of the oldest ski hills in the country, our plans include much of what other ski resorts have proposed and have found success in implementing. Snow King's investments will ensure our lifts continue to run while serving locals, visitors, and our amazing local nonprofit organizations for years and years. Snow King is the heart of our community and town. We are committed to continuing that relationship with collaborative leadership, strategic investments that reflect shared priorities and a continued pledge to serve our community.

RELEASED	
INDEXED	
ABSTRACTED	
SCANNED	

WARRANTY DEED

Snow King Holdings, LLC, a Wyoming limited liability company, GRANTOR, of Teton County, State of Wyoming, for and in consideration of TEN DOLLARS (\$10.00) and other good and valuable consideration, in hand paid, receipt of which is hereby acknowledged, CONVEYS AND WARRANTS to Snow King Mountain Resort, LLC, a Wyoming limited liability company, GRANTEE, whose mailing address is P.O. Box 1846, Jackson, Wyoming, 83001, the following described real estate, situated in the County of Teton, State of Wyoming, hereby waiving and releasing all rights under and by virtue of the homestead exemption laws of the State of Wyoming, to-wit:

See Exhibit "A" attached hereto and by this reference made a part hereof.

State Parcel ID No.: 22-41-16-34-3-00-003

Together with and including all oil, gas, and other minerals and mineral rights appurtenant thereto and owned by Grantor, if any, and all improvements and all other appurtenances and hereditaments thereunto belonging; subject to general taxes for the year of closing, local improvement districts, guaranteed revenues to utility companies, building and zoning regulations, city, county and state subdivision and zoning laws, easements, restrictive covenants, and reservations of record.

WITNESS our hands this 27 day of NOVEMBER, 2017.

GRANTOR: SNOW KING HOLDINGS LLC
 GRANTEE: SNOW KING MOUNTAIN RESORT LLC
 Doc 0940086 Filed At 14:53 ON 11/28/17
 Sherry L. Daigle Teton County Clerk fees: 18.00
 By Mary D Antrobus Deputy

Snow King Holdings LLC, a
 Wyoming limited liability company

By: Max C. Chapman, Jr.
 Max C. Chapman, Jr.
 Manager

STATE OF WYOMING)
) ss
 COUNTY OF TETON)

The foregoing instrument was acknowledged before me by Max C. Chapman Jr., who is personally known to me or has established his identity and authority to me by reasonable proof, as Manager of Snow King Holdings, LLC, a Wyoming limited liability company, this 27 day of November, 2017.

Witness my hand and official seal.



[Signature]
 Notary Public

February 13, 2021

EXHIBIT A

LEGAL DESCRIPTION
FOR
TRACT B, EXCEPTING
PINE LODGE ADDITION

A Parcel of land located in the NW1/4 SW1/4, Section 34, Township 41 North, Range 116 West, 6TH PM, Town of Jackson, Teton County, Wyoming, said Parcel of Land being all of Tract B of that Map to Accompany Lot Division Application recorded as Map T-71B in the Office of the Clerk of Teton County, **EXCEPTING THEREFROM** the Pine Lodge Addition to the Town of Jackson, recorded as Plat No. 1257 in the Office of the Clerk of Teton County, said Parcel being more particularly described as follows:

Beginning at a Point on the northerly boundary line of said Tract B, Record Map T-71B, said Point of Beginning also being the northeast corner of Lot 1, of said Pine Lodge Addition, Plat 1257 and being N89°54'18"E, 145.07 feet, from the ¼ Corner common to Sections 33 and 34 of said Township 41 North, Range 116 West;

Thence along the northerly boundary of said Tract B, N89°54'18"E, 409.06 feet, to the northwest corner of Tract A of said Record Map T-71B;

Thence along the westerly boundary of said Tract A as follows:

S0°45'37"W, 37.21 feet;
Thence S89°08'12"E, 35.13 feet;
Thence S1°36'36"W, 26.18 feet;
Thence S89°01'27"E, 16.06 feet;
Thence S0°46'07"W, 90.01 feet;
Thence N88°57'07"W, 14.01 feet;
Thence S0°58'04"W, 120.04 feet, to the southwest corner of said Tract A;

Thence along the southerly boundary of said Tract A, S89°02'41"E, 206.99 feet, to the southeast corner of said Tract A;

Thence along the easterly boundary of said Tract B, S0°18'16"E, 147.86 feet, to the southeast corner of said Tract B;

Thence along the southerly boundary of said Tract B, N89°50'34"E, 682.90 feet, to the southeast corner of Lot 2 of said Pine Lodge Addition, Plat No. 1257;

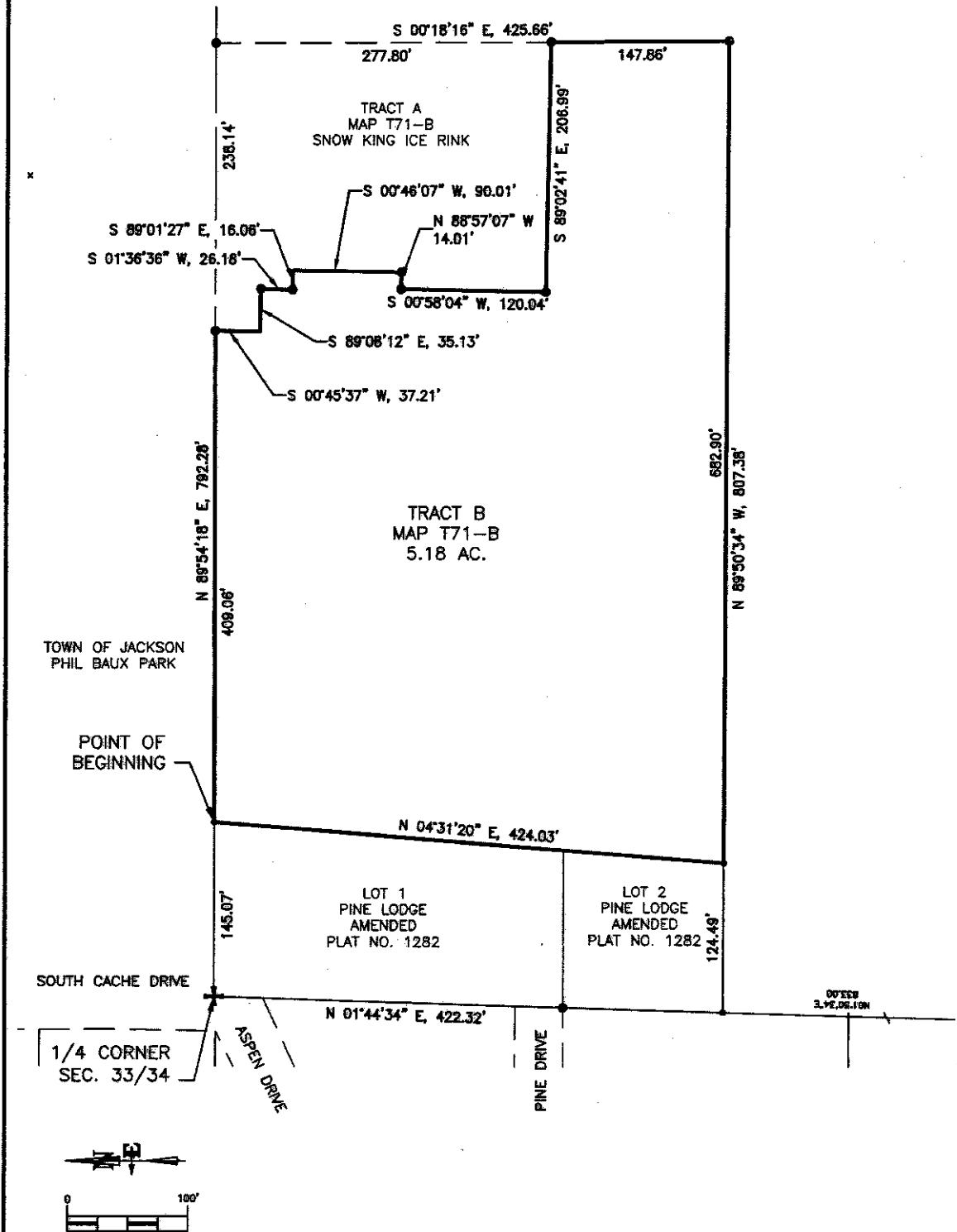
Thence along the easterly boundary of said Pine Lodge Addition, N4°31'20"E, 424.03 feet, more or less, to the Point of Beginning.

As shown on Exhibit B, attached hereto and by this reference made a part hereof.

Said parcel contains 5.18 acres, more or less, and is subject to any easements, rights-of-way, reservations or restrictions of sight and/or of record.

Michael Quinn
Wyoming PLS 4270
Nelson Engineering
Project 17-126-01

EXHIBIT B



DRAWING NO	DRAWING TITLE	DATE	6/11/2017
1	EXHIBIT B	ENGINEERED	MR
JOB NO		DRAWN	SK
17-248-01		CHECKED	
		APPROVED	

**NELSON
ENGINEERING**

P.O. BOX 1599, JACKSON WYOMING (307) 733-2087



August 20, 2018

Ryan Stanley
Vice President
Snow King Mountain Resort

Tyler Sinclair
Town of Jackson Planning Director
PO Box 1687
Jackson, WY 83001

Dear Tyler,

Based on feedback we have received from the general public, Parks and Recreation staff, and the Parks and Recreation board, we would like to submit the attached maps for consideration as part of the Snow King Resort Master Plan Amendment. Our original master plan submission with respect to Phil Baux Park included a vision for maximizing greenspace based upon feedback from the stakeholder process. The attached alternatives show different concepts for the Parks and Recreation Board to provide feedback on.

We greatly appreciate the time and effort you and the Town of Jackson have put into providing public feedback for this proposal and look forward to continue working with you for this review process over the coming months.

Sincerely,

Ryan Stanley



E Snow King Ave

S Cache St

RESTROOM

HORSE SHOE PITS

PICNIC SHELTER

- OPEN TURF -

PICNIC SHELTER

RANGER BOULDER

RESTROOM

Kickball

UPDATED PLAYGROUND

TETON BOULDER PARK

BLACKLINE

Bathroom

Tickets

GONDOLA LIFT

COUGAR CHAIR LIFT

Ski Club Expansion

SNOW KING ICE CENTER

2nd Sheet of Ice

- OPEN TURF -

Unobstructed Winter Zone

- OPEN TURF -

Winter Tubing (3) Lanes

Unobstructed Winter Zone

SNOWKING MOUNTAIN RESORT

Climbing Gym & Mountain Sports Training Center

ASPEN CEMETERY (Town of Jackson)

CCC'S TOWN HILL LOFTS, LLC

SNOW KING CENTER (Town of Jackson)

Snow King Base Area & Phil Baux Park
Concept Design A

S Cache St

E Snow King Ave

KM6, LLC

CCC'S TOWN HILL LOFTS, LLC

TUBE
LIFT

Tickets

Gondola

Ski Club &
Lodge Room
Expansion

SNOW KING
ICE CENTER

2nd Sheet of Ice

Mountain
Sports
Training
Facility

ASPEN CEMETERY
(Town of Jackson)

SNOW KING CENTER
(Town of Jackson)

Snow King Base Area
And Phil Baux Park
Concept Design B



Snow King
Planned Resort District
Master Plan

SNOW KING RESORT MASTER DEVELOPMENT PLAN

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AFFIDAVIT AFFECTING TITLE

Re: Snow King Planned Resort District Master Plan

COMES NOW JEANNE JACKSON, MAYOR OF THE TOWN OF JACKSON, WHO,
BEING SWORN ON HER OATH, DEPOSES AND SAYS:

That the Town of Jackson Town Council on December 18, 2000 did approve the Snow King Planned Resort District Master Plan and Conditions, attached. The Snow King Master Plan includes background information and explanations and is intended to specifically govern development at Snow King Resort.

Further your Affiant sayeth naught.

Jeanne Jackson

STATE OF Wyoming
COUNTY OF Teton

The foregoing Affidavit Affecting Title was subscribed, sworn to
acknowledged before me by JEANNE JACKSON
this 16th day of July, 2001

WITNESS my hand and official seal.



Cynthia A. Nicholson
Notary Public

My commission expires: 2/2002

RELEASED	
INDEXED	
ABSTRACTED	
SCANNED	

Grantor: TOWN OF JACKSON
Grantee: THE PUBLIC
Doc 0547519 bk 429 pg 1-211 Filed at 07:55 on 07/19/01
Sherry L Daigle, Teton County Clerk fees: 444.50
By KIMBERLEE JANSEN Deputy

INTRODUCTION

Background

In April of 1997, the Town of Jackson and Teton County adopted specific regulations to allow for the review and approval of Planned Resort districts within each jurisdiction. The regulations, included as Division 2500 of the Town's Land Development Regulations (LDRs), outline the Purpose and Intent, Applicability, Procedure, Standing, Amendments, Expiration, Extension and Reconsideration, Standards Applying to all Planned Resorts, and Findings of Approval applicable in the Planned Resort District. In the Town of Jackson, the only Planned Resort District is the Snow King Ski and Summer Resort. Division 2500 of the Town's LDRs specifically pertains to the review of the Snow King Ski and Summer Resort located within the Town of Jackson. Thus, this Snow King Resort Master Plan has been reviewed and approved according to the procedures outlined in Division 2500 and is not be subject to the other requirements of the Town's LDRs.

This Snow King Resort Master Plan has gone through a series of Joint Town and County Planning and Zoning Commission, Town Council and Board of County Commissioners meetings and workshops prior to the submission and approval of this final document. Final approval took place on December 18, 2000.

A Text Amendment to Section 2550.M.3.b. (2) of the Jackson Land Development Regulations (LDRs) was also approved by the Town Council, and amended this section to ensure consistency between the LDRs and this master plan. Furthermore, the amendment provides clarity in regards to what square footage is included when calculating the total allowable square footage allowed in the Snow King Master Plan. The enclosed copy of Division 2500 incorporates this Amendment.

The review process of this Snow King Resort Master Plan included a thorough review of each Chapter of the plan by the Town and County Planning and Zoning Commissions. Subsequent to the comments and suggestions raised by the Commissions, the document was revised to address the identified issues. Staff made all the required findings for approval and recommended approval with conditions that have been incorporated into this final document.

At the December 13, 2000 Joint Town and County Planning and Zoning Commission meeting both Commissions forwarded a positive recommendation to Town Council on the proposed Master Plan. At their December 18, 2000 meeting, the Town Council unanimously approved this Master Plan. All the conditions for Approval that were part of the motion have been incorporated into this final document.

This Master Plan applies to all properties located within the Snow King Planned Resort District. This approved Master Plan acts as a Sketch Plan as per Section 51200 Development Plan of the Town's LDRs. Prior to commencement of construction or operation of a new land use within the Planned Resort District; each individual application will be required to obtain a Final Development Plan and Building Permit from the Town. References to Final Development Plans within this document! Refer to Intermediate and/or Major Development Plans as defined in the Town of Jackson Land Development Regulations (LDR's) Article V Division Section 51200.C.4 - Thresholds for Development Plans. Therefore, Minor Developments, as defined in the LDR's, are exempt from Final Development Plan Review. Also, any such Minor Development(s) will not trigger any of the requirements set forth within this Master Plan that are tied to a Final Development Plan application.

This Snow King Resort Master Plan addresses all the specific submittal components outlined in Section 2530.A.2 of the LDRs, which includes the following:

1. Statement of Purpose
2. Master Site Plan
3. Dimensional Limitation Plan
4. Design Guidelines
5. Transportation Demand Management Plan
6. Housing Mitigation Plan
7. Capital Improvements Plan
8. Land Use Plan
9. Phasing Plan

Chapter 1: Statement of Purpose and Existing Conditions

The LDRs state that the intent of this Chapter is to describe the rationale for the proposed resort expansion and describe the design theme for the resort. In addition, the Chapter should also describe how the resort master plan fulfills the intent of this Division 2500, as specified in Section 2510, Purpose and Intent.

This document clearly articulates the overall intent of the resort master plan and the rationale for the expansion of the resort in statements such as the following:

"A primary purpose of this Master Plan is to create a vibrant mixed-use resort complex including a multi-faceted conference/convention center and community facility for Jackson, a facility that contributes to the economy of downtown and also serves as a permeable border between the town and the mountain."

"As a community partner Snow King offers the community, through this Master Plan, limits of development predictability, preserved open space, access to forest lands, and many other positive attributes discussed in this document."

The purpose and intent as described in Section 2510 of the LDRs is further defined and clarified by this plan on pages I.A.5 and 6 with an additional twenty-four bullet points describing the purpose and intent to be achieved by the Master Plan in terms of the built environment, impacts on the community and the role the resort will play in the greater Jackson Hole area.

The second purpose of this chapter is to provide a background for the master plan by describing the existing conditions, extend of the master plan winter and summer use maps and land ownership within the subject area. This purpose has been additionally addressed through the inclusion of both written and visual descriptions of the subject property and explanation of both existing and planned resort development. This section also clarifies how the existing development already in place within the Planned Resort District is dealt with after this Master Plan was adopted.

Chapter 2: Consistent with the Comprehensive Plan

The purpose of this chapter is to ensure that the resort master plan is consistent with the goals and objectives of the Jackson/Teton County Comprehensive Plan. This document provides a clear documentation as to how the proposed plan meets the goals and objectives of the Comprehensive

Plan. Staff concurred with this document's statement that a balance between what the resort brings to the community in terms of jobs, tax revenue, meeting space and recreational opportunities must be balanced with the associated impacts of these benefits on public infrastructure (roads, sewer and water systems, transit, etc.), and demand for employee housing. It is important to recognize that the Comprehensive Plan anticipated the growth and expansion of all resort areas in Teton County while at the same time maintaining the community character of Jackson Hole as shown in the following statements from the Comprehensive Plan:

"To support a balance of growth among residential, commercial and resort development to preserve and enhance community character."

"To manage the rate of growth in the residential, resort and commercial sectors in a way that allows the community to change while preserving community character."

"Teton County's three ski resorts all have significant growth potential (described in Chapter 2). The resorts are obviously important to the community; they make Teton County a two season resort area and add to the quality of life for local residents."

Staff found that the proposed plan is consistent with the Comprehensive Plan by providing a well-designed and thought out plan that will be a benefit to local residents and visitors while at the same time addressing the associated impacts of the proposed expansion on the local community.

Chapter 3: Compliance with the Land Development Regulations

The LDRs in Division 2500 Planned Resort District state that an applicant for a Planned Resort master plan may propose, and the Town Council may approve, alternative standards for development that are consistent with the purpose and intent of Division 2500. In addition, Division 2500 states that it is fully consistent with the Division that Planned Resorts may have dimensional, design, and other development standards different from those described in other sections of these LDRs due to the unique circumstances of, and community objective for, resort development. Staff determined that this master plan meets the requirements for a sufficient application per Division 2500 LDRs and is thus in compliance with the LDRs. Furthermore, as described in Chapter 1: Statement of Purpose and further described in this chapter the proposed master plan is consistent with Section 2510 Purpose and Intent and Section 2150 which defines a Planned Resort District. Finally, the chapter addresses the required findings as per Section 2560 of the LDRs.

Chapter 4: Master Site Plans

The master site plans depicted in this Chapter clearly illustrate the proposed development and the site characteristics. This Chapter stresses that the backbone of the master plan is the pedestrian circulation routes that run through the resort connecting the various outdoor and indoor facilities and activities. These routes are clearly shown by the Snow King Resort Circulation, Pathways and Sidewalks Map and the Snow King Resort Vicinity Trail Network Map included in this Chapter. The summer/winter master site plan clearly illustrates the location of development, vehicular and pedestrian circulation and interaction between the built and natural environment making up the resort. The inclusion of a sub-area plan is critical to show the resort in more focused and centralized areas for more detailed discussion throughout the remainder of the master plan.

Chapter 5: Land Use Plan

The intent of the land use plan is twofold. First, to identify the allowable land uses within a proposed Planned Resort. Second, to describe the amount and type of development that is to be expected as a result of the proposed master plan.

The land use designations are consistent with both the master plan's design theme and the character objectives for the resort, as specified in Chapter VI Design Guide lines of this master plan.

Various conditions for approval have been incorporated into the body of this Chapter.

This Chapter also includes a chart depicting the amount and type of development proposed in the master plan in an Example Development Chart. This proposed development example is only to be used as an example of what may be developed on site. The example development scenario is necessary in order to determine the possible impacts and required facilities and services as a result of the proposal. The proposed development example is consistent with the need for resort expansion as well as with the primary purpose of the master plan to: *"create a vibrant mixed-use resort complex including a multi-faceted conference/convention center and community facility for Jackson, a facility that contributes to the economy of downtown and also serves as a permeable border between the town and the mountain."*

Chapter 6: Design Guidelines

The intent of this Chapter is to provide design guidelines to establish standards for buildings, spaces signs and lighting within the resort district along with a mechanism for the implementation. The LDRs state that the design theme of the resort shall be defined by the applicant and be consistent with the standards of Division 2500.

Section 2540. G of the LDRs establishes seven individual criteria upon which the proposed Design Standards are to be evaluated.

The first criteria described as General in the LDRs establishes whether the proposed Guidelines will create a sense of place. The master site plan satisfies this requirement with three defined primary outdoor spaces. Each one of these locations (Entry Court, Pedestrian Plaza, Pool Courtyard) is designed for a specific function, provide connectivity between the various elements of the resort and take advantage of the natural features found in the area.

The second criteria: Architecture, is satisfied by the proposed Guidelines including sections on Building Form, Massing and Character, Roofs, Exterior Materials, Windows, Commercial Frontage, Entryway, Decks and Balconies, color and Sub-Area 2 Specific Guidelines. The description and criteria provided in these sections will provide base standards upon which individual Final Development Plans can be evaluated for consistency with the master plan.

The third criteria: Bulk and Scale, has been addressed in the Building Form, Massing and Character section of this Chapter. In addition, the Chapter VII Dimensional Limitations graphically shows the three-dimensional building envelope dimensions, Circulation Overlay Zone and Building Envelope Sections designed to control the bulk and scale of the proposed development.

The fourth and fifth criteria: signage and lighting, although addressed in the master plan, shall be further researched and approved as separate sections prior to the submission of the first Final Development Plan for the resort.

The sixth criteria: Site Planning, has been adequately addressed in the master plan in various chapters including Chapter II Master Site Plans, Chapter VI Design Guidelines, Chapter VII Dimensional Limitations Plan and Chapter IX Transportation Elements.

The seventh criteria: Character element, as per Section 2550.M, has been incorporated successfully into the proposed Design Guidelines. The resort will have a definable architectural character and site design that meets the standards identified in Section 2550.M of the LDRs for the Snow King Resort.

Chapter 7: Dimensional Limitation Plan

The intent of the proposed Dimensional Limitation Plan is to specify dimensional limitations necessary to achieve the design theme identified for the master plan. The plan includes floor areas and floor area ratios, densities, landscape ratios, height, setbacks, building envelopes, etcetera, or other lines delineating areas on which restrictions of development are to be imposed and areas in square feet for each lot or building. Any dimensional limitations unspecified by the Planned Resort master plan shall be established by the standards set forth in Section 2530.C, Other Development Options.

This Master plan accomplishes this through a method of three-dimensional building envelopes presented primarily in graphic format. The proposed three-dimensional building envelopes provides the ability to review proposed Final Development Plans against the proposed envelopes for consistency with the master plan. The building envelopes provide both height and setback requirements for the plan. In addition, standards for setbacks, open space, landscape surface area, landscape surface ratio, building floor area, lodging capacity and floor area ratio are also included as part of the master plan. The various dimensional limitation standards provided in this Chapter ensure that the proposed resort character is maintained.

Chapter 8: Housing Element

The intent of the housing element is to ensure a supply of affordable and employee housing that is commensurate to the demand for housing created by development within the Planned Resort.

The Housing Element adequately addresses the estimated demand and proposed location of employee housing required as a result of the proposed master plan.

Chapter 9: Transportation Element

The intent of the proposed transportation element is to ensure that the resort development does not produce an amount of vehicular traffic that undermines the community's character, and endangers the public health, safety and welfare (i.e. noise, air quality and traffic impacts). The Snow King Planned Resort master plan provides an optimum mix of automobile, transit and pathway facilities within the resort, encourage coordination of all resort transportation facilities with the County-wide transportation system, promote design and management which encourages shifts from single - occupancy vehicle trips to multi-occupancy trips, or other transportation modes, and provide equitable cost sharing for facilities and services.

The Traffic impact analysis adequately addresses the requirements described in Section 2540. H.1 of the LDRs. The proposed plan demonstrates how the travel behavior of resort visitors and employees will be managed to minimize the number of vehicle trips on the roadway network resulting from the resort development. Thirteen strategies are proposed that may be used to influence mode choice and reduce automobile trips as required by the plan.

The proposed shared parking analysis in combination with the proposed onsite parking will more than adequately meet the anticipated supply and demand for parking at the resort based on the example development plan. In addition, the proposed Entry Plaza planned as the vehicular hub for the resort will adequately handle the volume and wide range of vehicle types that will be utilizing the facility.

Chapter 10: Capital Improvement Plan

The intent of the capital improvements element is to ensure that infrastructure and essential services will be provided in an efficient and timely manner to accommodate projected resort demands. The capital improvements element identifies service providers, analyzes impacts and proposes a capital improvements plan for facilities and services needed by the resort.

This Masterplan accurately identified and acknowledged the necessary service providers required for the development of the proposed master plan. The impact analysis adequately meets the requirements outlined in Section 2540. 1.2.

The provided capital improvements program is consistent with the required impact analysis and clearly specifies how the deficiencies in infrastructure will be remedied or mitigated, including descriptions of the infrastructure improvements, the responsibility and sources of funding for the improvements, and the timing for completion of improvements. Concept plans for required improvements are also provided.

Chapter 11: Phasing and the Snow King Resort Master Association

The intent of the phasing element is to ensure that development within the resort occurs in a logical sequence, including amenities and necessary public service expansions. The resort is required to not only provide the necessary improvements and services as a result of the resort expansion, they are also responsible for the monitoring and long-term maintenance and replacement of all facilities, both on and off site.

The proposal to have all responsibilities for the phasing plan and implementation of the master plan be controlled by the Snow King Master Association (SKRMA) meets this requirement. This Association will be able to implement, control and monitor the required improvements and services required as part of this master plan. Detailed descriptions of the duties of this Association are described in this chapter.

Chapter 12: Community Services Element

The Snow King Resort has long played an important role in the community, providing facilities and recreational opportunities to both out of town visitors and the local community. Snow King is utilized as the primary conference/meeting room facility in the Town of Jackson. The Snow King

area provides an abundant array of recreational opportunities both summer and winter from hiking, mountain biking, and the alpine slide ride to skiing, tubing and ice skating.

Conditions of Approval

When the Jackson Town Council approved this Master Plan certain conditions were incorporated into the approval. Most of them are incorporated into the body of the various Chapters of this Master Plan. Other conditions that were part of the approval are:

- All Final Development Plans shall include a detailed Landscape Plan for the review and approval by the Town.
- A detailed signage program for the entire resort will be prepared by the resort and reviewed and approved by the Planning Director prior to the first Final Development Plan application.
- A detailed exterior lighting program for the resort will be prepared by the applicant and reviewed and approved by the Planning Director prior to the first Final Development Plan application.
- The applicant shall provide an employee housing requirement for Indoor/Outdoor Recreational Facilities to be and reviewed and approved by the Planning Director prior to the first Final Development Plan Application.
- The applicant shall be required to implement a minimum of two and a maximum of all thirteen proposed Transportation Demand Management strategies in order to meet the goals as described in the Transportation Element of this Master Plan.
- The applicant shall be required to implement the Travel Demand Management Monitoring System as described in the Transportation Element of this MasterPlan.
- The applicant shall be required to update the proposed shared parking analysis provided as part of the Transportation Element upon substantial completion of this Master Plan to ensure that the Example Development scenario used to develop the original analysis is working.
- The Capital Improvements Plan and other Chapters of this Master Plan include conditions of approval that were part of the approval of this Master Plan.
- The horizontal and vertical Building envelopes fronting Snow King Avenue have been revised in this final version of this Master Plan to comply with condition #28 of the Master Plan approval concerning the human scale aspect of Sub-Area 2 adjacent to the public thoroughfare.
- This Final Version of this Master Plan incorporates all the conditions that were part of the Town Council's approval and is the complete Final Version of the Snow King Master Development Plan as approved by the Jackson Town Council on December 18, 2000.

STATEMENT OF PURPOSE

Snow King has been a community resource and a community partner for over 60 years. This Master Plan presents a well-balanced next-generation vision of this partnership.

As stated in Section 2530 A.1, the purpose of this Planned Resort Master Plan is to *establish the development standards and serve as a guide to all future development within the Planned Resort. The Planned Resort Master Plan is intended to be of sufficient detail to describe the amount, type, size, location and impact of the proposed resort, but technical specifications of the proposed development, such as engineered plans or fully engineered plans or fully detailed architectural drawings are not required.*

Although sometimes repetitive, this Master Plan is consistent with the Comprehensive Plan, complies with the Land Development Regulations and adheres to all the procedures and standards of Division 2500 of the Land Development Regulations. The Goals, Objectives and Criteria listed in this Statement of Purpose are the guiding principles of this Master Plan.

Prologue

From a bird's eye view, the Town of Jackson is nestled into a narrow space between the Elk Refuge and the mountains, built at the fork of Cache Creek and Flat Creek and extending along the creeks at the foot of the mountains. The Town Square is at the center of this unique topography. The quality that makes the Town of Jackson attractive is the way in which it fits into this topography so that human habitation is seen as a natural part of the much larger landscape.

Snow King Resort, now and when developed as proposed in this Master Plan, aims to be an extension of this defining quality of the town of Jackson. As the border between the town and the mountains, Snow King "fits into the country" and it completes and compliments the downtown core.

As a blend between a visitor-serving resort and a community-serving facility, Snow King is a place where local residents and visitors share space comfortably. This proposed development is consistent with the traditional style of Jackson Hole hospitality: Snow King Resort invites visitors to join right in, relax and take part in the life of a unique community.

A primary purpose of this Master Plan is to create a vibrant mixed-use resort complex including a multi-faceted conference/convention center and community facility for Jackson, a facility that contributes to the economy of downtown and also serves as a permeable border between the town and the mountain.

Access to public lands (US Forest Service) from town through our private land in a seamless transition has always been a priority at Snow King. In fact, so unnoticeable is this transition that most people do not realize that they are entering private property. This tradition is intended to continue.

Among the stated purposes and intent of the resort district, as stated in the Land Development Regulations and the Comprehensive Plan, is to provide recreational opportunities that rely on indigenous natural attributes of the area. These opportunities are provided to both the community and the visitor through the development of Snow King's resort facilities. Snow King has provided the Town of Jackson, and the community at large, with in-town recreational facilities since 1939.

The ski area provides a venue for the junior ski racing programs, adult ski racing as well as recreational skiing and snowboarding, both day and night. During the summer the area provides a trail system, which has become a staple hiking, running, biking and riding area for residents and visitors alike. In turn other resort facilities and on mountain activities provide the financial and operational platform, which support and provide the ability to maintain and expand these recreational opportunities to both valley residents and visitors.

This Snow King Planned Resort Master Development Plan establishes the development standards and serves as a guide to all future development within the Snow King Planned Resort District. This Planned Development document represents a carefully balanced and well thought out development plans for the properties, it is organized in a clear manner responding to each Section of Division 2500 of the Land Development Regulations and is intended to expand on prior foundations through a collaborative plan, design and approval process between Snow King, the Town of Jackson and Teton County. This foundation is defined in the Land Development Regulations and is consistent with prior approvals dating back to 1972 and with prior presentations approved under the Complete Neighborhood provisions of the old Town of Jackson Development Guidelines.

Since the first chair lift was built in 1939, Snow King has been a community resource and a community partner. When the hotel opened in 1976, Snow King Resort opened its doors to a great variety of community meetings and events. Snow King has pioneered innovative relationships with the U.S. Forest Service, with the Town of Jackson and with many community organizations such as the Teton County Parks and Recreation Department, the Jackson Hole Ski Club, the Jaycees and many other community organizations. Virtually every non-profit organization in Teton County uses Snow King facilities to bring people together. Many local people regularly use Snow King's hiking and skiing trails as well.

Snow King Resort has, for years, been one of the largest employers in the Town and County. Among the large employers, we pride ourselves in maintaining a very stable level of employment throughout the year.

A very important consideration in this plan is to develop the property with porous edges and inviting corridors that allow circulation to the National Forest lands from the Town. It also considers the property as a bridge connecting the East and West ends of the Town via trails and pathways. Rather than stand out at the base, Snow King Resort melts into the mountain.

As owners of the largest contiguous land parcels within the Town of Jackson, we have planned and given a great deal of thought to the future development of these lands. We have also proven our slow and careful approach to development. As a community partner Snow King offers the community, through this Master Plan, limits of development, predictability, preserved open space, access to forestlands, and many other positive attributes discussed in this document. Additionally, Snow King is operationally integrated in the community. As resort operators we differ from the standard sub - division developer since we continue to operate the product of our construction/development phase providing assurances of ongoing responsibility to the community.

In addition to the recreational facilities, the Snow King Resort Hotel has provided the largest year round meeting and conference facilities in the county since 1976.

Within the resort core all buildings are interconnected by indoor and outdoor circulation corridors alleviating the need for guest and visitors to drive to services. Pedestrian and shuttle connections are planned to be developed and improved to connect the Multi Agency Campus, Town Square and Snow King. This Master Plan also encourages East/West and North /South pedestrian connections that complement the fabric of the Town and connect it to its mountain roots.

Functionally, visitors will be able to step out of our meeting rooms directly into the mountain environment. The pedestrian circulation system links the Resort to the mountain on both the north/south and the east/west axis so that Resort use is an integrated part of the mountain trail system. Outdoor recreation is the defining characteristic and largest land use of Snow King Resort summer and winter.

On the Town side, the entire downtown core is viewed as part of the resort in the sense that downtown amenities complement the convention facilities and lodging located on our site. Downtown shops and restaurants will be part of the immediate visitor experience, with both transit and pedestrian pathways linking Snow King to the Town Square conveniently.

The proposed development also blends sensitively with the adjacent residential neighborhood, as lodging facilities are bordered by condominiums and employee housing as a buffer for the residential neighborhood to the north and east. In addition, the Resort intends to provide an attractive Cache Street terminus that marks the end of the commercial development of the downtown core and the beginning of the residential neighborhood to the west.

Scale and Type of Development

An objective of this Master Plan is to develop a high-intensity resort node of development, which is compatible with its location and with its crucial relationship with downtown Jackson. The size and character of the proposed development is appropriate to its position as the center for year-round recreational, conference and resort activities within the Town of Jackson for both residents and visitors.

On the mountainside of the Town/Forest border defined by Snow King Resort, the proposed development blends into the contours of the mountain both physically and functionally. The buildings take advantage of the complex contours at the base of the mountain. The scale and shape of the mountain will make these structures appear modest. The Design Guidelines Chapter addresses how large structures such as the existing hotel and the Snow King Center and future additions fit into the topography.

The regulations set forth four basic considerations for establishing the amount and type of development: (1) rationale and character objectives for the resort area; (2) overall development which can be permitted while preserving community character; (3) infrastructure capacity; and (4) resort self-sufficiency to minimize vehicle trips.

The first two issues are discussed in the context of consistency with the Comprehensive Plan, the Land Development Regulations and the Design Guidelines. The issue of infrastructure capacity is discussed as part of the Capital Facilities Element. The issue of resort self-sufficiency is generally

not applicable since the intention of this Master Plan is to be integrated with the down town area. However, the proposed uses do provide basic conveniences and amenities needed by on-site guests and conference center users. Land uses and intensity are consistent with the Land Development Regulations.

The proposed maximum scale of development is in keeping with Division 2500. Three-dimensional building envelopes and design guidelines are used to provide a level of predictability. These physical parameters, in concert with the intensity of use thresholds, allow this document to provide long range planning for infrastructure, capital facilities and community land use patterns. These predictions should enable the Town and the resort to equitably share responsibility for future infrastructure and capital facility improvements.

Goals and Objectives

Section 2510 of the Town of Jackson Land Development Regulations state that *the purpose of the Planned Resort District Standards is to provide and guide the creation or continuation of a planned development around a major recreational facility. The intent of this District is to:*

- A. Encourage recreational activities that rely on indigenous natural attributes of the area, contribute to the community's character and economy and have had a long-standing, beneficial role in the community; and*
- B. Provide flexibility for planning and developing recreational resort facilities in a creative, efficient and coordinated manner in order to provide quality visitor experiences; and*
- C. Create a process in which applicants, Teton County and the Town of Jackson collaborate with landowners in planning and designing resort master plans that meet community goals and respond to the unique circumstances of the resort area; and*
- D. Permit resort development that contributes to expanding the winter and shoulder economic seasons; and*
- E. Ensure that resort plans incorporate a mix of land uses, promote alternative modes of transportation, and provide a pedestrian-oriented community in order to alleviate traffic related impacts; and*
- F. Ensure resort plans are consistent with the Comprehensive Plan, and therefore, are beneficial to the community; and*
- G. Enable long-range planning for infrastructure, capital facilities, and community land use patterns by establishing a level of predictability in the maximum potential size and character of each resort area; and*
- H. Ensure a balance is maintained between tourism and community that promotes social diversity but does not cause undesired shifts away from rural, western community character; and*
- I. Produce resort plans that make significant contributions toward protecting attributes of the community that are considered critical to the community's long-term health, welfare, and wellbeing.*

The Town of Jackson LDR 's also state that the Objectives of the Planned Resort District is:

To be a mixed-use district configured around a resort complex. Resorts are to be well balanced they are to provide tourist accommodations as well as seasonal and year-round housing. The design of resorts is to be compatible with adjoining areas and is to be connected to the community at large by roads, transit and pathways. A portion of the resort workforce, particularly seasonal employees of hotels and restaurants are to be able to find housing within the resort district. Commercial development is to provide both tourist and local convenience shopping opportunities as appropriate.

Division 2500 includes the following factors and resort characteristics that are important in Snow King's future development:

Capitalization on the location at the terminus of Snow King Avenue.

Creation of a sense of arrival.

Creation of an active, attractive, pedestrian streetscape along the eastern end of Snow King Avenue.

An attractive, safe and direct pedestrian streetscape connection to the Town Square.

A layout that blends the edges of the resort into neighboring developments, creating a porous edge to the resort that encourages pedestrian travel into and through the area.

Structure sizes and layout that draw people into the resort area.

A continuity of architecture and activities within the resort, creating a multi-use sense of place.

Pathways throughout the resort and connections to the Jackson Hole pathways system.

Continued provision of the amenities of "town hill" skiing.

All of these factors and characteristics are discussed and considered in detail throughout this Master Plan.

This Master Plan endorses and complies with all the above Goals and Objectives and adds this additional criterion:

- Create a vibrant year-round district in a unique resort-oriented urban commercial environment, serving both visitors and residents.
- Maintain and enhance access to public lands through private lands in a seamless transition. Preserve open space, ski runs and extend existing Town parks into the mountain.
- One dominant central hotel oriented towards conferences and meetings without lying accommodations of various types.
- Create meaningful outdoor activity areas that relate to both buildings and open space considering long vistas, and within a comfortable urban pedestrian framework.
- Solidify Snow King's role as the main convention and conference facility in the community.
- Create East/West trail networks that interconnect with other trails leading from Town up the mountain.
- Frame the access to the mountain West of the Snow King Center with a companion building, One Town Hill.
- Locate services and parking underground, wherever feasible, within a comfortable walking distance of destination, while creating building facades that conceal these uses.
- Separate service/delivery areas from the guest areas of the resort.
- Careful use of density to reduce the need for transportation within the district and from Snow King to the Town Square area.

- Create a Sense of Arrival at the Resort convenient for both visitors and local guests and with sufficient space for various concurrent functions and with clearly visible key destination points.
- Balancing activities to create an efficient distribution of usage throughout the day and the year.
- Create a festive resort-like atmosphere, with a variety of eating and recreational experiences. Lively all seasons.
- Integration into the town's fabric in a non-competitive symbiotic commercial relationship to downtown. Commercial areas should act as adjuncts to recreation, lodging and conference facilities.
- Community oriented Resort and Conference Center with a variety of year-round recreational activities and amenities for visitors and residents, achieving sufficient volumes of pedestrian circulation to create vibrant public spaces.
- Within the resort, pedestrian, bicycle and skier circulation shall be encouraged through the use of a pathways system. Pathways will be integrated into the resort and the Town's fabric and segregated, as much as possible from automobile circulation. The overall plan will be pedestrian friendly.
- Planning with landscape scenic values in mind.
- Design guidelines that enhance the natural attributes of the site and encourage architectural by distinctive design.
- Encourage design diversity with common themes.
- Create a Pedestrian Plaza from the hotel to the Snow King Center with porous building edges.
- Maintain the appearance of a resort set at the edge of town with public access through it to the National Forest Service land. Keeping a sense of connection to the mountains.
- Intercept as much vehicular traffic as possible at or near the Resort's entrance.

Submittal Components

This Snow King Planned Resort Master Plan document considers, addresses and ultimately assists in achieving these Goals and Objectives, while taking advantage of the unique characteristics of the site.

When considered as whole, the Master Site Plans, Land Use Plan, Design Guidelines and Dimensional Limitation Plan provide a clear vision of the visual and physical character of the resort.

Other components such as the Housing, Transportation, Capital Improvements, Phasing and Community Service Elements address the impacts and remedies associated with the development of the Resort.

Various Chapters of this Master Plan identify, address and respond to all the requirements of Division 2500 in a clear, complete and comprehensive manner.

Introduction to Existing Conditions and Vicinity Maps

This chapter of the Snow King Master Plan defines the existing conditions within the Snow King Resort District (PRD) and its immediate neighborhood. The maps are designed to provide distinct information and to assist in the familiarization process as well as providing reference information with respect to the later chapters. The first three maps provide information about the current zoning in the Snow King Planned Resort District (PRD) vicinity, and the current status of the built environment at Snow King Resort. The fourth map builds upon the existing conditions by including the approved, and presently being built, Love Ridge Lodge Homes project. The fifth map in this section indicates the extent of this Master Plan.

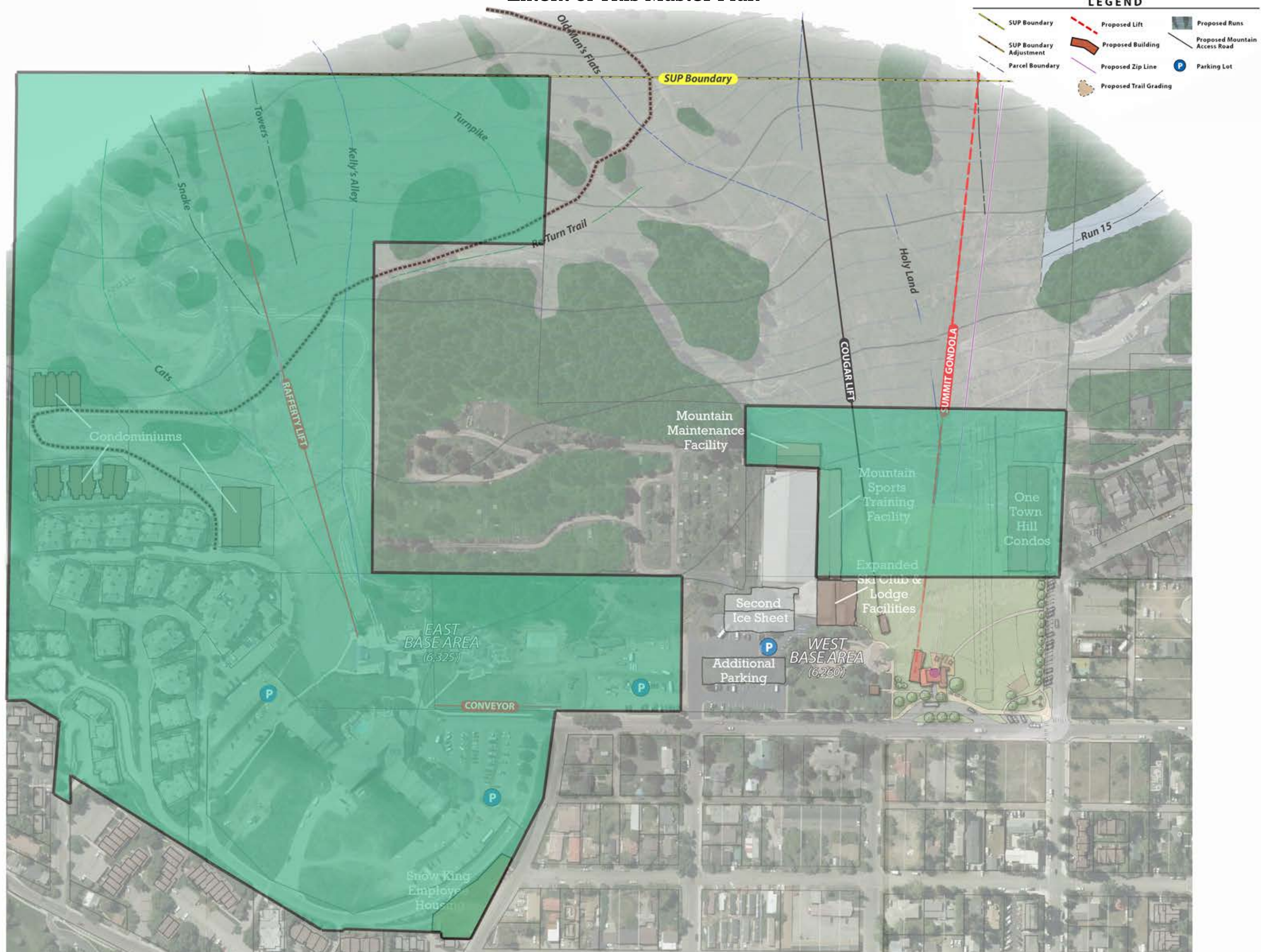
The "Extent of the Master Plan" excludes areas within the PRD that have been previously developed and exist as separate subdivisions. They include the Pitchfork, Grand Vista, Clark's Knoll and Remington Condominiums as well as the Stevens' project. The "guest (APO) count" allocated to these mostly existing developments (252) has been deducted from the maximum lodging capacity authorized in the District (2,460 guests), netting a maximum lodging capacity available for this Master Plan of 2,208 guests (APO).

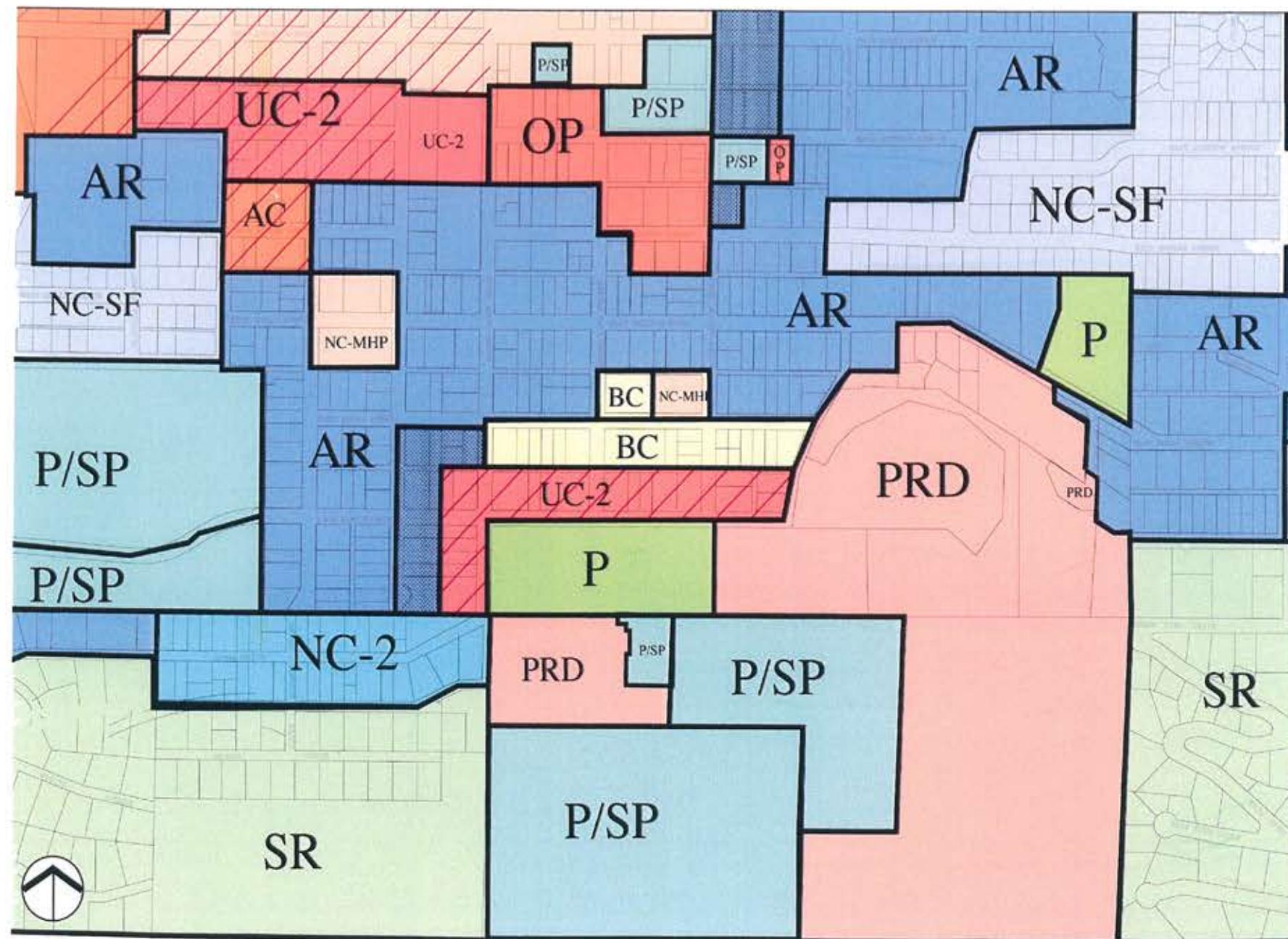
The next map in this chapter is the Land Ownership Map that indicates the mosaic of private owners, as well as US Forest Service and Town of Jackson parcels, which comprise the base of the resort.

All the owners within the Master Plan Area (Extent of Master Plan) have agreed to this submission and are presenting this Master Plan jointly. Property owners within the "Existing Condominiums Areas" are participating to a limited extent since most development on these parcels has already occurred. The "Statement Regarding Existing Condominiums" details the development permitted within the Existing Condominium Areas.

The Extent of this Master Plan is therefore limited to a 62.364-Acre area, all within the PRD district. This area has been divided, for presentation purposes, into 5 Sub-Areas defined in the "Sub-Area Plan". These Sub-Areas are used for presenting the Master Plan into better manageable components.

Extent of This Master Plan





D. Neighborhood Zoning Map

AC	Auto-Urban Commercial
AR	Auto-Urban Residential
BC	Business Conservation
NC-2	Neighborhood Conservation - Two Family
NC-MHP	Neighborhood Conservation - Mobile Home Park
NC-SF	Neighborhood Conservation - Single Family
OP	Office Professional
P	Public Park
P/SP	Public / Semi-Public
PRD	Planned Resort District
SR	Suburban Residential
PRD	Planned Resort District
SR	Suburban Residential
UC-2	Urban Commercial - Two

	Lodging Overlay
	Office Overlay



E. Existing Conditions Map

This Plan reflects the Snow King Resort Area as it is in its present state. Structures Include:

- The Snow King Resort Hotel
- The Grand View Lodge Conference Center
- The Snow King Sports and Event Center
- Grand View and Love Ridge Condos
- Rafferty Center

Major Site Features include:

- Snow King Ball Park
- Phil Baux Park
- Rafferty, Cougar, and Summit Ski Lifts
- Alpine Slide, Mountain Coaster
- Miniature Golf, and Maze



E. Existing Conditions Plus Approved Plan

This Plan reflects the existing Snow King Resort Area with the addition of the approved KM6 and Snow King Hotel Development. Included in the approved development are:

- Proposed buildings A-E of the Snow King Hotel.
- Proposed conference center, commercial development, and housing on the KM6 parcel.
- Pine Lodge development now known as One Town Hill condominiums.
- Storage facility behind ice rink.
- Mid-mountain lodge, accessory buildings, and pavillion.
- Condominium building 27 located on lot 58 above Grand View Condominiums.
- Mountain maintenance facility located on Vine Street.
- Cabins located on lots 53 and 57 above Grand View condominiums.

I. G. Extent of This Master Plan

The previous map, I.G., indicates the extent of area in the Snow King Planned Resort District area that is pursuant to this Master Plan. This map differs from the "Extent of the PRD" map, J.B., because it excludes the "Existing Condominium Areas" (Parcels 2- A, 2- B, 2-C, 2-D and 2-E). For planning purposes, the remaining 62.364 Acres has been subdivided into five Sub-Areas. These areas are described on page IV D., SUB-AREA PLAN. Extent of This Master Plan• Sub-Areas 1-5.

I. H. 2. Statement Regarding Existing Condominiums

The following projects, have a limited part in this Master Plan presentation:

- Pitchfork Townhomes
- Grand Vista Townhouses
- Remington Townhomes
- Stevens Property
- Clark's Knoll Townhouses

These projects encompass a total of approximately 4.85 acres and can accommodate a maximum of 252 guests. These 252 guests reduce the maximum lodging capacity remaining in the balance of the Snow King Planned Resort District to 2,208 (2,460 - 252 = 2,208). Legal descriptions of the parcels encompassing these projects are attached in the Addendum Section.

The Pitchfork, Clark's Knoll and Grand Vista projects were constructed from 1990 through 1996 and are expected to remain as they are regarding dimensional limitations, parking and impervious surfaces.

The Remington and Stevens properties are not completely built-out and have been assigned 20 and 24 guests respectively.

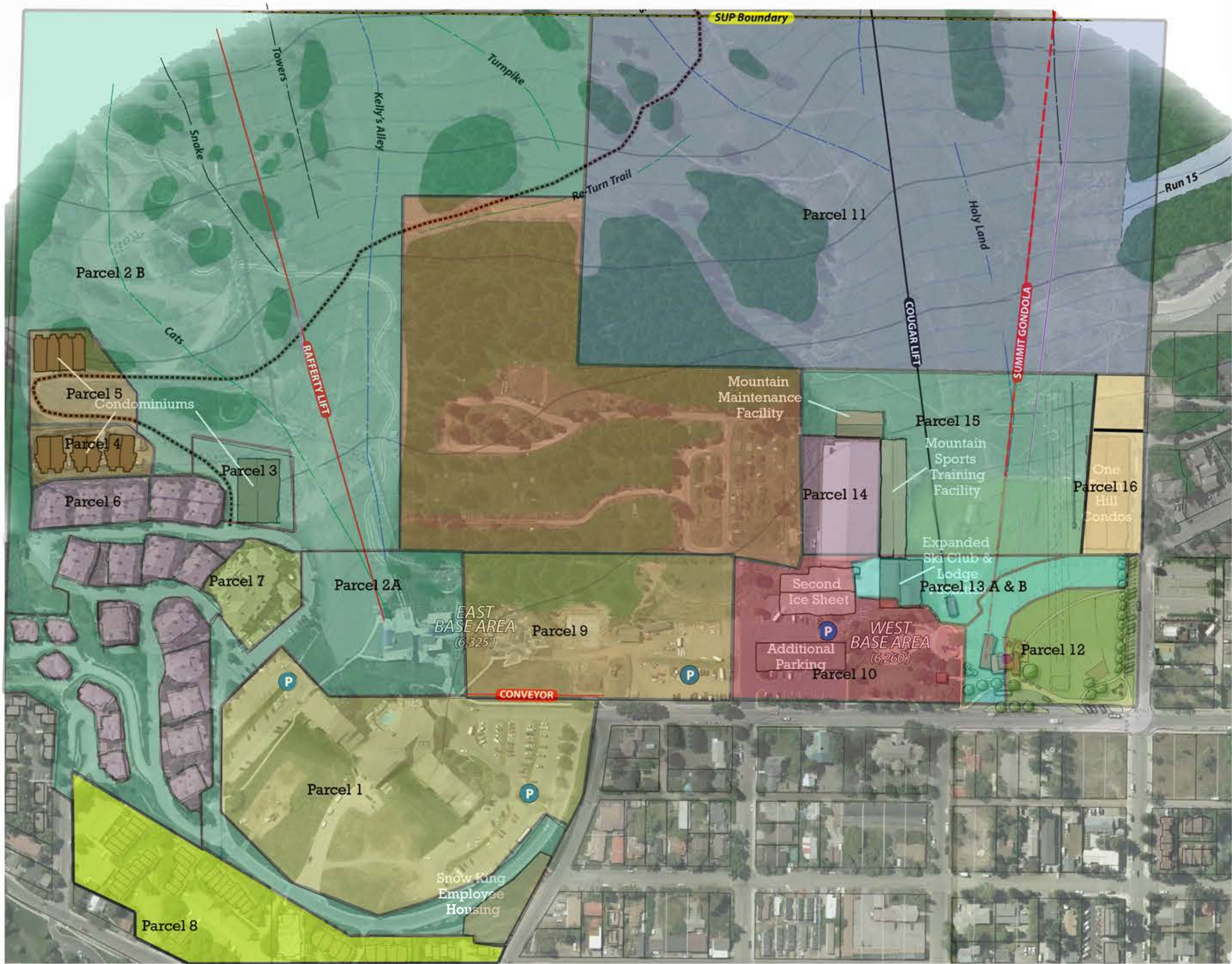
- Units within all these projects can be rented for short-term purposes.
- The Remington project is allowed a maximum 20 guests (APO's) and therefore is allowed to build an additional unit sized similarly to the 4 existing units.
- The Stevens lot is allowed a maximum of 24 guests (APO's) and 9600 SF of livable space.
- The Remington lot has been built with one employee unit and will remain so.
- The Stevens lot will need to provide its own employee unit or make an arrangement for compliance with the Housing Mitigation Plan for the Snow King Planned Resort District.
- Any redevelopment may not exceed these maximum Floor Areas

-Pitchfork	95,200 SF	-Grand Vista	6,800 SF
-Clark's Knoll	44,000 SF	-Stevens	9,600 SF
-Remington	9,400 SF		

and cannot exceed the # of guests assigned in the table *below*.

All applicable sections of the Town of Jackson Land Development Regulations, including but not limited to, parking, employee housing, landscape ratios, height restrictions and impervious surface ratios, apply to any redevelopment that may occur within these developments. The Town of Jackson under Section 2530 shall review all these properties after approval of this Master Plan.

	Pitchfork	Clark's Knoll	Grand Vista	Stevens	Remington	TOTALS
Condominium Units #	30	19	3	6	5	63
Doors#	48	19	3	12	10	92
Guests#	120	76	12	24	20	252
Site Area - Acres	2.8	1.3	0.2	0.28	0.27	4.85 Acres
Site Area - SF	122,000	56,400	8,700	12,300	12,000	211,400 SF
Parking Spaces - #	60	38	6	16	10	130
Employee Units - #				As needed	I (2Bdnn)	



I. Land Ownership

This map indicates the private and public land ownership in the Snow King Area. The Parcels owned by Snow King Mountain Resort LLC, JMIR Snow King LLC, KM6 LLC, CCC's Town Hill Lofts LLC, ABSK LLC, and privately owned condominiums pertain to this Master Plan. These parcels are:

JMIR Snow King LLC:

- Parcel 1 8.29 Acres
- Parcel 7 (Grand View Lodge Commercial)

Snow King Mountain Resort LLC:

- Parcel 2A & 2B 35.2 Acres
- Parcel 3 .83 Acres
- Parcel 15 5.2 Acres

KM6 LLC:

- Parcel 9 4.92 Acres

ABSK LLC:

- Parcels 4 & 5 1.89 Acres

CCC's Town Hill Lofts LLC:

- Parcel 16 1.3 Acres

Privately owned condos at Grand View, Love Ridge, and Simpson Patent:

- Parcel 6 4.73 Acres

Total Extent of this Master Plan 62.364 Acres

Legal description of these parcels can be found on the Teton County Map Server.

Other Parcels within the PRD:

Existing Condominium Areas:

- Parcel 8 4.85 Acres

See: Statement Regarding Existing Condominiums

Other Parcels presented here, although not part of this Master Plan:

Parcels owned by Town of Jackson under lease to Snow King Mountain Resort LLC

- Parcels 11, 13 A & B, and Parcel 12 in winter only
- Approximately 32 Acres.

USDA Forest Service Special Use Permit
 Issued to Snow King Mountain Resort LLC - 369.51 Acres

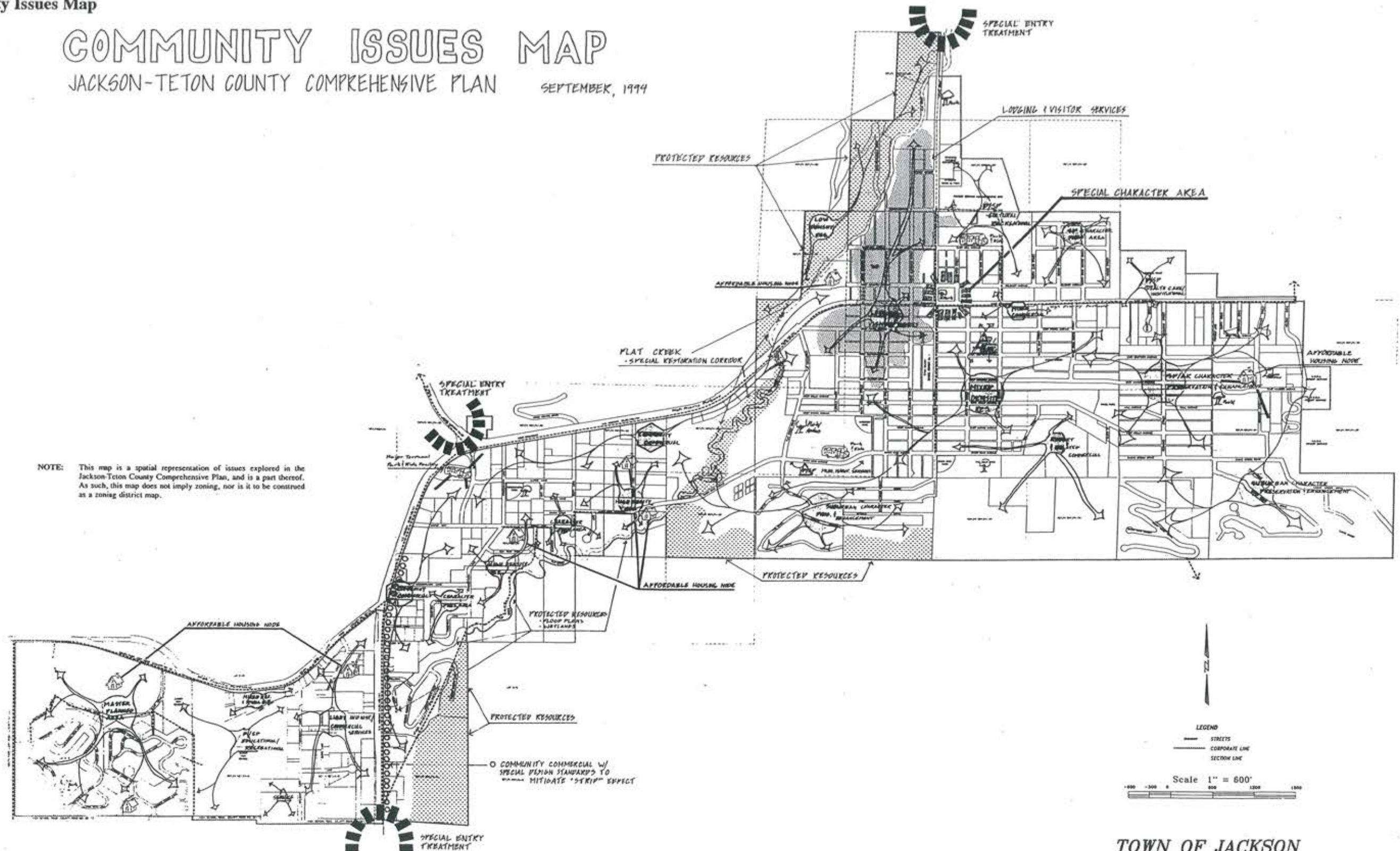
I. Community Issues Map

COMMUNITY ISSUES MAP

JACKSON-TETON COUNTY COMPREHENSIVE PLAN

SEPTEMBER, 1994

NOTE: This map is a spatial representation of issues explored in the Jackson-Teton County Comprehensive Plan, and is a part thereof. As such, this map does not imply zoning, nor is it to be construed as a zoning district map.



TOWN OF JACKSON
TETON COUNTY, WYOMING

COMMUNITY ISSUES MAP

Trail Improvement Program
Snowking/ Cache Creek

(see Scoping Document of May 12, 1998 by Jackson
Ranger District, Bridger-Teton NF)

1"=1200'

ORTHO PHOTO
USGS-1976

TOPOGRAPHY
NELSON
ENGINEERING
HORIZONS FILE
4-1853

Prepared:
August 18, 1998



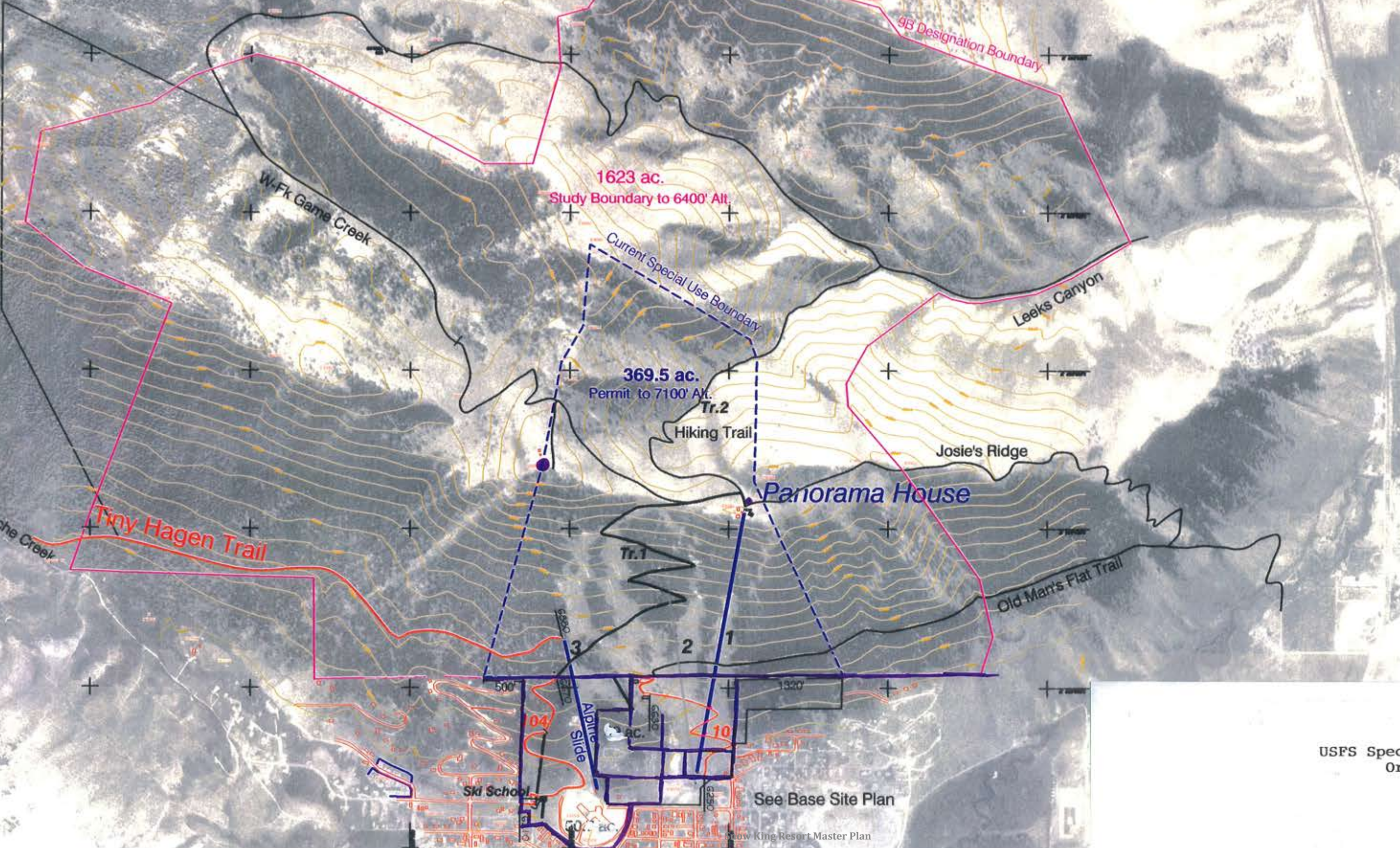
Salt Lake City, Utah

SUMMER
USE,
MOUNTAIN

Snow King
Resort

Box SKI
Jackson Hole
WY. 83001

USFS Special Use Permit Area
Ortho Photo





7808 Ft

panorama house

BEAR CAT

BEAR CAT GLADES

UPPER EXHIBITION

EXHIBITION

SUMMIT CHAIRLIFT

HOLY LAND

COUGAR TRIPLE CHAIRLIFT

JUMP RUN

LODGE ROOM
SKATING RINK

PHILBAUX PARK

KING TUBES

RAFFERTY CENTER
MOUNTAIN SPORTS CENTER
KINGS GRILL
COWBOY CORRAL

snow king mountain sports

MAGIC CAPER

FLYING SQUIRREL

EAST'S CHUTE

WEST'S CHUTE

BELLY ROLL

SLOW GRAIL

GRIZZLY

ELK

SLOW GRAIL

LOWER GRIZZLY

LOWER ELK

OLD MAN'S FLATS

KAREN'S WAY

UPPER KELLY'S

DOWERS

SNAKE RIVER RUN

SLOW GRAIL

GUANAPIKE

RE-GUARD GRAIL

KELLY'S ALLEY

CATS GRAIL

CATS

VistaMap

- LEGEND**
- | | | | | | |
|---|-------------------------|---|------------------------|---|-------------------------------|
|  | SUP Boundary |  | Existing Run |  | Proposed Tree Skiing Terrain |
|  | SUP Boundary Adjustment |  | Ski Patrol |  | Proposed Runs |
|  | Parcel Boundary |  | Parking Lot |  | Proposed Mountain Access Road |
|  | Existing Building |  | Mountain Coaster |  | Upgraded Ski Patrol Facility |
|  | Proposed Lift |  | Proposed Zip Line |  | Proposed Maintenance Facility |
|  | Proposed Building |  | Proposed Trail Grading |  | Proposed Wedding Venue |



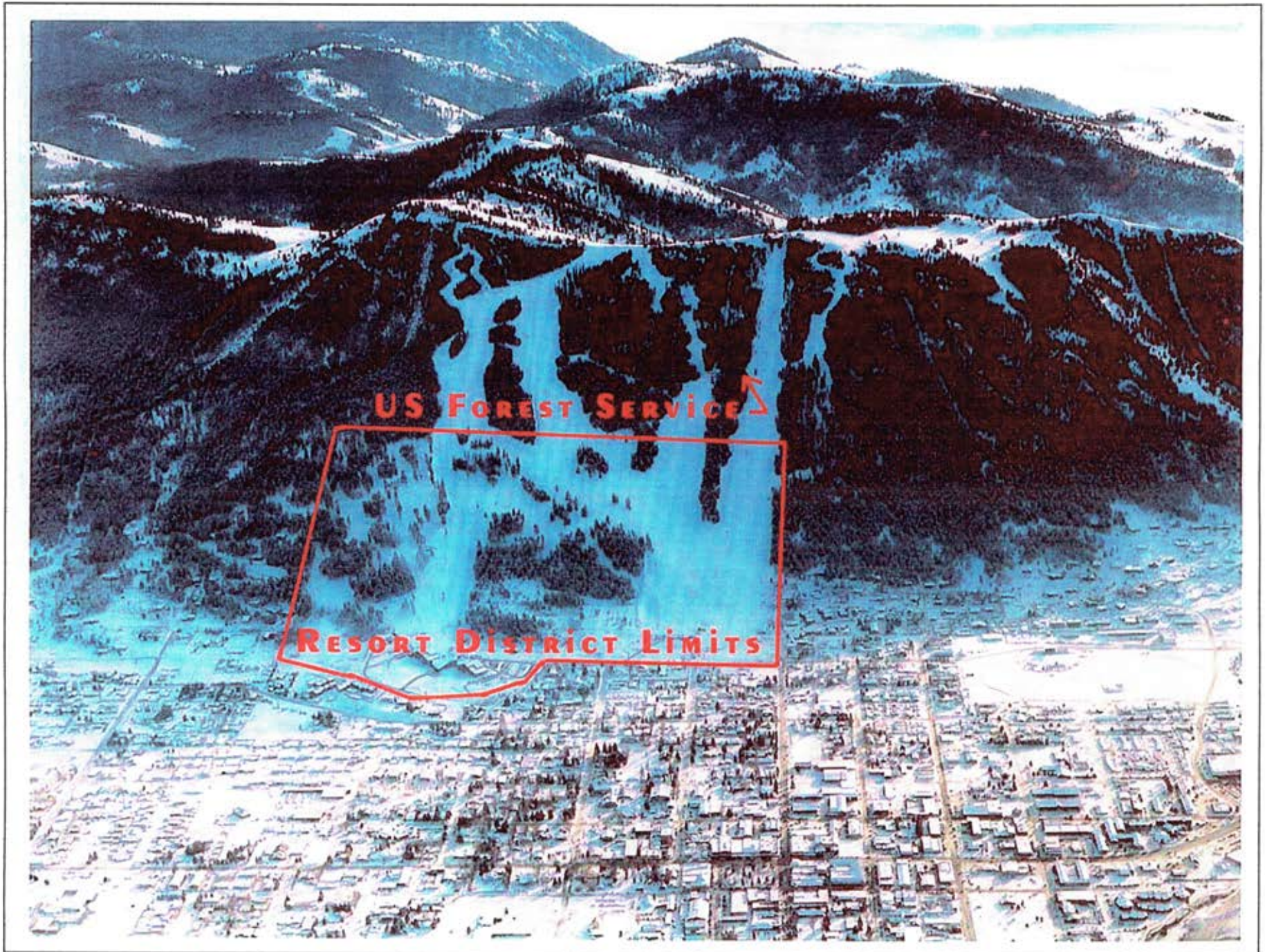
Contour Interval = 25 Feet

0 300 600 1200 Feet

North

Prepared by:

SE GROUP



II. CONSISTENT WITH COMPREHENSIVE PLAN

This Master Plan is designed to help realize the vision statement and to reflect the guiding principles adopted by Teton County and the Town of Jackson as part of the Comprehensive Plan, and is consistent with the Comprehensive Plan as a whole and specifically addresses goals and objectives in every Chapter of the Plan. In addition to the statements in this Chapter, other submittal components further articulate the relationships between the Snow King Master Plan and various community goals.

The Snow King Resort is indicated on the Community Issues Map as having a unique role serving both the residents of the community and the visitor-based economy of the valley. The Resort is intended to be a "Community Resort" with unique access to residents. This access is exemplified by the pathway and trail system, which is the integral fabric of the Resort.

It should also be noted that the Comprehensive Plan preceded the adoption of Division 2500 of the Land Development Regulations referring to Snow King. Therefore, Division 2500 already incorporates, within its body, most pertinent issues concerning the Comprehensive Plan. Various impacts were addressed in economic, planning and other studies that were part of the process of adopting the Snow King Planned Resort District Ordinance.

Three important community character goals specially relate to Snow King: maintaining social and economic diversity, maintaining a balance between visitation and the community and to enhance this economic center through redevelopment. The proposed plan will maintain and enhance the social and economic diversity by offering a variety of potential uses internally within the resort. New commercial, office and retail space in addition to improvements in guest facilities such as rooms, condominiums and conference areas will provide a balance of services for both guests and residents.

This proposed development is intended to help the Town of Jackson realize the vision statement in the Comprehensive Plan (pages 1-6 and 1-7), as follows:

"It is the vision of the citizens, planners and elected officials, who havee all contributed to this plan, to guide and manage change and development to:

- ***Support and promote a diverse social and economic population that includes a resident work force:***

Snow King Resort currently employs over 260 persons in a variety of professional levels most of them on a year-round basis and expects to continue this pattern in its expansion. Snow King is among the top five year-round employers in Teton County. The proposed housing plan will assist us in housing more of our employees in Town. The conference facilities assist in attaining a stable year-round work force.

- ***Preserve the traditions and character of the Rocky Mountain West and Wyoming, including ranching and through architectural design;***

The design of the proposed development will help to preserve the traditional character of the region, both architecturally and functionally. The traditional character of Jackson Hole is the outcome of blending outdoor recreation, visitor services and community life and is expressed not only through architecture and appearance, but also through its functions. Snow King has proven for over 60 years our commitment to the community.

- ***Promote economic sustenance that does not depend on population growth;***

Sustainable, sensitive tourism, concentrated in already-developed areas, designed with the landscape and outdoors in mind, benefits this community economically and functionally. This proposed development aims to continue and enhance this kind of low-impact tourism.

- ***Set aside, for generations to come, scenic vistas and wildlife habitat;***

Unlike other resort development in Teton County, Snow King takes advantage of all the infrastructure and commercial development in the downtown core. It concentrates visitor impacts in the downtown core and invites them to "step outside" and enjoy our natural resources. Snow King has a proven track record of harmonious relationship with the U.S. Forest Service. This Master Plan provides generous areas of meaningful open space.

- ***Maintain and enhance environmental quality, including air and water quality;***

All new buildings will make use of technologies that help enhance environmental quality, and be connected to the existing Town of Jackson utility network. The Snow King Resort Master Association will assist in controlling air and water quality. The resort already has a strong recycling program that will continue and be expanded.

- ***Maintain outdoor recreation and adventure opportunities;***

This proposed development provides varied outdoor recreational opportunities as part of the downtown experience. Enabling both locals and visitors to ski, skate and hike right in town, minutes from the Town Square, is one of Snow King's primary contributions to the community. Outdoor recreation at Snow King will be enhanced by this proposed development and access to the mountain through private lands preserved.

- ***Offer a spectrum of housing types, especially for resident workers.***

This proposed development meets the Town's employee housing requirement, with the overwhelming majority being provided within the limits of the Town, as an integral part of the Town and the town's housing stock.

The guiding principles adopted in the Comprehensive Plan (pages 1 - 7 and 1-8), state that "*Teton County is a community first and a resort second*" and "*it is the intent of this Plan to create conditions for a sustainable visitor-based economy...that reflects the unique, small-town, Western commercial character of Jackson, and the outdoor recreational opportunities of Teton County as key components of the visitor experience.*" Snow King Resort is shown on the Community Issues Map as having a unique role serving both residents and visitors because of its location and history. This proposed development would make a crucial contribution to the long-term sustainability of the downtown, visitor-based economy.

In reference to Chapter 2 of the Comprehensive Plan (Population, Economy and Growth), this proposed project directly serves two goals stated on page 2-1. It will "*enhance visitor services that emphasize the area's unique outdoor attributes*" by providing a conference center that opens to the mountains as well as through its use of outdoor recreational spaces and pedestrian circulation and plazas. The Master Plan also "*defines the future boundaries of growth necessary to preserve community character.*"

This project contributes directly to maintaining community character in three ways.

- It will help to maintain social and economic diversity both by providing a range of employment opportunities and through an exceptionally strong employee-housing program. The project also enhances the social and economic diversity within the resort itself by greatly expanding the mix of uses for both visitors and residents.

- It will help to maintain a balance between visitation and community life by serving these two functions within a single facility. The conference facilities are intended to be used by visitors and residents alike, as they are now.

- This project will also help to maintain community character through redevelopment and improvements of the existing economic center at Snow King. Snow King is the largest lodging facility and resort in the Town of Jackson and currently plays a key role in the area's economy.

In Chapter 3 (Community Character), it is noted that part of the process of maintaining community

character is through providing for a style of tourism that highlights regional differences and unique characteristics. *A recent study stated that "it is a joy to encounter places that preserve, enhance and celebrate those things that set them apart and give them a meaning and personality all their own."* (Page 3-1) Snow King's role is an interface between the town center and the mountain and combines the use of its facilities by residents and visitors alike. This integration sets Snow King apart and gives it its own personality. The seamless transition from Town to Resort is emphasized in this Master Plan.

In Chapter 4 (Natural and Scenic Resources), this project addresses three objectives (pages 4-7 and 4-8).

- It will *"improve the visual quality of existing development"*. Visual quality is addressed throughout this Master Plan and buildings are carefully placed to minimize visual impacts. A visual impact study is part of this Master Plan.
- It will help to *"preserve open space"* by providing for ample open space as part of the site plan design.
- It will help to *"provide and manage access to natural resource areas in a manner consistent with natural resource protection goals"* through a network of trails which improve access as well as concentrate other uses in specific, already-impacted areas.

Regarding Chapter 5 (Housing), this project will *provide a variety of affordable and employee housing as the resort continues to develop*, as called for in the Town's housing goals shown on pages 5-6 and 5-7. Because of stable year-round employment, this development also helps the resort's workforce afford available housing. The Housing element proposes housing both within the PRD and in other locations in the Town of Jackson. It also proposes a variety of housing types to meet the needs of different levels of employees. Snow King is proud of the broad spectrum of employment opportunities it offers and intends to support this spectrum with appropriate housing.

In Chapter 6 (Commercial and Resort Development), tourism and related services are recognized as the economic base of the community. The conference center is a key component of this sector. The Comprehensive Plan also calls for *avoiding strip development and encouraging outdoor-oriented tourism*. With the ski hill, hiking and biking trails, skating and other outdoor amenities located near the center of town, this proposed development addresses both of these goals. An additional plus is the ready accessibility to the community of our resort facilities. The proposed development also fulfills the goal of creating a full-service conference /convention center and provides a stabilizing year-round foundation to our seasonal economy.

In Chapter 7 (Community Facilities), this Master Plan will enable us to *collaboratively anticipate community facility needs*, a primary goal (page 7-19). It also helps locate demand for community infrastructure in an appropriate location.

In regards to Chapter 8 (Transportation), the Comprehensive Plan calls for *transportation planning, which helps to preserve and enhance community character*. The location of a conference center within walking distance of downtown, helps to minimize traffic demands. The transportation element of this Master Plan takes into consideration transit, pathways, traffic impacts, parking and airport capacities.

The recurring theme of this chapter is balance: seeking a balance between what the resort gives to the community in terms of jobs, tax revenue, meeting space, and recreation and, in turn, what the resort requires in terms of water, sewer, mass transit and employee housing. The theme of balance also relates to the scale and character of the development and how well it fits into the fabric of the community and the landscape. As mentioned in the Statement of Purpose, this proposed development is an excellent example of balance.

In all of these ways, and many others, the proposed Master Plan is consistent with the Comprehensive Plan and helps to meet its community goals.

II. COMPLIANCE WITH LAND DEVELOPMENT REGULATIONS

All the lands within this Master Plan are zoned "Planned Resort District" in the Official Zoning District Map, and all development is governed by Division 2500, Planned Resort District, of the Town of Jackson's Land Development Regulations. This Division specifies the purpose, intent procedures and standards applying to such developments and guides all aspects for this Master Plan. This Master Plan is fully consistent with the regulations in Division 2500.

The Master Site Plan utilizes and complies with the intensity of use and performance-based thresholds established in Section 2550 M of the regulations. The land under this Master Plan will be used as a mixed-use district designed in such a manner as to preserve open space by concentrating development only in specific portions of the district, and allocating access routes to the national Forest and to pathways that connect the East and West sides of the Town.

This document, as a whole, responds and complies with all the sections of the zoning and development regulations relevant to Snow King. Even when compared with other zoning Districts, the proposed Landscape Surface Ratio (.50 for the total of Sub-Areas 1, 2, 4, 5 and 6 and .30 for the area within Sub-Areas 1, 2 and 4) and Floor Area Ratio (.40 for the total of Sub-Areas 1, 2, 4, 5 and 6 and .60 for the area within Sub-Areas 1, 2, and 4) compare favorably even with those for residential areas and with the requirements of Division 2500.

As specifically stated in Section 2550.B, *"it is fully consistent with the Division that Planned Resorts may have dimensional, design and other development standards different from those described in other Sections of these LDR's due to the unique circumstances of, and community objectives for, resort development."* This Master Plan presents its own Dimensional Limitation Plan in accordance with Section 2550. E, that takes into account the specific topography and location of the lands encompassed in this Master Plan.

The Dimensional Limitation Plan explains its rationale and establishes vertical and horizontal dimensional limitations that are a product of the existing built environment and the topographical context of this site. Floor areas are necessarily large to insure Snow King's position as the largest conference facility in the valley. These aspects of the built environment are tempered by a three-dimensional building envelope system specific to all the high use areas. The types of allowable uses are many and varied to insure community needs, diversity, synergy and increased economic viability. These uses are consistent with a high-intensity resort development node tucked against the base of Snow King Mountain.

The following is a summary of how this Master Plan meets the requirements of each section of Division 2500 and the required findings for approval.

SECTION 2150 PURPOSE AND INTENT

Section 2150 of the Town of Jackson Land Development Regulations defines the Planned Resort District Zoning District as follows:

"Planned resort (PR) District. The purpose of the Planned Resort (PR) is to provide for a mix of recreational, retail and service-oriented activities, which has a high degree of self-containment and provides economic and other benefits to the community. Typical uses include, but not limited to, ski slopes and associated facilities, lodging, conventions facilities, retail and restaurants."

The Snow King Resort Master Plan is responsive to every objective of Division 2500. As the largest convention facility and resort in the Town of Jackson, and encompassing a large contiguous undeveloped land located between Town and forest, the proposed development represents perhaps the only opportunity available to the Town to meet these objectives. The goals of this Master Plan and the purposes of these regulations are closely matched. The purposes of these regulations are stated as to:

A. Encourage recreational activities that rely on indigenous natural attributes of the area, contribute to the community's character and economy and have had a long-standing beneficial role in the community;

Snow King Resort blends conference facilities and other visitor services with varied year-round recreation on the mountain, including skiing, skating, tubing, hiking, biking, horseback riding, activities for children and a summer chairlift and alpine slide. Snow King has evolved as an important part of Jackson's community character because of the way it functions, as a gathering place for both residents and visitors. The existing conference and hotel facilities have benefited Jackson Hole residents and visitors since 1976, while the ski hill and other mountain recreation uses represent a tradition going back to 1939.

B. Provide flexibility for planning and developing recreational resort facilities in a creative, efficient and coordinated manner in order to provide quality visitor experiences;

The proposed development has been planned within the context of the entire downtown area and is coordinated with plans for the Multi-Agency Campus and the Community Center for the Arts to contribute to an animated, viable and vibrant downtown. Snow King's development encourages a concentration of services in the downtown area, leading to more pedestrian activity and efficient corridor use that will bring people to the Town Square. Snow King is an integral part of a holistic downtown vision, and the proposed convention facilities will be the mainstay of a year-round downtown economy.

C. Create a process in which applicants, Teton County and the Town of Jackson collaborate with landowners in planning and designing resort master plans that meet community goals and respond to the unique circumstances of the resort area;

This Master Plan is another step in a long-standing pattern of collaboration and partnership between Snow King and the Town of Jackson, which includes the joint development of Snow King Center and many aspects of the ski operation including snowmaking water and land leases. All the landowners within the more than 62 Acres extent of this Master Plan are acting in unison.

D. Permit resort development that contributes to the winter and shoulder economic seasons; Convention facilities are key because they attract year-round use. Currently our meetings and convention business provide us with a better off-season occupancy than the Teton County average. With the proposed development, we will be able to accommodate a much broader variety of meetings, and as a result, expect a better spring and fall occupancy rate.

E. Ensure that resort plans incorporate a mix of land uses, promote alternative modes of transportation, and provide a pedestrian-oriented community in order to alleviate traffic-related impacts;

As expressed in various Chapters of this Master Plan, non-motorized pathways are the backbone of this mixed -use resort. In addition to the obvious benefits of providing convention facilities in the immediate downtown area with pedestrian and shuttle access to all the Town Square Businesses Snow King also provides pedestrian access to the mountain. Many people take advantage of Snow King's trails and recreational facilities to enjoy the outdoors without leaving town. Snow King's unique mix of land uses helps ease transportation demands in various ways. This Master Plan includes all the required components of a transportation element and proposes a transportation plan that will serve the goals adopted in the Town's Transportation Plan. Snow King will be an integral part of a multi-modal downtown transportation system. In addition, Snow King's trails and pathways will add a valuable amenity above and beyond what is required by the regulations.

F. Ensure resort plans are consistent with the Comprehensive Plan, and therefore, are beneficial to the community;

Consistency with the Comprehensive Plan is discussed in detail in another Chapter.

G. Enable long-range planning for infrastructure, capital facilities, and community land use patterns by establishing a level of predictability in the maximum potential size and character of each resort area,

This Master Plan establishes maximum development potential in keeping with the maximum established in Division 2500, and provides the framework for collaboration in the provision of infrastructure needed for a successful development.

H. Ensure a balance is maintained between tourism and community that promotes social diversity but does not cause undesired shifts away from rural, western community character;

Snow King's development is a continuation of a pattern of use, which is already well established for our property. This development will maintain the existing balance between visitor and resident use of the facilities and bring much-enhanced benefits to the community as a whole. We cannot claim that it will not contribute to the shift away from rural character, but this shift is a consequence of other factors as well. No doubt each discreet development small or large, contributes to this change. Although some portions of the site will be developed in an urban manner, over half of the land is dedicated to open recreational space.

I. Produce resort plans that make significant contributions toward protecting attributes of the community that are considered critical to the community's long-term health, welfare and well- being;

The proposed convention facilities will make a significant contribution toward a sustainable economy for the Town of Jackson, as documented in prior studies. The Resort as a whole will make a large contribution to the economic health of the downtown area. The proposed employee-housing element will make a significant contribution to the housing stock for working people in the downtown area. The proposed recreational development will benefit the entire community and existing recreational uses will be maintained. The design will be a visual enhancement of the mountain base area.

SECTION 2520 APPLICABILITY

Snow King Resort is specifically named.

SECTION 2530 PROCEDURE

This Master Plan is in compliance with the procedures outlined in Section 2530.

Section 2530 A3 I. and 2. Require the following submittal components:

- (a) *Statement of Purpose*
- (b) *Master Site Plan*
- (c) *Dimensional Limitation Plan*
- (d) *Design Guidelines*
- (e) *Transportation Demand Management Plan*
- (f) *Housing Mitigation Plan*
- (g) *Capital Improvements Plan*
- (h) *Land Use Plan*
- (i) *Phasing Plan*
- (j) *Community Services Element*

The Chapters of this Master Plan are organized, as much as possible, in response to this requirement.

SECTION 2550 STANDARDS APPLYING TO ALL PLANNED RESORTS

This Master Plan application is complete as per Section 2550 requirements. Each section of this Master Plan explains how it intends to meet the standards for various components and elements set forth in Section 2550.

SECTION 2550 (M) (3) STANDARDS SPECIFIC TO SNOW KING RESORT

These standards fall into six categories:

- a. *Character and design*
- b. *Capacity*
- c. *Land use*
- d. *Landscape surface area*
- e. *Environmental analysis*
- f. *Relationship to Town Square*

Regarding (a) character and design, this is discussed in detail under "Design Guidelines", Chapter VI of this Master Plan. The proposed development meets and exceeds every one of the specific design standards for Snow King. Although some of the buildings are necessarily large, the scale needs to be considered in the whole context of the goals and objectives of this Planned Resort District.

Regarding (e) environmental analysis, the site does not contain any wetlands and does not interfere in wildlife migration routes. Environmental and hazardous materials assessments have been conducted and no underground storage tanks are located in any of the parcels under consideration. Soils analysis has included studies of the maps prepared by Dr. Love and Harry Covington pertaining to steepness of slopes, ground stability, geologic maps, loamy soils and snow slides possibilities. In addition, visual inspections have been conducted with Dr. Love and results of soil test borings, pits and actual foundation excavations have been analyzed.

All structures in this Master Plan are located in appropriate and stable soil areas. Some of the small

structures located within the steeper slopes of Sub- Area 4 are located on soils that will require engineered foundations. Visual impacts are discussed in detail in various chapters of this Master Plan.

As an operating business, consideration has also been given to operational efficiency and the wise use of resources. Snow King presently follows, and will continue to adhere to, OSHA, DEQ, EPA, ADA and BATF regulations regarding the storage, handling and disposal of dangerous materials as well as other employee and guest related requirements. Impacts are also minimized through the use of management guidelines, such as the National Ski Area Association's Environmental Principles for Ski Areas.

Regarding (f) relationship to Town Square, the transportation element of this Plan describes components, which encourage non-motorized access and public transit access to the Town Square.

Other various aspects are presented in written or graphic form throughout this Master Plan.

SECTION 2560 FINDINGS FOR APPROVAL

This Master Plan positively responds to and meets or exceeds all the findings for approval described in Section 2560:

- A. *Consistency with Comprehensive Plan. The Planned Resort master plan is consistent with the goals and objectives of the Jackson/Teton county Comprehensive Plan.*
- B. *Consistency with purpose and intent. The Planned Resort master plan is substantially consistent with the purpose and intent of this Division, as set forth in Section 2510, Purpose and Intent.*
- C. *Affordable and employee housing. The Planned Resort master plan ensures a supply of affordable and employee housing that is in accordance with the requirements for housing created by development within the Planned Resort.*
- D. *Design guidelines. The Planned Resort master plan contains design guidelines that*
 - 1. *Establish standards for buildings, spaces, signs and lighting within the Planned Resort*
 - 2. *Promote the design concepts set forth in Section 2550.G, Design element; and*
 - 3. *Establish a method for consistent implementation of the guidelines.*
- E. *Transportation element. The Planned Resort master plan contains a traffic impact analysis and transportation demand management plan that:*
 - 1. *Promote multimodal forms of transportation that are consistent with the transportation goals of Jackson /Teton County Comprehensive Plan;*
 - 2. *Manage the generation of resort related traffic to avoid undermining community character and endangering the public health, safety and welfare; and,*
 - 3. *Identify an equitable cost sharing plan for transportation facilities and services*
- F. *Capital improvements plan. The Planned Resort master plan contains a capital improvements plan that ensures infrastructure and essential services will be provided in an efficient and timely manner to accommodate projected resort demands.*

G. Land use element. The Planned Resort master plan promotes land uses that support and maintain the character of the resort as specified in Section 2550.M, Character Element.

H. Phasing plan. The Planned Resort master plan contains a phasing plan.

I. Character element. The Planned Resort master plan ensures the resort 's development will be in keeping with the community's goals.

This Master Plan is consistent with the Comprehensive Plan and the purpose and intent of all these regulations. In the following chapters, the introduction for each chapter specifies how this Master Plan meets the requirements for affordable and employee housing, design, transportation capital improvements, land use and phasing. We believe that this Master Plan meets and exceeds the standards for each of these elements.

The final finding required for approval is that the Master Plan "ensures the resort's development will be in keeping with the community's character and the planned character for the vicinity of the resort." This issue is addressed in the Statement of Purpose.

Among the many features of this Master Plan is that it meets the present and future needs of the Town of Jackson by enhancing an already-existing pattern of use. By expanding Snow King's capacity, the Town of Jackson can attain several desired goals with minimum impact. The impacts that are anticipated are generally compatible with the resort' s vicinity UC-2 zoning.

A particular and unique strength of this Master Plan is its conformance to the Community Services standards (Section 2550, which call for the Resort to function as *"integral parts of the community by participating in civic initiatives and by implementing the goals of the community."* These standards encourage *"programs designed to retain access to the resort's main recreational activity and facilities, ... help to maintain a balance between out-of-town visitors and the community, and contribute to the quality of life of the community."* As a community partner for over 60 years, Snow King is proud of its close relationship with the community. The various Chapters of this Master Plan clearly address all of the impacts and the rationale o f the proposed development in a cooperative spirit with the community.

Issues of building height are considered in the Dimensional Limitations Chapter.

It must be noted that goals such as creating a sense of arrival, a dense development oriented towards pedestrian circulation, creating meaningful open spaces and activity areas, proximity to parking, incorporating employee housing and in general creating a vibrant mixed-use district necessitates higher buildings than in other zoning districts. The topography of the site clearly helps in blending larger buildings into the mountains. The Dimensional Limitations and Design Guidelines Chapters expand on this topic and also compare future buildings with the existing hotel and Snow King Center. When taken together, a balance is reached that achieves the stated goals and objectives of this Master Plan.

Regarding (b) capacity, the maximum lodging capacity of 2,460 guests and the maximum building square footage of 915,000 SF are to remain in adherence to the intensity of use established in Section 2550 M.3.b. as amended.

This appropriate capacity and size of the resort was discussed in detail during the process of adoption of Division 2500. Independent studies conducted by the Town and County took into consideration

not only the site characteristics of each resort, but the inter-relationship between Snow King and other resorts, mainly Teton Village. The size of private land parcels, floor area ratios, landscape surface ratios and other specific site factors were also considered in the process. The size of the resort was also determined to be appropriate in relation to the conference/convention facilities desired by the community and the need to make this conference center financially feasible.

These and other aspects were factors determining the optimum size of the Snow King District Planned Resort and these results were incorporated into Division 2500 of the Land Development Regulations.

When fully developed, Snow King Resort's goal is to have the best-equipped conference facility in the State of Wyoming. As proposed these facilities will be highly flexible, much more pleasant than most urban conference centers and will be visually and functionally connected to the surrounding landscape with ready access to the outdoors. When enhanced by Jackson's allure as an exciting destination, this facility will have the potential to attract meetings from all around the region as well as from the highly competitive national market. The objective will be to accommodate conferences for 100 to 300 participants with sufficient space for breakout rooms and to accommodate concurrent groups and functions. This scale is compatible with our community's transportation systems and other commercial infrastructure.

Additionally, Snow King hosts many conferences that use other lodging facilities in town. As their enrollment and programming needs expand, more conference and exhibit space are required to accommodate these town-wide meetings. These meetings provide a stable, low-impact base for the visitor services sector of our economy and, as envisioned in these regulations, contribute to other long-term community goals.

In this context, it is important to note the purpose of this Master Plan is to define maximum build-out for Snow King Resort. This proposal represents the complete facility that will be available to Jackson and these facilities will be developed in phases, over a period of time. As time passes space requirements for individual uses change, while the overall caps remain in place.

Regarding (c) land use, the standard calls for convention facilities capable of competing successfully in the *"year-round convention market."*

Regarding proposed commercial development, the health club, daycare and ski school are all integral parts of a full-service facility and will benefit the lodging guests and other community needs. New food and beverage facilities are proposed in addition to the existing restaurant and kitchens, as well as unassigned commercial space for neighborhood convenience business and for on-site guest services. The proposed movie theatres will be able to be used for conferences during the day and attract visitors to invigorate the pedestrian plaza at other times.

Regarding (d) landscape surface area, the standard calls for a minimum LSR of .25 within developed areas of the Resort. This Master Plan provides a higher minimum LSR of .30 within these developed Sub-Areas. As called for in this standard, the Plan also provides an attractive streetscape along Snow King Avenue, a porous edge and high quality outdoor public space for events and interaction. The goal is to achieve a festival marketplace atmosphere for the plaza area by combining the multiple functions of conference center, commercial space, food and beverage service and open space. The creative mix of businesses and functions will be the key to success.

IV. A. Introduction to Site Plans

The Master Site Plan on the following pages is a refined product of the Conceptual Master Plan submitted in 1995 during the Planned Resort District presentations that were the basis of the PRD ordinance. While slight variations occur, the foundations of the proposed Master Plan are based on the attached Concept Plan and is consistent with prior presentations and masterplans dating back to 1973.

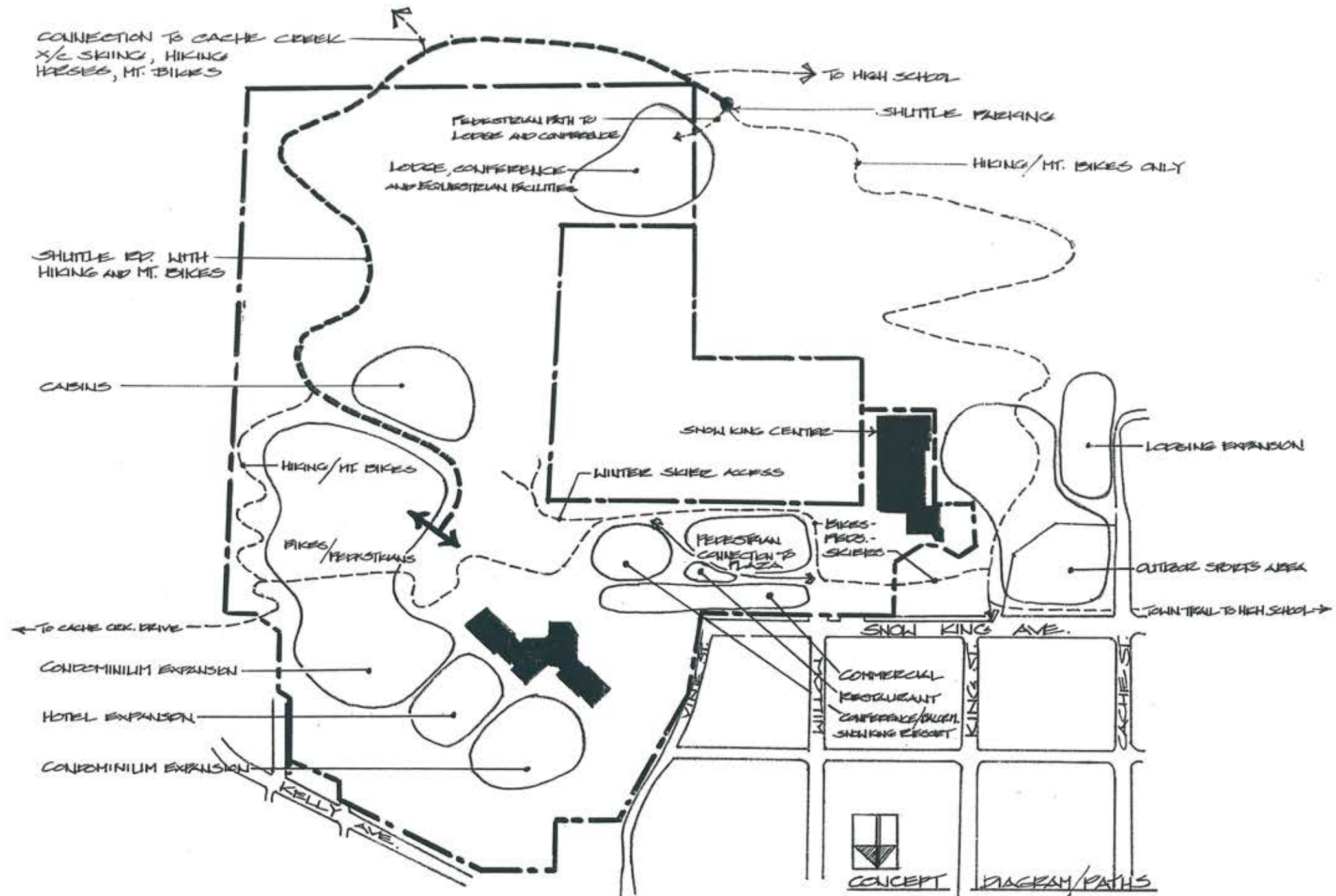
The large contiguous undeveloped land holdings being considered in this Master Plan afford a great opportunity in designing a successful project. Careful consideration has been given to its topography, vegetation, and location. Hiking trails, wind, soils, vehicular, pedestrian and services access, orientation, light and other aspects of the site have been inventoried and considered. This plan is the result of many years of careful thought and studies.

The backbone of This Master Plan is the pedestrian circulation routes connecting Town to Forest lands and the various functions of the Resort. Pedestrian and vehicular circulation is separated as much as possible and East/West and North/South pedestrian/bike connectors are of primary importance. Two primary hiking, riding and bike trails cut across the face of Snow King providing summer shuttle access to the mid-mountain area and additional opportunities for hikers and mountain bikers. The KM6 area (Sub-Area 2) fully develops the pedestrian plaza with connections to Willow Street and the downtown area of Jackson, as well being the nexus of the East/West pedestrian/bike trail network.

This Master Plan places various functions in the most appropriate location and within reasonable walking distances of one another. Dense lodging and conference facilities are located in close proximity to allow conference participants mostly interior circulation. At the same time, priority is given to convenient access to the outdoors from lodging and conference areas, as well as to the availability of natural light to most meeting rooms. The Conference Center is centrally located in close proximity to parking, porte cochere, lodging, underground services and within walking distance to the existing hotel meeting rooms and the Snow King Center.

Building envelopes are a result of their relationship to many aspects, but most importantly indoor and outdoor pedestrian circulation, proximity and access to recreation/assembly areas and intended to create meaningful outdoor spaces. Other Chapters of this Master Plan discuss the rationale for the many aspects of the proposed development. The resulting design accomplishes the goals and objectives of this master plan in a manner complimentary to its location and site characteristics.

This Chapter presents graphic information about the proposed development after build-out. Two separate maps present the proposed Site Plan. The Summer Master Plan depicts the proposed development with both existing and approved features, as they would appear during the summer season. The Winter Master Plan does the same for the winter season. The importance of pedestrian circulation is better portrayed in these two separate maps and in the Transit Routes, Trails, Pathways and Sidewalks plans. The Snow King trail map puts the Master Plan into the larger context of the Snow King massif. The Sub-Area plan sub-divides the total area of this Master Plan into smaller sections for purposes of clarity and ease of analysis.





C. Proposed Master Plan

The proposed Summer / Winter Master Plan depicts the proposed development along with existing and approved features. Proposed site development features include:

Love Ridge / Grand View Vicinity

- Grand View Lodge & Conference Center
- Grand View & Love Ridge Condos
- Proposed development on lots 53, 57, & 58

Hotel Additions

- Buildings A, B, C, D, E
- Extended Porte Cochere
- Paved Parking Areas, Roads and Walks
- Heated Parking Areas, Roads and Walks
- Swimming Pool, Soaking Pool Plaza

KM6 Area

- Conference Center
- Buildings K, L, M
- Walks and Stairs
- Heated Plaza, Walks and Stairs
- Existing Miniature Golf and Maze

East Base Area

- Rafferty Center & Mountain Coaster
- Alpine Slide & Rafferty Lift

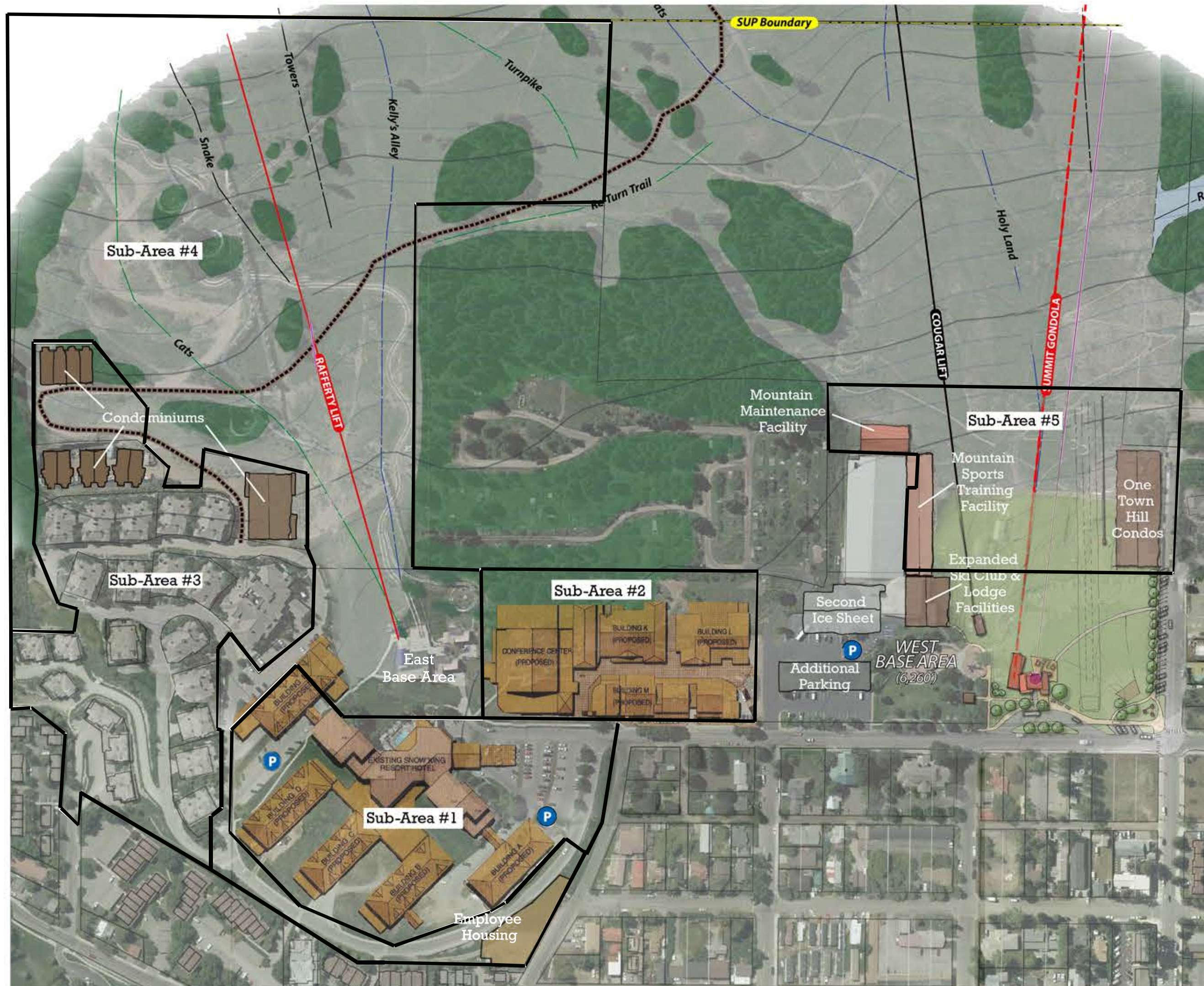
West Base Area

- One Town Hill Condos
- Proposed Mountain Sports Training Facility
- Proposed Mountain Maintenance Facility
- Snow King Sports and Event Center
- Proposed Expanded Lodge Building
- Proposed Gondola and Zip Line

Vine Street Area

- Employee Housing
- Mountain Storage Facilities

*Includes original proposed plans for Hotel and KM6 properties

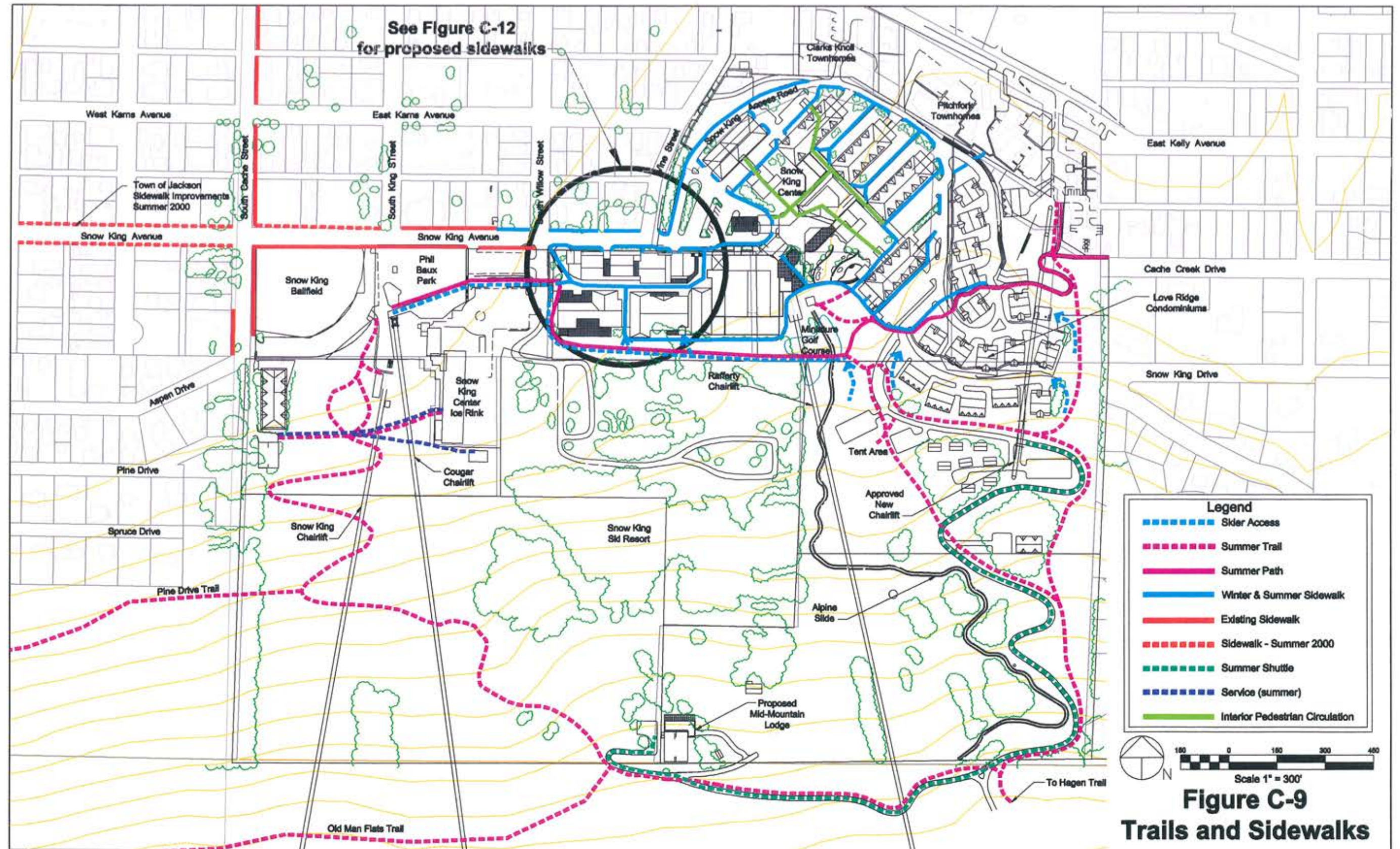


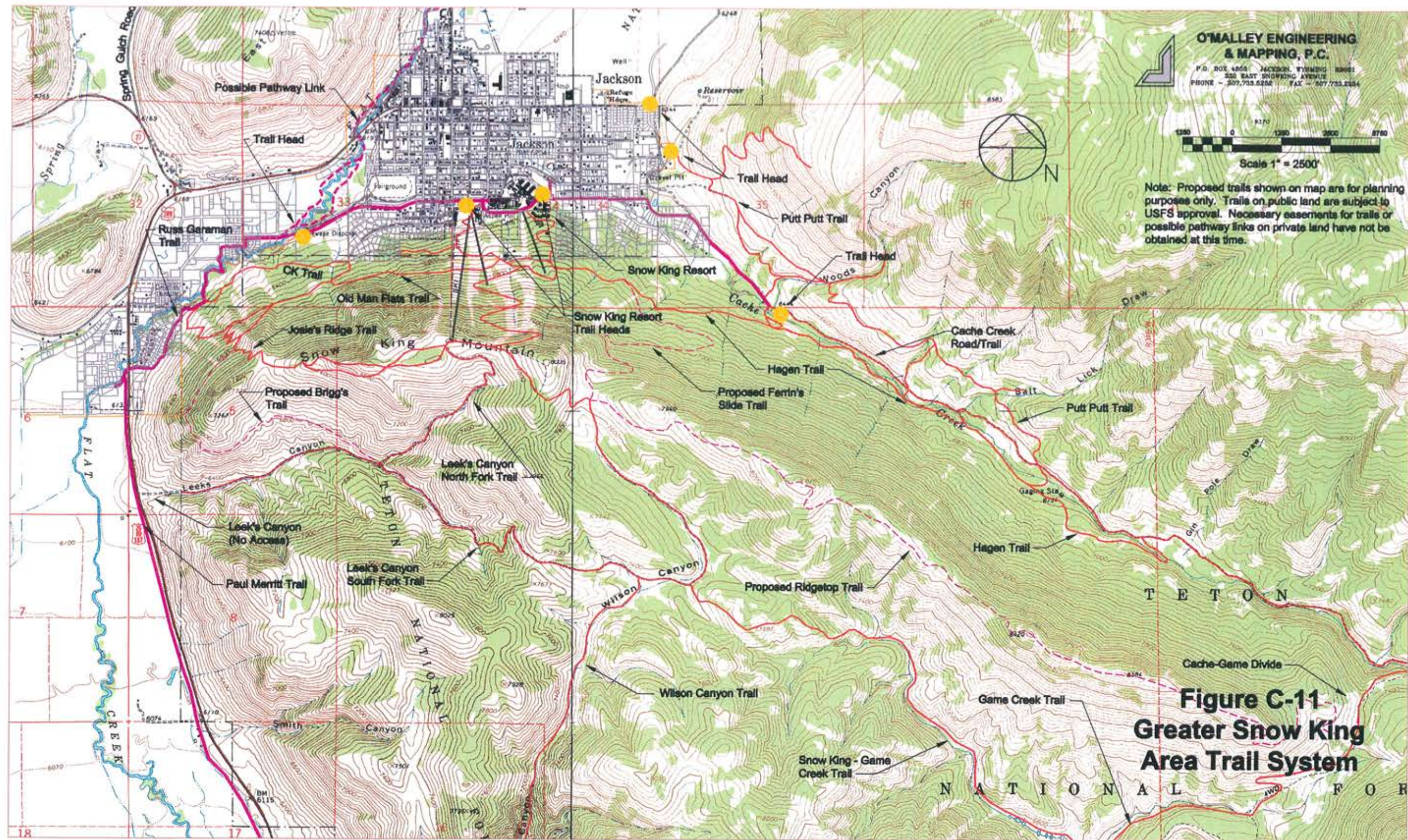
B./D. Sub-Area Plan

For planning purposes the land in the Snow King Planned Resort District has been reconfigured as follows:

- Sub-Area #1: Existing Hotel and Hotel Additions
- Sub-Area #2: KM6 Area-between Hotel and Snow King Center
- Sub-Area #3: Existing and proposed Condominiums
- Sub-Area #4: Snow King Mountain recreation area and proposed employee housing
- Sub-Area #5: Snow King Mountain West Base Area and One Town Hill

*Includes original proposed plans for Hotel and KM6 properties





V. THE LAND USE PLAN

Introduction to Land Use Plan

Section 2560 of the PRO regulations requires a Land Use Element that supports and maintains the character of the resort. The regulations set forth permitted uses and guidelines for the amount and type of development.

As stated in other Chapters of this Master Plan, a major goal is to create a vibrant mixed-use resort. To attain this goal, many varied uses are allowed and the whole site is considered as an integral unit in order to maximize efficiency and create the desired results. The objective of this Master Plan is to develop a high-intensity resort node of development, which is compatible with its location in the neighborhood, and with its crucial relationship with downtown Jackson.

Permitted uses are defined in Section 2550.J. Permitted uses include residential uses, uses necessary to support the resort's primary recreational activities and uses necessary to support the resort's lodging, day visitors, employees and use by local residents. In the case of Snow King, conference center uses are emphasized and commercial uses serving on-site guests and the adjacent neighborhood are permitted. Special events are also permitted. Prohibited uses include regional serving commercial uses and commercial amusement activities, which are deemed detrimental to community goals and character.

The regulations set forth basic considerations for establishing the amount and type of development:

(1) Rationale and character objectives for the resort area; (2) overall development which can be permitted while preserving community character; (3) infrastructure capacity; and (4) resort self-sufficiency to minimize vehicle trips.

The first two issues are discussed in Chapters II, III, VI and VII, in the context of Consistency with the Comprehensive Plan, Compliance with the Land Development Regulations, Design Guidelines and Dimensional Limitations Plan. The issue of infrastructure capacity is discussed as part of Chapter X, Capital Improvements Plan. The issue of resort self-sufficiency is generally not applicable since the intention of this Master Plan is to be integrated with the downtown area. However, the proposed uses do provide basic conveniences and amenities needed by on-site guests and conference center users and assists in decreasing vehicle trips.

Overview of Permitted Uses

The uses allowed in this Master Plan provide a balanced mix that will enliven the resort and support its dual purpose as a center for both visitors and residents. All the allowed uses fall within the scope of permitted uses, and most descriptions are derived directly taken from the definitions provided in Section 2220 of the Town of Jackson Land Development Regulations.

Although future uses cannot be completely anticipated, the intent is to comply with the overall goals and objectives of this Master Plan. The Resort District can be characterized as having similarities either in part or in whole, to all zoning districts. These similarities are mixed together into a constantly evolving balance. In order to maintain a healthy balance for the future, flexibility in the type and intensity of use is essential.

The Land Use Plan and its associated land uses are divided into two broad categories; those uses allowed within the building envelopes and those uses allowed outside the building envelopes (Recreation Land Use Zone).

Uses within the building envelopes are generally characterized as residential, commercial institutional, amusement /recreation and home uses. Recreation Land Uses are allowed to spill into the building envelopes.

Uses outside the building envelopes can generally be classified as non-residential, amusement/recreation and temporary uses. While these uses may require the need for structures or other physical improvements they are usually small in scale and quite specific in use. To attempt to confine development, which is related to the recreational activities such as skiing, biking, horseback riding, alpine slide etc. seems an impractical, if not impossible task. Hence the rationale for allowing recreational use flexibility outside the building envelopes.

Other various recreational uses such as swimming pools, hot tubs, playgrounds, picnic areas and shelters, pathways, trails, tennis and volleyball courts, alpine slide, miniature golf, outdoor function areas, sign structures, bridges, ticket windows, barns, tents, performing stages and platforms, dance floors, band stands, BBQ areas, ski lifts, decks, loading areas, nurseries, equestrian operations, ski school and day care facilities are allowed both within and outside the Building Envelope areas.

The following descriptions are intended to familiarize the reader with the uses particular to this Master Plan, as well as other uses which the resort feels are appropriate consequently establishing the nexus between this multiple use district and the LOR's. Definitions will be as per Section 2200 of the current Land Development Regulations unless otherwise noted. Thresholds for size and number of permitted uses is discussed in the Dimensional Limitations Plan.

Uses Permitted Within Building Envelopes.

Residential Uses - Snow King anticipates the following residential uses: Conventional Single Family Units, Accessory Residential and Institutional Residential. Employee housing is also to be located throughout the site and integrated within the Resort in various nodes.

While it appears that residential use within the Snow King PRD will be limited, Snow King believes that residential uses may still have a place in the resort. Consequently, the previously stated uses as defined by Section 2220 are allowed.

Accessory Residential Unit. -While these types of residential uses are highly unlikely within the resort area, Snow King does not want to preclude their use.

Institutional Residential-Employee Housing. Units of this type are permitted. Institutional-Residential Employee Housing is meant to comply with this Master Plan 's Employee Housing requirements. Unit types may vary and may include, but not limited to, dormitories and multiple occupancy units.

Institutional Residential. Other. Like accessory units this type of use is currently not being considered by the resort. However, it is not out of the realm of possibility that a private school dormitory housing or some type of group living facility or dormitory might be a future possibility.

Non-Residential Uses - Snow King has the following commercial uses included in this Master Plan: Commercial Lodging (including hotel, condominiums, condominium-hotel, interval ownership units and support facilities associated with residential and non-residential short-term rentals), Commercial Retail, Office uses, Restaurant /Bars and Service uses. Although not currently in the group of contemplated commercial uses the resort believes that Bed and Breakfast operations could increase the Resort's ability to provide a viable center for both visitor and residents. These uses are all defined by Section 2220, and are appropriate to include herein.

Commercial Lodging - Commercial Lodging (or simply lodging) can take the form of hotel rooms, cabins, lodges, townhouses, condominiums, condominium-hotels or interval ownership units. Condominiums or other units can be sub-divided into separate sub-units called "lock-offs". A lock-off is a portion of a larger residential unit that can be used, or rented, separately from the rest of the unit. A unit can have more than one-lock off portion; for instance, a 3-bedroom condominium unit can be subdivided into 3 separate rental units, each with a separate entrance door. Interval ownership unit is defined as "Condominium-Time Share" in the Land Development Regulations Definitions.

This Master Plan indicates four hotel areas within the resort that are intended for lodging: the existing hotel and additions, Sub-Area's 2 and 3, and the One Town Hill condominiums. The vast majority of new lodging is proposed in the area of the existing hotel and additions. Uses are interchangeable and only limited by the capacity limits in the Schedule of Dimensional Limitations. Although for purposes of the Example Development a larger ratio of hotel rooms than condominiums have been used in the breakdown of the total guests allowed, it is not believed that this will be the ultimate lodging breakdown. Since hotel rooms have a greater per square foot and per guest impact on traffic, parking and housing the "worst case scenario" was chosen in order to calculate impacts.

Conference and Assembly Facilities. - Conference space is defined as the actual square footage of the meeting rooms whereas assembly space is defined as foyer or gathering space outside of the conference rooms. Assembly space accommodates registration tables, displays, receptions and other activities associated with a meeting event. The majority of the new conference and assembly space is anticipated for the Sub-Area 2.

Restaurant and Bar. -Expanded Food and Beverage facilities are contemplated throughout the Resort, but mostly concentrated in the core areas. Smaller Food and Beverage outlets are envisioned within the ropes course and miniature golf areas. Outdoor food and beverage facilities are also contemplated throughout.

Commercial Retail. These types of retail sales operations are contemplated for the street level shops along Snow King Avenue as well as within and surrounding the pedestrian plaza. The locations provide efficient access for neighborhood local convenience as well as access to lodging and parking and assists in creating vibrant pedestrian spaces. The close proximity to dense neighborhoods and the numbers of guests staying at the resort should increase the diversity and viability of retail operations. Any single commercial retail space exceeding 15,000 SF shall require a Conditional Use Permit, all other commercial retail is permitted by right.

Office. Commercial office space is planned for the spaces above the commercial retail and is envisioned as including professional services and other activities, which are conducted in an office environment. Similar to the Commercial Retail these types of use are appropriate throughout the resort and will provide a consistent level of local traffic to diversify the mix of activity and commercial viability of the area. Resort uses, such as the Resort management itself, will also require office space.

Service Use. The successful balance of local convenience and visit or services is intended by allowing this use type as defined in Section 2220. These diverse types of uses will be allowed and encouraged within the building envelope system.

Bed and Breakfast. This type of use shall require a Conditional Use Permit.

Residential Short-Term Rental. This use is allowed throughout the extent of the PR District.

Institutional Uses. As defined in Section 2220 three non-residential institutional uses are considered. Snow King Resort considers all to be valid and appropriate uses within the building envelope areas. Additionally, utility uses outside the envelopes are also allowed particularly in consideration of Snow King Mountain's expanding role in providing a base for valley wide telecommunications. Although the current plan does not contemplate most of the types of institutional uses named in Section 2220, these uses are allowed since in almost every instance large segments of the community would utilize the resort and its many activities and services.

Day Care Center Group. A day care center is not currently planned; however, it may be part of future development within the resort district and could serve the needs of guests, employees and valley residents. Day care can also take the form of a "Discovery Center" and can be operated in conjunction with the Ski School. Snow King Mountain does offer a summer day camp program to local school age children from ages 7 to 14.

Amusement and Recreation Uses. Within the building envelope area, the following uses are appropriate; Commercial Amusement and, Indoor Recreation. In addition, the uses of Outdoor Recreation, Tour Operators / Outfitters and Ski Area may in whole or in part of their operation occur within the building envelope area.

Commercial Amusement. Commercial Amusement uses are permitted as follows:

- Permitted by Right: noncommercial theatres and music halls, video arcades, and indoor skating rinks.
- Conditional Use: bowling alleys, commercial movie theatres and music halls, pool and billiard halls and shooting arcades.
- Other uses shall require a Conditional Use Permit unless determined to be unnecessary by the Town Planning Director.

Indoor Recreation. Planned Indoor Recreational uses include a health club and spa, intended for use by both residents and guests. A large indoor/outdoor pool is also planned. In addition, similar types of operations may be feasible and are appropriate from the standpoint of providing diverse opportunities to visitors and residents.

Home and Temporary Uses. While none of the uses defined under the Home Uses and Temporary Uses designations are currently contemplated, the Resort believes that they are compatible, appropriate and may have a place in the future of the resort. The presence of home businesses, small day care operations and cottage industry would help to diversify the social fabric within the Resort. Temporary Uses such as Special Events are perfectly adapted to the plaza in Sub Area #2.

Uses Permitted within the Recreation Land Use Zone

Outdoor Amusement/recreation. Outdoor Recreational uses are permitted as follows:

- Permitted by Right: youth recreation camps, bicycle facilities and uses, swimming pools and hot tubs, tennis, volleyball courts, paddle tennis, stables and corrals not associated with an agricultural use, cross country ski trails and facilities, playground, picnic areas and shelters, zip lines, yurts, splash pads and water features, mountain coasters, mazes, ropes courses, outdoor food and beverage facilities, pathways, trails, alpine slide, miniature golf, outdoor function areas, performing stages and platforms, dance floors, band stands, BBQ areas, ski lifts, summer and winter tubing park, decks, climbing walls, loading areas, ski school facilities and other related ski facilities and amenities.

One of the greatest assets provided by Snow King to the community is the continuing existence of both summer and winter recreational opportunities. Summer outdoor recreation uses considered in the Master Site Plan include, but are not limited to, indoor and outdoor climbing walls, miniature golf, and an expanded trail system for hiking, biking and riding including both cross country and downhill bike trails. Phil Baux Park, and its seamless expansion into Snow King's private lands is also an integral part of this Master Plan.

Winter outdoor recreation includes tubing, skating (both indoors and outdoors) and of course skiing and snowboarding. Skiing and snowboarding activities comprise the bulk of these activities from the perspective of land and support facilities. In addition to the existing base facilities and lifts near term improvements include a new gondola to the summit and continuing improvements to the snowmaking operations. A proposal for a modest expansion of the ski area to include a safe access road to the summit has been presented to the USFS and is included as part of this master plan. Snow King supports the definitions for Outdoor Recreation and Ski Slopes provided in Section 2220 since it allows the flexibility to construct and operate all the ancillary facilities associated with both summer and winter activities.

Other uses such as Day Care Center, summer day camp, ski school, utilities and nursery, allowed within the Building envelope area, will also be allowed in the Recreational Land Use Zone.

Ski slopes are obviously allowed, as well as all the facilities required to operate the ski area such as maintenance and storage spaces, snowmaking facilities, explosive storage, lifts and ski slopes lighting.

- Conditional Use Permit will be needed for Skateboard parks, equestrian centers.
- Other uses not mentioned above shall require a Conditional Use Permit unless determined to be unnecessary by the Town Planning Director.

Agricultural Uses. Snow King does not have any plans to rear livestock or grow crops nor does the applicant believe that this is an appropriate use within a resort setting.

Tour Operators/Outfitters. Seasonal facilities such as warming buildings or restaurants are intended to be used, as much as feasible, year-round and may be used for these purposes.

Temporary Uses. As stated in the section on Uses Within the Building Envelopes the resort acknowledges Temporary Uses as one of the most important uses to be allowed within the Resort District. Particularly important is the Special Event definition provided in Section 2220. Winter ski races, the Hill Climb, mountain bike races and summer Hill Climb are a few of the important events held on the mountain each year. The Annual 4th of July fireworks has been considered in allocating open space. Over the years, other outdoor uses will come up. Snow King assumes that the desire for more of these types of events will grow in number and diversity. With the exception of Gravel Extraction all the Temporary Uses listed in Section 2220 may have a place at the resort and are allowed.

Special Events. Special events such as music and dance festivals, snowmobile events, art and craft show, concerts, live theater, and similar events, which are compatible with the resort and its facilities, shall be permitted.

The attached Land Use Schedule is intended to summarize the above descriptions. Where the Limited note is used in the Schedule, reference the above text for details.

Although Final Development Plans will determine the precise areas dedicated to each use, an Example Development has been created in order to calculate impacts such as traffic, parking, employee housing and utilities needed at the site. As discussed in Chapter VII, this is only an example and relative sizes and locations of various uses will change over years. This Example Development only represents Snow King's best estimate of uses within Building Envelopes at this point in time.

Uses not governed by this Master Plan

This Master Development Plan does not directly pertain to land owned by the Town of Jackson (TOJ) or the United States government and managed by the United States Forest Service (USFS). However, included with the 2018 amendment to this master plan and update are maps that show future proposed plans on USFS lands and TOJ property. Among the proposed uses indicated on TOJ land are an additional sheet of ice added to the North of the existing Snow King Sports and Event Center, a zip-line and gondola landing in the existing parking area of Phil Baux Park, a climbing gym and indoor training complex adjacent to the existing ice rink, and concert pavilion in Phil Baux Park. The accepted 2017 USFS Master Development Plan covers all uses proposed on USFS managed lands which can be seen in the included 2017 USFS Master Plan Map.

SNOW KING RESORT LAND USE SCHEDULE

	Building Envelope Zone	Recreation Land Use Zone		Building Envelope Zone	Recreation Land Use Zone
Gravel Processing			Commercial		
Extraction			Office	Y	
Disposal			Planned Commercial	Y	
Temporary Uses			Commercial Retail	L	
Christmas Tree Sales			Heavy Retail/Service	Y	Y
Contractor's Office	Y	Y	Services	Y	Y
Special Event	y	y	Restaurant/Bar	y	L
Real Estate Sales Office	y	y	Drive-in Facility		
Shelter	y	y	Commercial Lodging	y	
Farm Stand			Bed and Breakfast	C	
Gravel Extraction & Processing			Dude/Guest Ranch		
Amusement/Resort			Residential short-term Rental	y	
Commercial Amusement	Y	Y	Agricultural Support/Service	L	L
Campgrounds			Institutional Residential-Other	C	
Outdoor Recreational	Y	Y	Residential		
Indoor Recreational	y	y	Agricultural Employee Housing		
Tour Operators/Outfitters	y	y	Conventional Single-Family Unit	y	
Ski Slopes	y	y	Conventional Single-Family Subdivision	y	
Home Uses			Planned Residential	y	
Home Occupation Home Businesses	y		Planned Unit Development	y	
Day Care Home, Family	y		Mobile Home		
Day Care Home, Group	y		Mobile Home Park		
Cottage Industry			Working Ranch Subdivision		
Aeronautical			Guest House/Guest Unit	L	
Airports			Accessory Residential Units	y	
Landing Strips			Institutional Residential/Employee Housing	y	
Heliports			Nonresidential		
Balloon Operations			Agricultural		
Industrial			Agriculture	L	L
Institutional			Nurseries	L	L
Light Industry					
Heavy Industry					
Institutional					
Institutional	C	C			
Utilities	C	C			
Day Care Center Group	y				

Y:::Permitted by Right, C:::Conditional Use , S:::Special Use

L= Limited -See Text for details

EXAMPLE DEVELOPMENT

Land Use by Sub- Area	Sub- Area 1 Motel	Sub- Area 2 KM6	Sub-Area 3 Love Ridge	Sub-Area 4 Love Ridge Vicinity	Sub-Area 5 Pine Lodge	Sub- Area 6 Mid - Mountain	TOTAL For All Sub- Areas
Condominium Units (Number)	10	15	40	28			93
Hotel Room (Number)	698	100		32	60	28	918
Total Units	708	115	40	60	60	28	1,011
Statistics: Lodging SF/Guest	234	330	481	398	225	255	276
Total Guests (Number)	1,436	260	160	176	120	56	2,208
Above-Ground Uses (Square Feet)							
Lodging	336,000	86,000	77,000	70,000	27,000	14,000	610,000
Lobby / Reception	12,000	6,000			1,000	2,000	21,000
Conference / Meeting	9,000	40,000			2,000	3,000	54,000
Assembly	1,000	23,000					24,000
Commercial: F&A	27,300	11,000				3,000	41,300
Commercial: Unassigned	11,200	42,000	4,000		10,000		67,200
Commercial: Theaters		9,000					9,000
Health Club, Daycare, Ski School, Etc.	17,000						17,000
Services: Back or House & Storage		17,000					17,000
Services and Circulation	8,500				5,000	1,000	14,500
Supply & Mech	2,000						2,000
Services - Offices	3,000						3,000
Supply - Public		6,000					6,000
Office		4,000					4,000
Outdoor Recreational Uses	25,000						25,000
Total Above-Ground Building Area	452,000	244,000	81,000	7,000	45,000	23,000	915,000
Underground Uses (Square)							
Hack or House		18,000					18,000
Supply, Mechanical, Maintenance	18,000	28,000					46,000
Services Loading / Circulation	84,000						84,000
Loading Dock Area	6,000	22,000					28,000
Kitchen Storage Services					4,000	7,000	11,000
Maintenance / Services	20,000						20,000
Storage and Misc.				5,000			5,000
Supply Services – Public		2,000					2,000
Underground Conference		22,000					22,000
Underground Assembly		9,000					9,000
Lockers • Health Club	20,000						20,000
Total Underground Building Area	148,000	101,000	0	5,000	4,000	7,000	265,000
Ground Surface Area (SF)	551,000	284,000	217,000	611,600	282,900	770,000	2,716,500
Floor Area Ratio (FAR)	0.82	0.86	0.38	0.12	0.16	0.03	0.34

VI. DESIGN GUIDELINES

A. Introduction:

Division 2500 requires Design Guidelines, which establish standards for buildings, spaces, signs and lighting within the PRO. These Design Guidelines respond to and specifically address the standards set forth in Section 2550-m-3 of the Town of Jackson Land Development Regulations that state:

- ***Character and design.*** *As indicated on the Community Issues Map of the Jackson/Teton County Comprehensive Plan, Snow King Resort will continue its role as a unique, resort-oriented urban commercial node serving both visitors and residents. Improvements and expansions at Snow King will solidify its role as the main convention and conference facility in the community. Factors and resort characteristics important in Snow King's future development include:*
 - (1) *Capitalization on the location at the terminus of Snow King Avenue.*
 - (2) *Creation of a sense of arrival.*
 - (3) *Creation of an active, attractive, pedestrian streetscape along the eastern end of Snow King Avenue.*
 - (4) *An attractive, safe and direct pedestrian streetscape connection to the Town Square.*
 - (5) *A layout that blends the edges of the resort into neighboring developments, creating a porous edge to the resort that encourages pedestrian travel into and through the area.*
 - (6) *Structure sizes and layout that draw people into the resort area.*
 - (7) *A continuity of architecture and activities within the resort, creating a multi-use sense of place.*
 - (8) *Pathways throughout the resort and connections to the Jackson Hole pathways system.*
 - (9) *Continued provision of the amenities of "town hill" skiing.*

The following Design Guidelines address the specific characteristics and issues excerpted above. These Design Guidelines will be administered by the Snow King Resort Master Association (SKRMA). Final Development Plans will be reviewed and approved by SKRMA prior to presentation to the Town for approval as per Section 2530. B.

The visual presentations accompanying this Master Plan show the character and quality of the buildings that these guidelines will produce. New development is intended to visually enhance the existing resort, add a new and exciting dimension to the Town of Jackson, and blend with the built and natural landscape. The plaza, storefronts and entry tower are intended to provide a pleasant and attractive Snow King Ave. streetscape, inviting to the visitor or resident approaching from the West.

B. Design Guidelines. Character and Design Objectives

1. Capitalization on Location at Terminus of Snow King Avenue

The current main entrance to Snow King Resort is at the East end of Snow King Avenue. This entrance will remain and be strengthened in a number of ways. The entryway will be re-graded to a slightly gentler slope and equipped with snow-melting surfaces. The street frontage will be lined with three- and four-story buildings with retail uses at street level and other uses above. These buildings will create an important street edge designed to provide visual interest to pedestrians and motorists. The East/West axis will be improved with the addition of landscaped islands that will screen the paving surfaces and soften the approach. The entrance to the hotel will be brought further West by means of a large Porte Cochere, which will serve as a drop-off for the hotel and conventions users, as well as for buses, cars, shuttles, limousines and taxis.

2. Creation of a Sense of Arrival

By expanding the Porte Cochere and creating a courtyard, the sense of arrival is enhanced and circulation, both pedestrian and auto, clarified for the arriving guest. Consideration is given to loading and unloading requirements for both guest and residents attending functions at the Resort. The large vehicular plaza is designed with large vehicles (buses, outfitter vans, and trailers) in mind. The row of buildings along the south side of Snow King Avenue, starting with the entry Tower and plaza at the west, will help draw people visually into the resort and is an important feature necessary to create a sense of arrival. Pedestrians will be able to walk along an outdoor arcade lined with retail windows, providing visual interest and shelter from the weather.

3 & 4. Creation of Pedestrian Streetscape Along East Snow King Avenue and a Connection to the Town Square

The addition of buildings fronting the street with retail and commercial uses will enhance the pedestrian experience by adding visual interest, sidewalks and lighting. Snow King Resort will work in concert with the Town of Jackson to direct pedestrians between Snow King Resort and the Town Square. Willow, King and Cache Streets are all options for pedestrian connections to downtown.

5. Porous Edge Encouraging Pedestrian Travel

The building edge along Snow King Avenue is articulated to reduce the apparent bulk and scale of the two-, three-, and four-story structures. Small retail and commercial spaces connected by a covered arcade will disguise the parking structure behind and give an active and inviting facade. By using different building heights and varying the roof forms, the street edge is given scale and visual interest. The facade facing Snow King Ave. East of Willow is designed to integrate with potential future development along the north side of the street. The open areas to the East and West will encourage hiking and biking up the mountain. On the West, behind the ballpark, the One Town Hill building will define the western edge of the resort and be visible when approaching the Resort from the North. The large open space area between the Snow King Center and the One Town Hill will continue to act as a magnet for mountain access and be enhanced with additional outdoor activity areas.

6. Size and Layout that Attracts People

The new master plan is built around three primary outdoor spaces, each of a very distinct character and purpose. The centrally located Entry Court, with re-graded drive and expanded pick-up and drop-off areas, is the vehicular centerpiece of the new plan. Arriving visitors will be able to pull in under the cover of the Porte Cochere and will be directed to check-in areas or to the convention center. Access to the parking structure will be clearly marked and easily accessed. The second major public space is the plaza above the parking structure, which is affronted by lodging/commercial buildings. This entirely pedestrian space connects the main hotel, the convention center and other condominium and hotel wings through a pedestrian bridge, to the Snow King Center, the Ski hill, and Phil Baux Park. This pedestrian plaza is to be lined with food and beverage outlets, shops, kiosks and outdoor activities and is intended as the center of pedestrian activity for the Resort. The third major public space is the Pool Courtyard, which will be enhanced under the new master plan with terraced gardens, water features, and hot tubs stepping up the hill from the hotel lobby. This space commands south sun, exceptional views up to Snow King Mountain and is well protected from prevailing winds. This will be the recreational centerpiece of the hotel and condominium complex and will also be visible from the main hotel lobby attracting guests to the outdoors. The new Health and Fitness Club will overlook and connect to this Pool Courtyard. The effect of these three spaces will be to give the visitors distinct spatial and programmatic experiences and will serve to attract and amuse people in many different ways.

7. Continuity of Architecture and Activities/Multi-Use Spatial Sense

The spatial experience outlined above is enhanced by the fact that it incorporates mixed uses and by the variety of activities that will take place at the Resort. The mixture of retail, office, restaurants recreation, and lodging mimic the uses typically found in active urban areas, and the proposed density is necessary to activate these outdoor spaces.

8. Pathways Connecting to Pathways System

The Pathways and Trail system is the backbone of the Snow King Resort Master Plan. The proposed system will provide a nexus for the regional trail system. The special location of the Snow King properties allows for East/West and North/South Trail and Pathways connections. Special emphasis is placed on the separation of pedestrian and vehicular circulation and the creation of meaningful interior and exterior spaces for pedestrians to congregate. The pathway system within Snow King Resort expands, and connects to the off-site pathways (See Summer Circulation and Pathways and Winter Circulation and Pathways).

9. Continuation of the Amenities of "Town Hill" Skiing

The Snow King Ski Hill is intended continue in operation as an amenity for both residents and guests alike. Skiing, sledding and other activities figure prominently in the new Snow King Master Plan. The increased intensity of the resort is hoped to lead to an expansion of the amenities as the need arises.

C. Design Guidelines. General Purposes

The purpose of these conceptual design guidelines is to give some idea of the physical character that is being envisioned in this Master Plan and will be used to assist Snow King Resort in the planning, design and construction of projects build under this master plan. They reflect the goals of the master plan in attempting to create a true resort experience with visual variety, pedestrian activities, and a unique character which will make the resident and visit or experience more memorable. It is the intent of these guidelines to strike a balance between control and creativity, to allow enough flexibility in the choice of materials and style to give life to the resort, while at the same time maintaining a sense of cohesiveness. The world's great cities were not designed by one architect at one time, but rather grew and developed over time with the creative input of many. Snow King Resort is attempting to create a broad enough palette of possible materials and design elements to encourage a unique blend of architecture, which will give it variety and visual interest.

Snow King Resort has an important role as anchor for the Town, a counterbalance to the Town Square and the proposed Visitor and Multi-Agency Camp us at the North end of Cache Street. As such, it must act as a terminus, a destination for both residents and tourists. This Master Plan, by adding significant intensity to the Resort, makes it a much more varied and desirable destination than it currently is. The combination of Convention Facilities, the Snow King Center/ice Rink, an array of lodging facilities, retail, commercial functions and a Health Club/Spa, all reinforce Snow King's role as a multi-use center for the community.

As the Master Plan builds on the existing Snow King Resort, so do the architectural guidelines, which build on the existing character that has developed during the life of the resort. The new architecture of the Snow King Resort will build on the community character of Jackson with well-designed buildings, clean rooflines, taper-sawn shake roofs and a clearly expressed structure. The materials palette, while encouraging a preponderance of wood and stone, will also include stained concrete, painted or oxidized steel, stucco, and high quality cultured stones.

Indigenous architecture has long had a powerful association for people who visit the West, from the log cabin in the woods, to the burl wood columns in the Cowboy Bar. Snow King has established a

character that is clean and somewhat modern. Its new character must tie to the old and yet be firmly rooted in today's world. While rustic character has been adopted for other resorts, a more direct simple architecture that capitalizes on large areas of glass, simple roof forms and tautly detailed elegant materials, will distinguish Snow King from other Jackson experiences. Tying the new buildings with the old will create a powerful and unique style for Snow King as it develops in the new millennium.

The resort and convention business has changed over the years and the new Snow King Master Plan incorporates changes intended to keep it apace in this intensely competitive business. By more effectively attracting today's conferences and tourists, Snow King will continue to provide a strong economic infusion for the community.

Section 2550. G requires Design Guidelines that establish parameters for buildings and spaces in the Planned Resort following this outline.

1. General. *The design theme of the Planned Resort shall have an emphasis on outdoor recreational activities and create a sense of place. A sense of place is created when site planning and architecture:*

- a. Concentrate activities and human interaction into identifiable spaces, such as a plaza or mall;*
- b. Assemble a built environment that connects buildings, spaces and structures through common scale, design and materials;*
- c. Incorporate into the built environment the natural features and cultural heritage of the area; and*
- d. Produce an identifiable image that is associated with the planned resort and with Jackson Hole.*

There shall be visual continuity among the resort structures and design elements without unduly limiting variety in design. Development shall be compatible with the surrounding built and natural environment in both scale and character.

2. Architecture. *Building design guidelines shall reflect:*

- a. The community's architectural character and themes*
- b. A human scale, pedestrian-orientation, which are created when:*
 - (1) The height of buildings does not overwhelm people walking beside the buildings; and*
 - (2) The ground level doors, windows and design features of buildings create an interesting diversity for people walking past the buildings.*
- c. A built environment in keeping with the cultural and aesthetic values of the community*
- d. Natural attributes of the immediate vicinity*
- e. Building materials and colors compatible with the surrounding natural and built environment.*

3. **Bulk and scale.** *The design guidelines shall ensure the bulk and scale of individual buildings within the Planned Resort achieve compatibility with:*

- a. Other structures within the Planned Resort, when the resort development is completed, and*
- b. Neighboring structures that are not a part of the resort, and*
- c. The natural environment.*

4. **Signs.** *The design guidelines shall include a sign component that sets forth the sign theme for the Planned Resort and specifies criteria for determining permitted sign sizes types and locations. The guidelines shall contain prototypical examples of all types of signs, including wall, canopy, freestanding, directions, and informational signs. The flexibility extended to Planned Resorts via this Division, to propose standards for signs different from those specified in Chapter 15.28, Signs, of the Jackson Municipal Code, is encouraged with the purpose of having sign guidelines in keeping with the unique character and needs of the resort.*

5. **Lighting.** *The design guidelines shall include an analysis of proposed project lighting. Areas to be illuminated (parking areas, walkways, entries, etc.) shall be identified and general standards should be set forth. Identification of models and types of standards and fixtures is encouraged, but specific illumination plans and photometric footprints are not required. Generally, lighting shall be low-intensity, low-profile, and shielded to avoid "light pollution" and glare to offsite areas. General illumination standards are set forth in Section 49370, Exterior Lighting and Glare.*

6. **Site planning.**

*A. **Orientation and aspect.** Structures and public spaces within the Planned Resort, generally shall be arranged with views of, and access to, the principal resort recreational amenity.*

*b. **Entrance features.** Entrances to the Planned Resort shall create a sense of arrival. A sense of arrival is created when the entrance into the Planned Resort is easily identifiable and is consistent with the design theme of the resort.*

*c. **Natural Resources.** The site design shall highlight the natural resources within the Planned Resort and integrate them into the layout of the resort in order to promote a connection to the natural environment. Consequently, natural features of the site, such as significant vegetation, rock outcroppings, water bodies, etc., shall be preserved and incorporated into the project design to the extent practicable.*

*d. **Pathways and pedestrian facilities.** Pathways and pedestrian facilities, including access for the disabled, shall be integral components of the site design. The site shall provide an attractive, outdoor atmosphere that encourages use and reliance upon pathways and walkways.*

*(1) **Safe, convenient and direct access.** Pathway and pedestrian systems shall provide safe, convenient, and direct access throughout the resort, to public lands, transit facilities and the existing or planned community pathway system, when adjacent to the resort.*

(2) Pathways. *Pathways shall be provided for non-motorized transportation, except motorized wheelchairs for the disabled shall be permitted. Bicycle racks, ski racks, etc., shall be provided at various destination points within the resort.*

e. Transportation facilities. *Site design shall integrate safe, convenient, and direct access to transportation services and facilities (i.e., bus shelters, information kiosks,) and shall incorporate the facilities necessary for the proper functioning of the Transportation Demand Management Plan (see subsection H.2, below).*

f. Circulation. *The layout of local street, alleyways, and parking lots shall be sensitive to the natural terrain and landscape. Cut and fill areas shall be minimized and natural features of the site such as wooded areas, rock outcroppings and water bodies, shall be preserved to the maximum extent practical.*

g. Access. *Safe vehicular access appropriate for refuse removal, recycling, emergency services, and delivery shall be provided. Service access shall not create unsafe conflicts with automobile and pedestrian access to primary destinations within the resort.*

h. Landscaping. *Project landscaping including hardscape areas shall be consistent with the overall design theme of the resort. Use of indigenous plant materials is encouraged. Existing vegetation shall be preserved and incorporated into the design of the project to the extent practical, especially wooded areas and other significant vegetation which provides shelter or habitat for wildlife.*

The Guidelines and the plans and sketches incorporated in This Master Plan, when considered as a whole, address the above sections of Division 2550.

D. Architectural Design Guidelines

1. Building Form, Massing and Character: Buildings must feel as if they fit in the context of the Town of Jackson. They should not seem "imported" from someplace else. They must not overwhelm the pedestrian scale. Building masses will be broken down through the use of covered arcades at pedestrian levels and thru the use of building envelopes that require the structures to step back away from the street or plaza.

Architectural forms will be simple and practical, not elaborate. They must reflect an ability to deal with the severe climate and have honesty and directness similar to the best indigenous structures such as barns and sheds, or some of the structures in Yellowstone and Grant Teton National Parks.

In general, building forms should be used to create definable public spaces between buildings. Buildings affronting plazas should create an edge that defines the space. Buildings on the south side of a plaza step back above the second story to allow light into the plaza. Where building facades face the mountains or non-pedestrian spaces, buildings will be allowed to rise without necessarily stepping back.

Buildings should be sited to help shape the spaces around them and to create a sense of "street space" by lining up with adjacent buildings where possible.

Buildings should employ various architectural devices to help bring the masses to a more friendly, pedestrian scale. Changing materials, breaking the wall line, using different roof forms and adding balconies or projecting bays are some of these devices.

Larger buildings may be broken into smaller elements that appear to be an aggregation of smaller buildings. Overly differentiated facades on a single building are to be avoided however.

2. **Roofs:** in order to be sympathetic to the existing Snow King Resort, new buildings must relate to existing architecture by using similar roof forms, generous roof overhangs, and some similar materials such as heavy timber beams holding up roofs overhangs.

Primary roofs must be sloped and in keeping with existing roofs, their slopes should predominantly be in the range of 4:12 to 7:12. Flat roofs and parapet roofs will be allowed where they act as connectors from one gabled roof to another and at larger spaces where necessary and not visible from street or plaza levels or where practical for best incorporating structures into the surrounding built environment. Special consideration is to be given to designing roofs in reference with nearby pedestrian uses. Roof materials should be as consistent as possible throughout the Resort.

Large roof overhangs should be held up by heavy timber beams or knee braces. Eave lines should be kept thin to avoid the heavy look of typical cold roof structures with 20" fascia's.

3. **Exterior Materials:** Buildings shall sit on masonry bases, and feel as if they are firmly rooted in the ground. Stone, cultured stone, stucco, synthetic stucco and concrete will withstand the extreme weather conditions and pilling up of snow along the foundations.

Appropriate materials above the ground level will predominantly be stone, cultured stone, wood siding, wood shingles, heavy timber, logs and glass. Other materials such as brick, stucco, synthetic stucco, oxidized steel, and board-formed concrete will also be allowed to a lesser extent. Buildings should have texture and visible structural purpose.

4. **Windows:** Windows at the pedestrian level should be as large as possible given the function behind them. For retail and/or hotel frontage windows should represent approximately 75% of the linear frontage.

Above the ground floor, there is no minimum requirement of window to wall. In keeping with the existing Snow King Hotel and its available views in all directions, large windows are encouraged. When in heavy walls of stone or concrete, windows should appear to be "punched", and they should have lintels of timber or stone. Metal clad windows, wood windows, and non-reflective aluminum storefront windows are all permitted. Darker colors of the windows are encouraged.

Divided light windows, if used, must have real divisions, either true divided light or simulated divided light with metal spacers between the double panes of glass. Snap-in false mountings will not be permitted. Generally larger expanses of glass are preferred to small divisions.

5. **Commercial Frontage, Entryways:** At the pedestrian level, Retail and Hotel storefronts should appear light, glassy and as transparent as possible. As a goal, approximately 75% of the linear frontage of walls opening onto the public plazas and arcades should be glass.

Stone, stained concrete, and painted steel are recommended materials for the pedestrian level walls between the glass.

6. **Decks and Balconies:** Decks and balconies add functional amenity to the resort but also become part of the design palette used to add character and create variety on the building exterior. Where possible balconies and decks should be located to take advantage of solar exposure and/or views. Long, linear balconies are not permitted.
7. **Walkways:** To promote the sense of a unified resort with pedestrian accessibility, buildings should have covered walkways on facades along which connections can be made to other buildings in the village. Wherever possible these walkways should have retail stores and restaurants and other visually interesting spaces along them. All buildings must take into account pedestrian access to all adjacent buildings and the rest of the Snow King Resort.
8. **Color:** The use of color should support and reinforce the overall design theme for Snow King Resort. As a year-round resort, colors chosen must work well in all seasons and help the resort blend with its town context as well as with the natural landscape. Color schemes should be built around natural materials, such as stone and wood. Earth hues, natural colors of foliage, deadfall timber and dried grasses are all appropriate. Primary or bright colors should be used sparingly, as accents to highlight the more muted color schemes. Use of "day glow" colors is not allowed. On wood, stains are preferred over paint.

9. **Lighting:** The lighting systems will serve functional and aesthetic roles that include:
 - Providing security and visual safety
 - Serving as directional indicators for vehicular and pedestrian traffic
 - Providing extended outdoor use time, particularly in pedestrian areas,
 - Reinforcing the identity and character through form, color, and materials of fixtures, visual light quality and placement

Lighting must be designed and configured in conformance to Town of Jackson standards. Light sources must be shielded so as not to reflect direct light upon adjacent buildings or properties.

Pedestrian scale lighting: The use of low level light sources at the pedestrian scale to accent or illuminate the ground plane provides a special opportunity to reinforce Snow King's unique identity and character. This is achieved by the use of proper fixtures at lower mounting

heights to produce a more intimate effect. At night, the fixtures provide light necessary for safety and visual effect. By day, the fixtures should lend animation and scale to the pedestrian environment. Fixtures at a maximum height of 16 feet will be used for these pedestrian areas. Painted steel will only be used for accent.

Additional pedestrian scale lights may be used including bollard lights at approximately 42' in height, and canister type lights on overhead structures. Lighting for pedestrian areas should be incorporated into the buildings whenever possible.

- 9. Disabled Accessibility:** Consideration for the disabled must be a part of the design process for any project. Every structure shall be accessible by the disabled through the use of ramps (not to exceed 8%) and/or elevators. All outdoor pedestrian areas must be accessible.

10. Sub Area 2. Specific Guidelines.

One of the key design elements is the pedestrian connection between the existing hotel area and the Snow King Center. This connection is intended to be made through a pedestrian mall located above underground parking. It is intended that this route be lined with covered arcades as defined below, and given ample visual and special variety to create a lively streetscape.

Key components of this pedestrian mall are:

Properly scaled buildings lining a properly scaled "street", storefront spaces with a predominance of glass, interesting shop windows and doors inviting to the pedestrian, indoor and outdoor food and beverage outlets, visual variety and not just a straight line of facades. Public spaces, lobbies, restaurants and similar extroverted uses should be placed along the mall to help enliven the spaces and make them inviting to passersby.

As a means to allow, and in fact require, this kind of streetscape in a future design whose exact programmatic needs are to be left flexible, a number of rules need to be followed:

- A 65' wide "overlay" zone has been created and called the "Pedestrian Mall Overlay." This overlay defines an area of Primary and Secondary pedestrian connectors that must fall within this overlay. See Pedestrian Overlay Drawings in the Dimensional Limitations Chapter of this Master Plan.
- Two types of Pedestrian Connections are established: Primary and Secondary.
- The width of the connections is flexible but is governed by the following parameters:
 - Primary Connection:** The open width of this connection shall be between 25' and 65' and should be able to structurally support fire equipment loads. Building height along this Primary Connection is governed by a 1 to 1 proportion of height of building to width of Pedestrian Connection, so where the Connection is say 35' wide, the height of buildings on either side shall not exceed 35'. In the event that there is room left in the maximum height plane of the building envelope grid, buildings can set back a minimum of 8' and extend up to the limit set by the building envelope grid. The 3-dimensional building envelope grid, as defined in the Schedule of Dimensional Limitations Sub-Area 2, shall take precedence. Areas designated T-1 and T-2 in the building envelope grid has special parameters as described in the Dimensional Limitations Plan.

Primary Connections must be lined, on at least one side, with a covered arcade ranging in width from 10' to 16' and at least 12' in height. Structural elements such as beams, trusses and knee braces may drop below the 12' height to a minimum of 9'.

-Secondary Connections are not subject to the above height to width limitation. However, these secondary connections must measure a minimum of 16' in width and 12' in height and are to occur approximately within these Secondary Connection overlays. These secondary connections can be bridged by buildings above, as long as the covered area does not exceed 40' in length.

- Building facades must be articulated, and are not permitted to run straight for more than 200' in length. Jogs or setbacks breaking a straight run must be at least 8' in depth. Curved facades will be allowed and considered breaks.
- Building facades must be organized into a base, middle and top, with appropriate changes of material, varying of the massing and the use of balconies to help break down the massing of the buildings.
- Among the conditions of approval of this Masterplan were proposed revisions to the schedule of dimensional limitations regarding the height and massing of building envelopes fronting Snow King Avenue along its South side. These conditions have been addressed in the building envelopes that are part of this Master Plan. These envelopes, as shown herein, are now in compliance with the conditions of approval. Town staff will review the final design of Sub-Area 2's public thoroughfare frontage at the Final Development Plan stage to ensure that this street level frontage is treated architecturally to achieve the appropriate scale.

As the Snow King Resort develops, these guidelines will ensure that it does so in ways that will greatly enhance its character and make it a more exciting place to visit.

Within this Chapter, as well as in the Schedule of Dimensional Limitations Chapter, drawings and sketches have been included. These are intended to clarify and define the intent of the written guidelines.

E. Site Design Guidelines. Plant Palette.

Site design at the Snow King Resort focuses on plant palette and design, pedestrian circulation, site architectural features and the colors and materials that comprise the build environment. Snow King's setting is both urban and rural. On the one hand the in-town location provides a diverse urban design context. This context generally implies that the site design will be dominated by landscape with formal plantings. Conversely, the resort is built into the base of a forested mountain and is bounded by the Bridger-Teton National Forest. This context usually implies a more random or natural site design. The objective will be to intertwine these two design goals, in a transitional manner, without creating confusion.

Just as the resort straddles a seam between the urban and rural environments it is located at the interface of three different plant communities. The lower portions of the site are dominated by the sage/grassland and the Aspen/Chokecherry communities; remnants of these communities still exist along the eastern boundary of the PRD. The higher, moister portions of the site exhibit a Douglas Fir and Spruce plant community.

Plantings around the resort should mimic these existing communities. Replication of the endemic plants also provides an excellent opportunity to provide visitors with information about the local flora. These plants will also provide an adaptable palette necessary to flourish in the wide variety of moisture, light and temperature conditions, which large buildings create and will also help to weave the rural with the urban environments.

Other planting materials of sufficient caliper will be used to screen and enhance the buildings. In general, the plant material will be in accordance with sections 4140, 4150, 4160, and 4170 of the Land

Development Regulations, except for areas designated as Ski Trails and Outdoor Recreation.

Within Sub-Area 4, only evergreens will be used to minimize visual impacts.

Detailed Landscape Plans will be part of each Final Development Permit Application.

F. Pathways and Circulation Elements

As described in Section 2550. G.6.d., the Planned Resort District is designed to *'provide an attractive, outdoor atmosphere that encourages use and reliance upon pathways and walkways.'*

The proposed pathway and circulation system of the Snow King Resort is comprised of a network of diverse pedestrian passageways that collectively provide a full range of use and circulation functions throughout the resort and adjacent properties. The system is intended to extend and enhance the existing pedestrian/recreations fabric of the town as well as to accommodate the functional demands of the proposed Snow King Resort expansion. In order to facilitate future pedestrian traffic growth, both within and without the PRD, direct and convenient linkages to transit facilities, parking and community pathways are incorporated in the system.

The proposed pathway system consists of the following physical components:

- 10' wide paved bike /pedestrian pathways
- Concrete sidewalks and stairs
- Heated concrete sidewalks and stairs
- Paved pedestrian pathways and plazas
- Gravel surfaced trails (pedestrian only)
- Gravel surfaced hiking /mountain bike /horse trails

The primary objectives of the proposed pathway system can be described as follows:

To provide links to existing paths the planned trail system connects to the Sink or Swim Trail up the mountain and to the East-West and Hagen Trail leading to Cache Creek.

To encourage pedestrian use. The pathways system is integrated into the proposed and existing buildings to create an open, convenient, non-hierarchical system of movement. By not directing or restricting pedestrian traffic the user is encouraged to wander and explore. The buildings and paths are situated in such a way that the pathways can be perceived as extensions of the internal building passageways, thereby, further encouraging pedestrian use.

The pathways system also promotes utilization by providing facilities for recreational activities including walking, hiking, running, biking and riding.

To provide safe pedestrian movement Much of the KM6 and Hotel Sub-Area pedestrian spaces located outside the Extent of Winter Skiing boundary are proposed to be heated for winter use. Pedestrian pathways are to comply, where feasible due to topographic conditions, with ADA requirements.

To provide an aesthetically pleasing and enjoyable experience. The pathways system takes full advantage of the natural attributes of the site and the various exposures to long vistas.

G. Signage

Signage within the resort can be divided into two categories: resort signage and commercial signage. Resort signage provides direction to basic resort services. It is to be homogenous in style, color and material. Commercial signage advertises services or products for individual businesses. Consequently, great latitude of style, color and material must be anticipated.

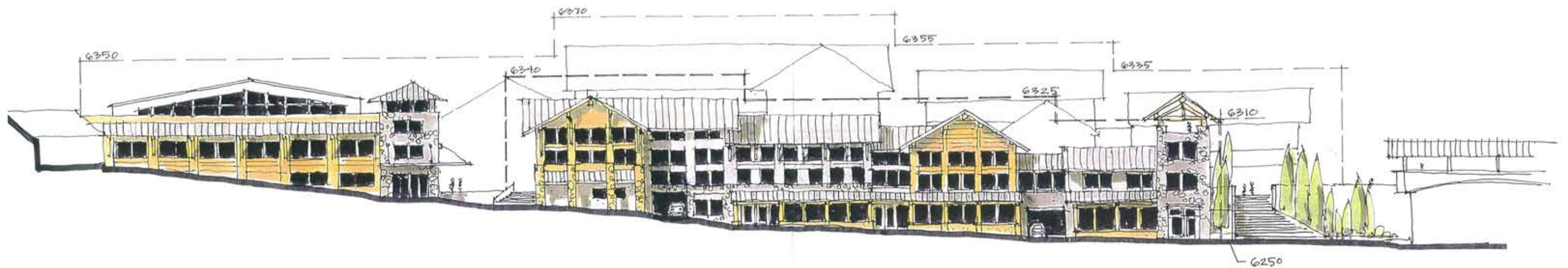
Sign Face Materials: The primary goal is to employ materials, which are non-reflective and have a soft or smooth textured appearance. Some acceptable material examples are: wood which has a natural oil or flat paint finish, unfinished metals which oxidize to a flat finish, or metals painted with a flat finish and other materials which can be shown to have flat, non-reflective surfaces.

Sign Standard Materials: Generally, the preferred standard material will be stone, stained concrete and wood. Standard materials should relate to the context of the site, particularly to the building with which they are associated. Signs should be incorporated into the structure of the building rather than being stuck on the outside as an afterthought. Metals, plastics and other material may be acceptable if it can be shown that they relate to and integrate the sign into the site and/or building. Large structures could be introduced at the Resort's entrance to enhance the sense of arrival, but must be composed of wood or stone.

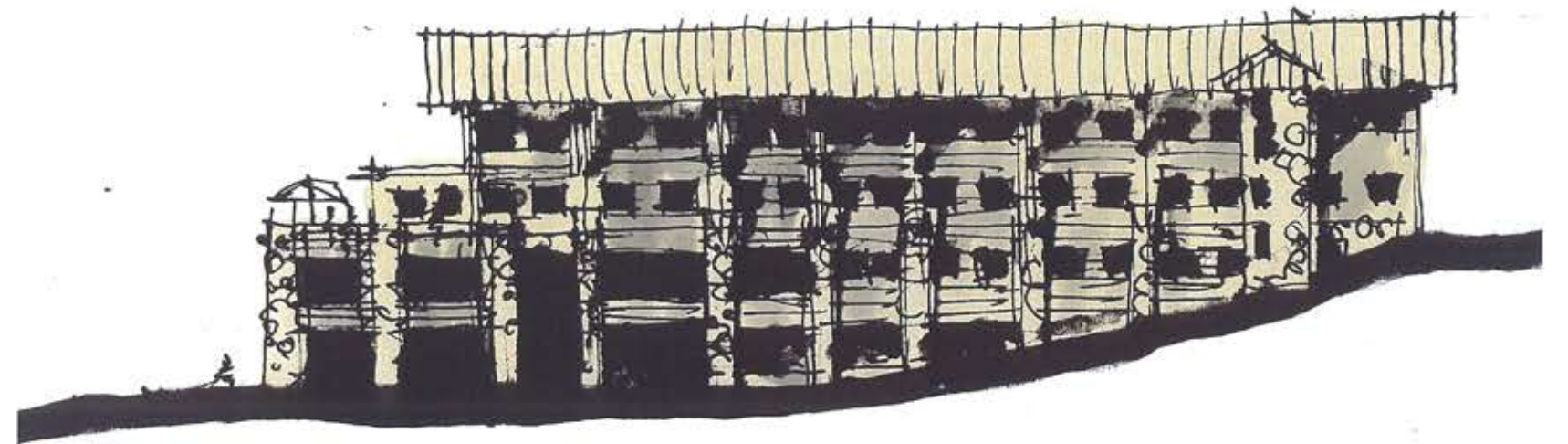
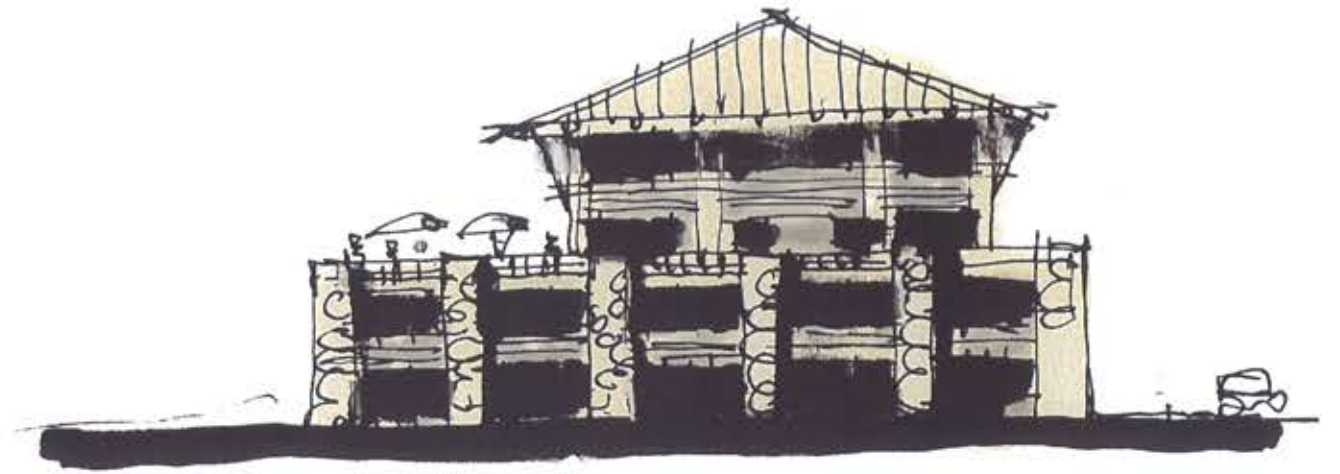
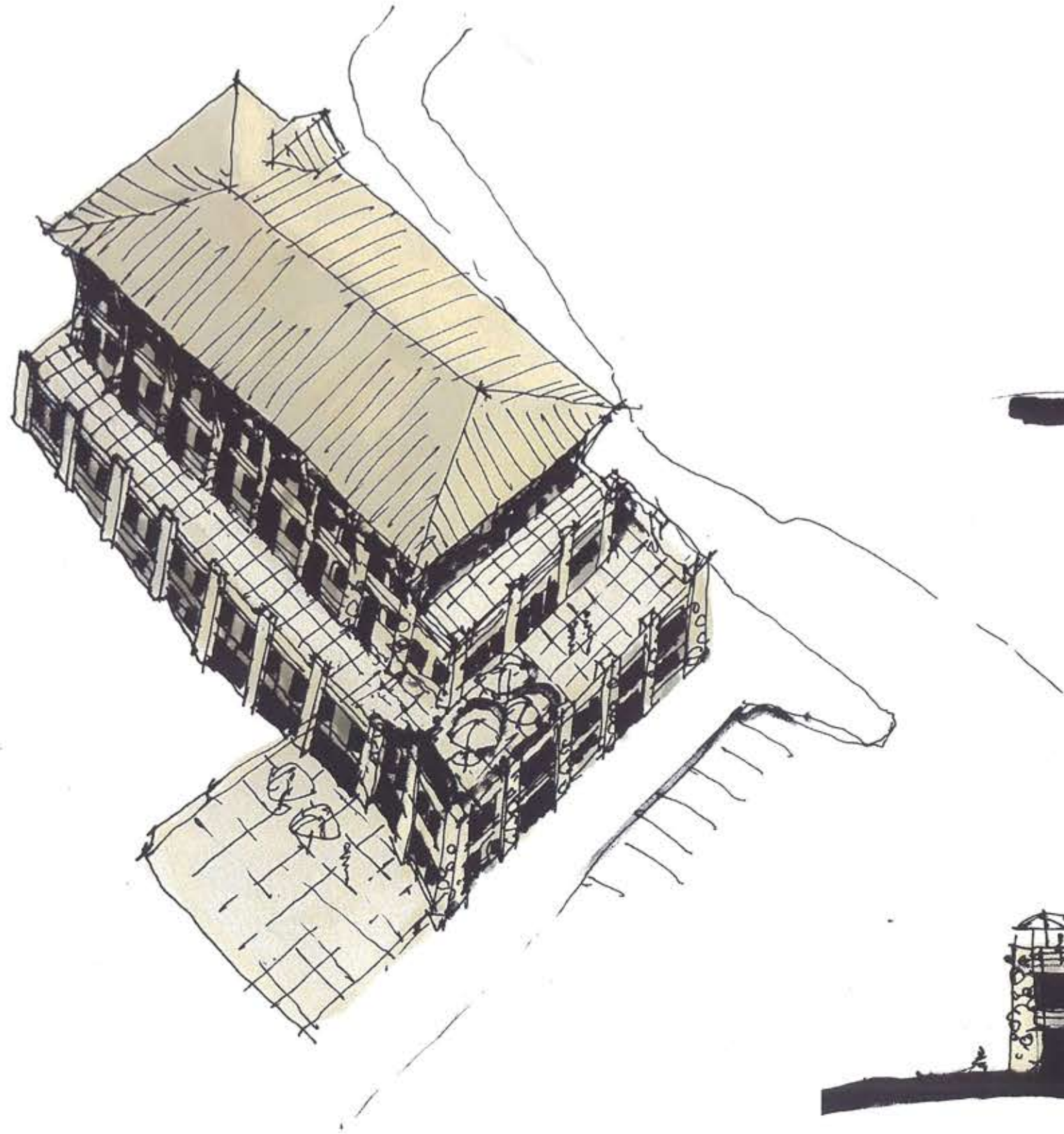
Sign Face and Standard Color: Colors should generally be muted earth tones similar to the endemic Jackson Hole soils. The use of earth tones in non-reflective media is another subtle method of unifying the build environment with its rural surroundings. This color theme is not intended to prohibit bright colors entirely; however, it is intended to define the predominant surface area of the sign face and all of the base and/or standards.

Signage Lighting: Fixtures for lighting sign faces should be incorporated into the structure of the sign. The fixture should be a 90-degree cutoff type, which is adjusted to prevent the lamp from being visible.

A detailed signage program for the Resort will be prepared, for Town Staff approval, prior to filing the First Final Development Plan Application.



SNOW KING MASTERPLAN - ELEVATION ALONG SNOW KING AVE.
27 Feb 01





Snow King View of Mid-Mountain Lodge from North of Visitor's Center



View South from Corner of Cache and Snow King

VI. DIMENSIONAL LIMITATION PLAN

A. Introduction, Definitions and Maximum Scale of Development

This Dimensional Limitation Plan has been prepared in accordance with the requirements of Section 2550.E.:

Dimensional Limitation Plan. *The Planned Resort Master Plan shall have a Dimensional Limitation Plan, which specifies dimensional limitations necessary to achieve the design theme identified by the applicant. The plan shall include floor areas and floor area ratios, densities, landscape ratios, height, setbacks, building envelopes, etcetera, or other lines delineating areas on which restrictions of development are to be imposed and areas in square feet for each lot or building.*

This Master Plan presents a Dimensional Limitations Plan that takes into account the topography of the site and the unique role of the project. As specifically permitted in Section 2550.B, these dimensional standards differ in several respects from standards described in other sections of the Town's Land Development Regulations.

A great deal of care has been given in the performance-based Design Guidelines and this Dimensional Limitation Plan to balancing the various goals of this Master Plan with the visual impacts of the development. The site's topography helps achieve this balance.

It should be noted that two existing buildings on the site are rather large, but fit into the mountain landscape. The existing hotel has over 130,000 square feet and is over 70 feet in height at places, while the Snow King Center has over 53,000 square feet. However, these buildings relate well to their location and are designed in such a manner as to disguise their size. The site's topography is appropriately used in this Master Plan in order to attain the major goals stated in the Statement of Purpose while minimizing impacts.

Many goals and objectives listed in Division 2500 and discussed in the Statement of Purpose necessarily lead towards larger buildings than those allowed in other sections of the LDR's. Division 2500 recognizes that fact and encourages a different approach to dimensional limitations as necessary to achieve these goals. Creating a sense of arrival, vibrant pedestrian spaces, structure sizes that draw people to the area, concentrating development in order to create meaningful open spaces, reducing walking distances, having a central arrival point, proximity to parking and creating a lively urban environment necessitate a dense development pattern for some areas of the resort. Some buildings are necessarily large in order to accommodate the desired size of the conference center as well as to have lodging within a reasonable, and preferably indoors, walking distance to the conference facilities.

Other goals, such as creating porous edges and blending into existing neighborhoods are also taken into account. The topography of the site assists in achieving the stated goals of this Master Plan in a successful mixed-use development. When combined and taken as a whole, the performance guidelines of this Dimensional Limitation Plan, the Design Guidelines, Land Use Plan and Site Plans are balanced to achieve the stated goals.

The Snow King Dimensional Limitation Plan is based on a method of three-dimensional building envelopes and is presented in a mostly graphic format. This method, when combined with the

performance based Design Guidelines, the Land Use Plan and the Site Plans, achieve the goals and objectives of this Master Plan while allowing flexibility and controlling bulk and scale within the integral pedestrian fabric of the Resort. This Plan adapts, and is well suited, to the site's topography as well as other site-specific considerations such as soils, vegetation coverage, solar and wind factors and proximity to common amenities.

This Chapter also includes photographs of a model used to demonstrate the 3-dimensional building envelope concept used throughout this Master Plan.

Since the lands comprising this Master Plan are unplanted and are not yet subdivided, setbacks are drawn and based only on the perimeter property lines. Setbacks at specific perimeter locations vary according to the relationship to adjacent areas.

Building envelopes defined in this Master Plan are intended to suggest approximate locations only and shall be allowed to be adjusted while keeping within the overall theme and rationale of this Dimensional Limitation Plan and the Design Guidelines. Final Development Plan applications and the approval process defined in Section 2530. B will finalize the details of each phase of development. Minor deviations on the locations and sizes of building envelopes can be approved by the Town's staff.

Sub-Areas 3 is controlled under separate procedures:

Sub-Area 3:

Lots 1 through 10 are to remain as previously approved, for the development of 40 condominiums. Lots 11 and 12 will be used for recreational and residential development, respectively, as previously approved. (Love Ridge Plat # 941). These 2 lots are exempt from the Schedule of Dimensional Limitations and floor area parameters. Lot 12 will be developed as a residential lot. Lot 11 will comply with the Recreational Land Use Zone parameters of this Master Plan.

Building area developed, and guest (APO) allocated within Sub-Area 3, will be deducted from the total building area and guest (APO) allowed within this Master Plan. The 10 condominium buildings within Lots 1 through 10 of Love Ridge are estimated to contain approximately 77,000 SF of Building Floor Area. Therefore, the Maximum Building Floor Area left over for Sub-Areas 1, 2, 4, and 5 is $(915,000 \text{ SF} - 77,000 \text{ SF}) = 838,000 \text{ SF}$. The 40 condominiums in lots 1 through 10 equal 160 guests (APO) leaving $(2,208 - 160 = 2,048)$ 2,048 remaining guests (APO) for Sub-Areas 1, 2, 4, and 5.

As previously mentioned, development within the existing condominium area will be controlled in accordance with the "Statement Regarding Existing Condominiums".

Building Envelopes.

The three-dimensional Building Envelopes for Sub-Areas 1, 2, 4, and 5 are shown in the attached Sub-Area maps. The location and dimensions of Building Envelopes are a result of their relationship to the natural topography and landscape, the vicinity areas, pedestrian circulation, visual impacts, proximity to open spaces, desired vistas from interior spaces (both public and private), accessibility to common parking and underground services and other design considerations. The best locations have been chosen to create meaningful open spaces and interior/exterior circulation areas. Higher

levels of intensity are allocated near these areas. A computerized three-dimensional model was also used in preparing this Dimensional Limitations Plan.

Special consideration has been given to blend the development into existing neighborhoods. At the East end of Snow King Avenue, the buildings facing the street have been kept at a lower level than those behind the pedestrian plaza. Only some higher points are interjected to assist in creating a sense of arrival. A transitional space is created at the Willow Street corner. The One Town Hill defines the western edge of the resort and frames the access point to the mountain.

The mountain's presence and dense vegetation act as a background to Sub-Areas 1 and 2. Consideration is given to the location of higher buildings in relation to this background and the appearance of these buildings from different angles, especially the approach to the resort and the views from adjacent neighborhoods.

Building envelopes describe and define the approximate three-dimensional parameters for building height and building ground coverage as well as the buildable scale of non-recreational development including building height within specific areas. These envelopes provide predictability regarding the scale of maximum potential development. Modifications of building envelopes are allowed, provided that the overall theme of the Resort as defined in this Master Plans remain in place.

The envelopes are defined in the Sub-Area plans in a plan view with the maximum top elevation of the roofs within the envelopes specified in the elevation number for each envelope. This elevation number refers to the Town of Jackson elevation datum. Chimneys, vents and roof top mechanical equipment shall be allowed to penetrate the top plane by no more than 4 feet. Decks, awnings, roof overhangs, exterior stairs, railings, parapets and other outdoor spaces will be allowed to penetrate building envelopes. Location of roads, walks, patios and other impervious surfaces is not restricted to building envelopes.

The height of Building envelopes located within Sub-Areas 4 and 5 are not indicated in the graphic format. Buildings within Sub-Area 4 envelopes will be limited to buildings in a scale similar to those already approved for lots 1 through 10 of the Love Ridge Plat.

Recreational buildings, and buildings/structures directly related or ancillary to recreational activities and functions are included in calculations of buildable square footage but are not restricted or defined by the building envelopes and coverage system. Buildings such as ski lifts, recreational improvements such as climbing walls, alpine slides, snowmaking, etc., require more flexibility in their location and site design. These structures are to comply with the Recreational Land Use Zone parameters.

Example Development.

This Master Plan and the Sub-Area Plan, indicate an Example Development. This Example Development has been used to calculate requirements for parking, employee housing, storm water run-off, traffic generation, employment, impervious surfaces, building coverage and utilities. This Example Development also responds to the estimated present day needs to support the conference center's size and other recreational and commercial infrastructure necessary to invigorate the resort and make it economically viable. As years pass the relative allocation of various land uses will adjust and vary according to market conditions while keeping within the specific Limits of Development stated herein.

The Example Development has also been weighted towards land uses producing larger impacts than others. For instance, most of the Lodging Capacity of 2,048 guests has been allocated to hotel rooms as opposed to condominiums, since hotel rooms have greater impacts per square foot, and per guest, on traffic, parking and housing than condominiums. In reality, however, it is expected that lodging uses will mostly take the form of condominiums.

Areas shown in the Sub-Area tables for Roads and Parking, OSR/LSR and total Impervious Surfaces are provided for informational purposes only and are not to be construed as maximum levels of development within Sub-Areas. References to Building Coverage equate to building footprints and have been used for calculations of storm water run-off. Final determination of actual development within each Sub-Area will be ascertained at the Final Development Plan stage. However, overall maximum development must comply with the Setbacks, Open Space Ratios, Maximum Building Floor Area, Floor Area Ratio (FAR) and Lodging Capacity limits set in the Sections that follow.

Recreational Land Use Zone.

The areas located outside the graphically defined building envelopes are designated as Recreational Land Use Zone.

Specific Considerations Related to Sub-Area 2

Certain specific parameters are part of Sub-Area 2's Limitations. The Pedestrian Mall Overlay Zone is graphically depicted in this Chapter (page VII. H) and further discussed in the Design Guidelines Chapter 4 of this Master Plan. This Overlay Zone restricts the height of buildings bordering the Primary Pedestrian Circulation Connection and establishes parameters for Primary and Secondary pedestrian connections.

Two areas (designated T-1 and T-2 in page VII. D) have special parameters. Within Building Envelopes T-1 a tower feature not exceeding 25% of its surface area can penetrate beyond the envelope ceiling (6310 and 6290) to a maximum height of 6330. The remaining 75% of these envelopes are restricted to the 6310 and 6290 limits. The Building Envelope designated as T-2 is excluded from the "Pedestrian Mall Overlay Zone" height guidelines, but restricted to the 6350-maximum height of the envelope as depicted in VII.D.

At the corner of Willow and Snow King a Plaza/Entry feature is intended. Pages VII. I and VII. J depict a conceptual image of the intended use of the corner envelope.

Specific Considerations Related to Sub-Area 3

The remaining developable lots within Sub-Area 3 consisting of Lots 53, 57, and 58 located to the South of the existing Grand View Condominiums will be developed to fit in with the bulk, scale, and character of the existing Grand View Condominiums. These buildings can be up to three stories in height with a basement and with massing, articulation, openings, and step backs used to reduce bulk and mass. Buildings on these lots may consist of one single building complex or multiple buildings in order to best create a design that fits well with the topography and neighboring condominiums. Parking is to be primarily provided on-site and generally consistent with neighboring development. Active uses, such as retail and services, are permitted on the lower two levels, with lodging, residential or office on upper floors. The minimum landscape surface ratio for these lots is 10%.

Specific Considerations Related to Sub-Area 4

Sub-Area 4 includes property owned and operated by Snow King Mountain for the purposes of summer and winter recreational facilities. Included in this sub-area is a parcel of land located on Vine Street where a maintenance facility for the ski area has been located. The original version of this master plan called for expansion of this maintenance facility. The 2018 amendment to this master plan envisions redevelopment of the site, with a similar building mass to the originally approved maintenance facility, for use as employee housing and storage facilities for mountain operations. Employee housing on this site would be designed as a dormitory complex for seasonal work and travel student employees with no requirement for on-site parking due to the fact that these

employees do not have vehicles. This building is envisioned to include enclosed storage facilities for mountain operations on the ground level. The existing mountain maintenance facility is proposed to be relocated to Sub-Area 5 to the South of the existing ice rink. This building would have a maximum height of 42 feet with a flat roof or 46 feet with a pitched roof. A flat roof may be desirable for this location to better integrate with the neighborhood and adjacent Snow King Loop road.

Specific Considerations Related to Sub-Area 5

Sub Area-5 primarily serves as the West Base area for Snow King Mountain ski area operations and contains the One Town Hill development. Proposed future development in this sub-area consists of an on-mountain maintenance facility for Snow King Mountain that would sit to the South of the ice rink and service grooming and snowmaking equipment as well as house a pump house for snowmaking should the existing snowmaking pump house be moved for a proposed future gondola. The building would be a maximum of two stories with the second level providing office space for mountain operations. Roof design for this building may be either flat or pitched to accommodate the usage and best integrate with the existing building and hillside. In addition, a mountain sports training facility is proposed as a new indoor recreational facility on the West side of the existing ice rink. The maximum height of this building, or addition to the ice rink structure would be the same height as the existing peak of the ice rink roof. The roof of this structure may be flat or pitched to best accommodate the recreational use and design of the building.

Specific Limits of Development.

The following Setbacks, Open Space Ratios (OSR), Building Floor Area, Floor Area Ratio (FAR) and Lodging Capacity will be the specific limits of development within the area of this Master Plan.

Setbacks.

Setbacks are graphically shown in the attached maps for Sub-areas 1,2, and 5.

Open Space Ratio (OSR).

Open Space Area defined a land surface not covered by buildings, structures or impervious surfaces. Ski trails and other open space recreational spaces as well as hardscape surfaces comprising pedestrian plazas, patios and outdoor function areas are also considered Open Space Areas.

Open Space Ratio (OSR) means the proportion of a development that is provided and maintained as Open Space Area.

Landscape Surface Area and Landscape Surface Ratio (LSR)

Landscape surface area means a land surface not covered by buildings, structures or impervious surface, except facilities and/or impervious surfaces specifically permitted in Section 4150, Standard Plant Unit. Once landscaped, according to division 4100, Landscaping Standards, the landscape surface area shall be left undisturbed and maintained to support plant life. Hardscape surfaces composing pedestrian plazas, patios and outdoor function areas are also considered Landscape surfaces.

Section 2550. M,3.d. specifies that:

Landscape surface area. Within areas of the Planned Resort to be developed as lodging, conference, commercial and related facilities, the minimum landscape surface ratio shall be .25, exclusive of the already permitted residential development that exists upon the enactment of this Division (Clark's Knoll, Pitchfork Townhomes, Love Ridge, and Love Ridge Addition.) Notwithstanding, the Town Council may reduce the minimum landscape surface area to no less than twenty (20) percent upon demonstration by the applicant that the following objectives are achieved with a reduced landscape surface area. The primary purposes of the landscaped areas within Snow King are to:

- (1) Create visually strong and attractive streetscapes.*
- (2) Create a porous edge to the Planned Resort such that residents and visitors in the surrounding areas are invited to enter the resort through attractive pedestrian ways.*
- (3) Support high quality urban design, including integral public spaces for interaction and public events.*

This Master Plan complies with 1, 2 and 3 above.

The following minimum Landscape Surface Ratios (LSR) are established for this Master Plan:

- For the total area of Sub-Areas 1, 2, 4, 5 and 6, the minimum LSR shall be .50
- Within the total area of Sub-Areas 1, 2, and 4 the minimum LSR shall be .25
- Within Sub-Area 5, the minimum LSR shall be .75
- Within Sub-Area 6 the minimum LSR shall be .90

Building Floor Area.

Building Floor Area is defined in Division 8300 as:

Floor Area. Floor area means the sum of the gross habitable floor area for each of a building's stories as measured from the exterior limits of the faces of the structure. The floor area of a building excludes attics, basements, cellars, unenclosed porches, or any floor space in an accessory building or in the principal building which is designed for the parking of motor vehicles in order to meet the parking requirements of these Land Development Regulations.

The key to Table 2400 of the Land Development Regulations defines basements as spaces where 50 percent or more of the perimeter is below ground level. Spaces defined as basements dedicated to various functions such as services, storage, meeting, support, loading and unloading are not included in computations of Building Floor Area, but are included when considering other impacts such as housing, parking and transportation.

Building Floor Areas Exclude:

- Areas dedicated to Employee Housing as per the Housing Mitigation Plan
- Temporary Buildings, such as Tents.

In accordance with these definitions the Total Maximum Building Floor Area for Sub-Areas 1, 2, 4, and 5 will be limited to 838,000 square feet.

Floor Area Ratio (FAR).

Floor Area Ratio (FAR) is defined in Division 8300 as:

Floor Area Ratio (FAR). Floor area ratio means the intensity of building, measured as a ratio derived by dividing the total floor area of a building or structure by the lot or sub-area.

- The Maximum Floor Area Ratio (FAR) for the total of Sub-Areas 1, 2, 3, 4, and 5 shall not exceed .40
- The Maximum Floor Area Ratio (FAR) for the total of Sub-Areas 1, 2 and 4 shall not exceed .60

Lodging Capacity.

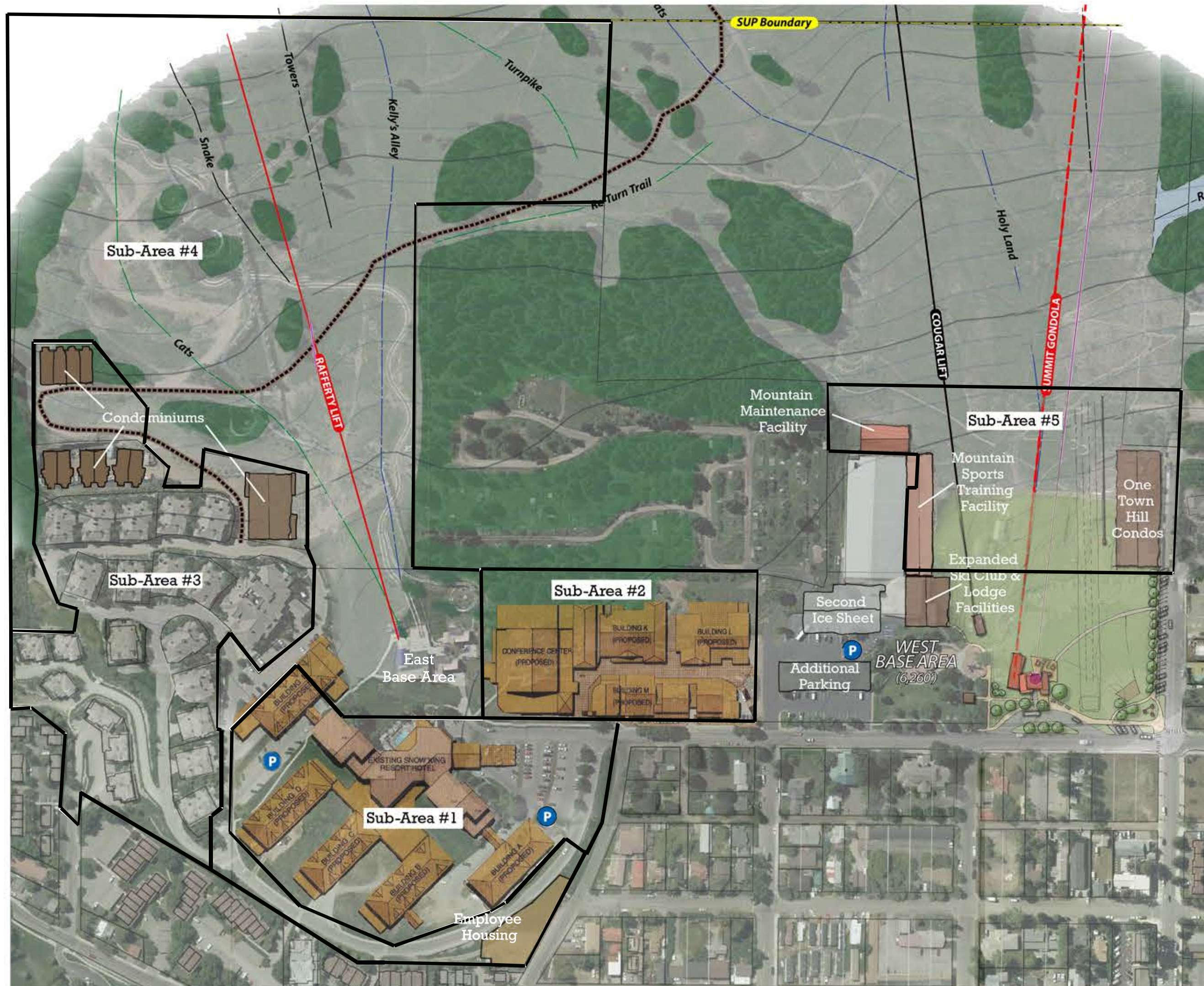
Lodging Capacity within Sub-Areas 1, 2, 4, 5 and 6 shall not exceed 2,048 guests (APO) as defined in Section 2550.M.2:

- a. Guest. A guest is a person who is accommodated in overnight lodging facilities within the Planned Resort. The number of guests is calculated by the "average peak occupancy" of the lodging accommodations.*
- b. Average peak occupancy. For the purposes of this Section, the following average peak occupancies (APOs) shall be used in calculating the capacity of guest accommodations:*
 - (1) Hotel, motel, or similar lodging unit. A hotel, motel, or similar lodging unit that exists as sleeping quarters and does not contain other types of living spaces such as a living room or kitchen, shall be assigned an APO of two (2).*
 - (2) Dwelling unit. A dwelling unit, used for short-term rental, shall be assigned an APO of four (4).*

Other. Other lodging facilities that do not meet the definitions above shall have an APO assigned that is the sum of the number of bedrooms the lodging facility contains multiplied by two (2).

EXAMPLE DEVELOPMENT

Land Use by Sub-Area	Sub -Area 1 Hotel	Sub-Area 2 KM6	Sub-Area 3 Love Ridge	Sub-Area 4 Love Ridge Vicinity	Sub-Area 5 One Town Hill	Sub -Area 6 Mid- Mountain	TOTAL For All Sub -Areas
Condominium Units (Number)	10	15	40	28			93
1 Hotel Room (Number)	698	100		32	60	28	918
Total Units	708	115	40	60	60	28	1,011
Statistics: Lodging SF/Guest Total	234	330	481	398	225	255	276
Guests (Number)	1,430	260	160	176	120	56	2,208
Above-Ground Uses (Square Feet)							
Lodging	336,000	86,000	77,000	70,000	27,000	14,000	610,000
Lobby / Reception	12,000	6,000			1,000	2,000	21,000
Conference / Meeting	9,000	40,000			2,000	3,000	54,000
Assembly	1,000	23,000					24,000
Commercial : F&B	27,300	11,000				3,000	41,300
Commercial : Unassigned	11,200	42,000	4,000		10,000		67,200
Commercial: Theaters		9,000					9,000
Health Club, Daycare, Ski School, etc.	17,000						17,000
Services: Back of House & Storage		17,000					17,000
Services and Circulation	8,500				5,000	1,000	14,500
Support & Mech.	2,000						1,000
Services - Office	3,000						3,000
Support - Public		6,000					6,000
Office		4,000					4,000
Outdoor Recreational Uses	25,000						25,000
Total Above -Ground Building Area	452,000	244,000	81,000	70,000	45,000	23,000	915,000
Underground Uses (Square Feet)							
Back of House		18,000					18,000
Support, Mechanical, Maintenance	18,000	28,000					46,000
Services--Loading / Circulation	84,000						84,000
Loading Dock Area	6,000	22,000					28,000
Kitchen Storage Services					4,000	7,000	11,000
Maintenance / Services	20,000	-					20,000
Storage and Misc.				5,000			5,000
Support Services - Public		2,000					2,000
Underground Conference		22,000					22,000
Underground Assembly		9,000					9,000
Lockers -- Health Club	20,000						20,000
Total Underground Building Area	148,000	101,000	0	5,000	4,000	7,000	265,000
Ground Surface Area (SF)	551,000	284,000	217,000	611,600	282,900	770,000	2,716,500
Floor Area Ratio (FAR)	0.82	0.86	0.38	0.12	0.16	0.03	0.34

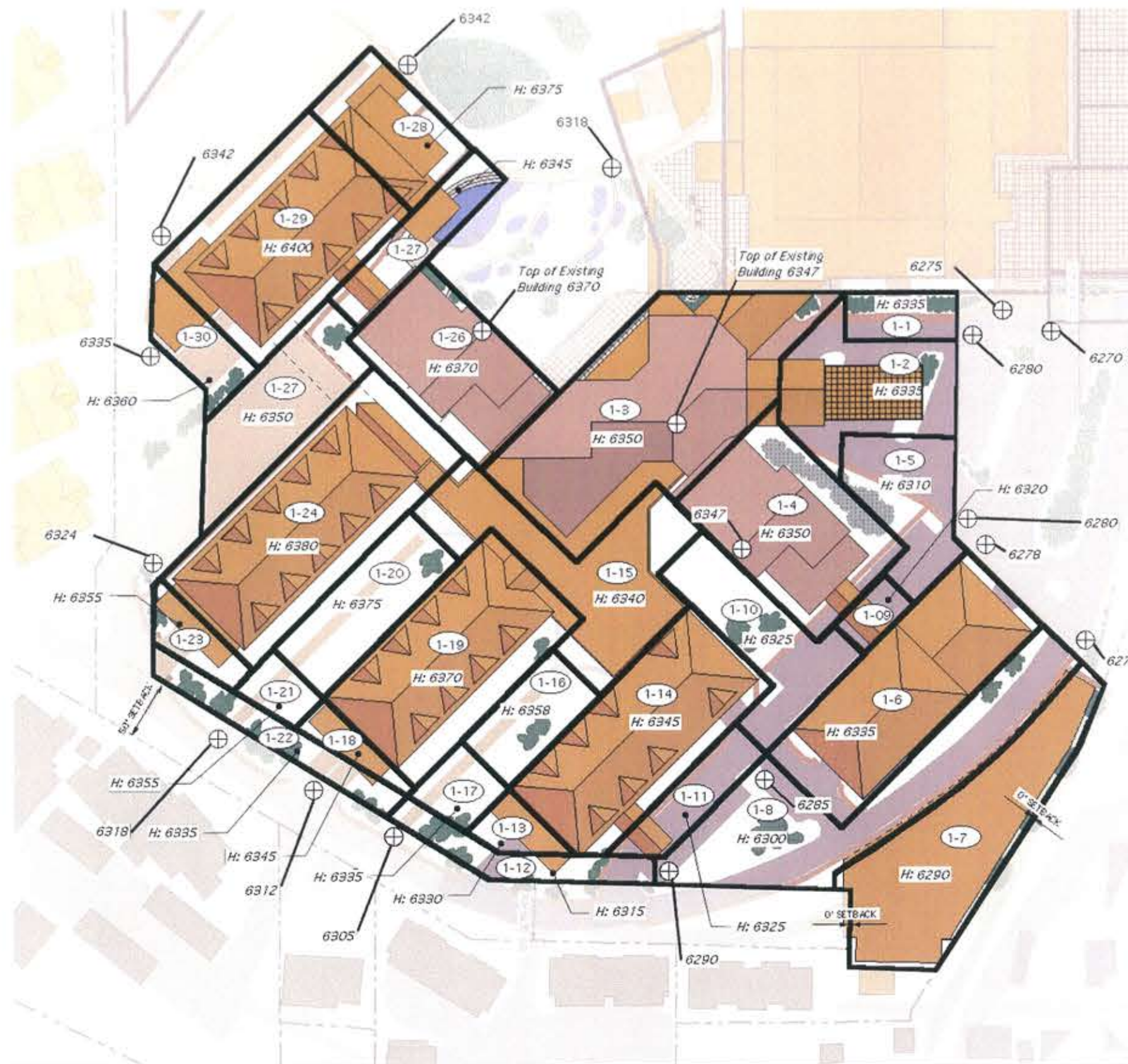


B./D. Sub-Area Plan

For planning purposes the land in the Snow King Planned Resort District has been reconfigured as follows:

- Sub-Area #1: Existing Hotel and Hotel Additions
- Sub-Area #2: KM6 Area-between Hotel and Snow King Center
- Sub-Area #3: Existing and proposed Condominiums
- Sub-Area #4: Snow King Mountain recreation area and proposed employee housing
- Sub-Area #5: Snow King Mountain West Base Area and One Town Hill

*Includes original proposed plans for Hotel and KM6 properties



C. Sub-Area #1

Sub-Area 1 Hotel Area and Hotel / Condominium Expansion

Ground Surface Coverage

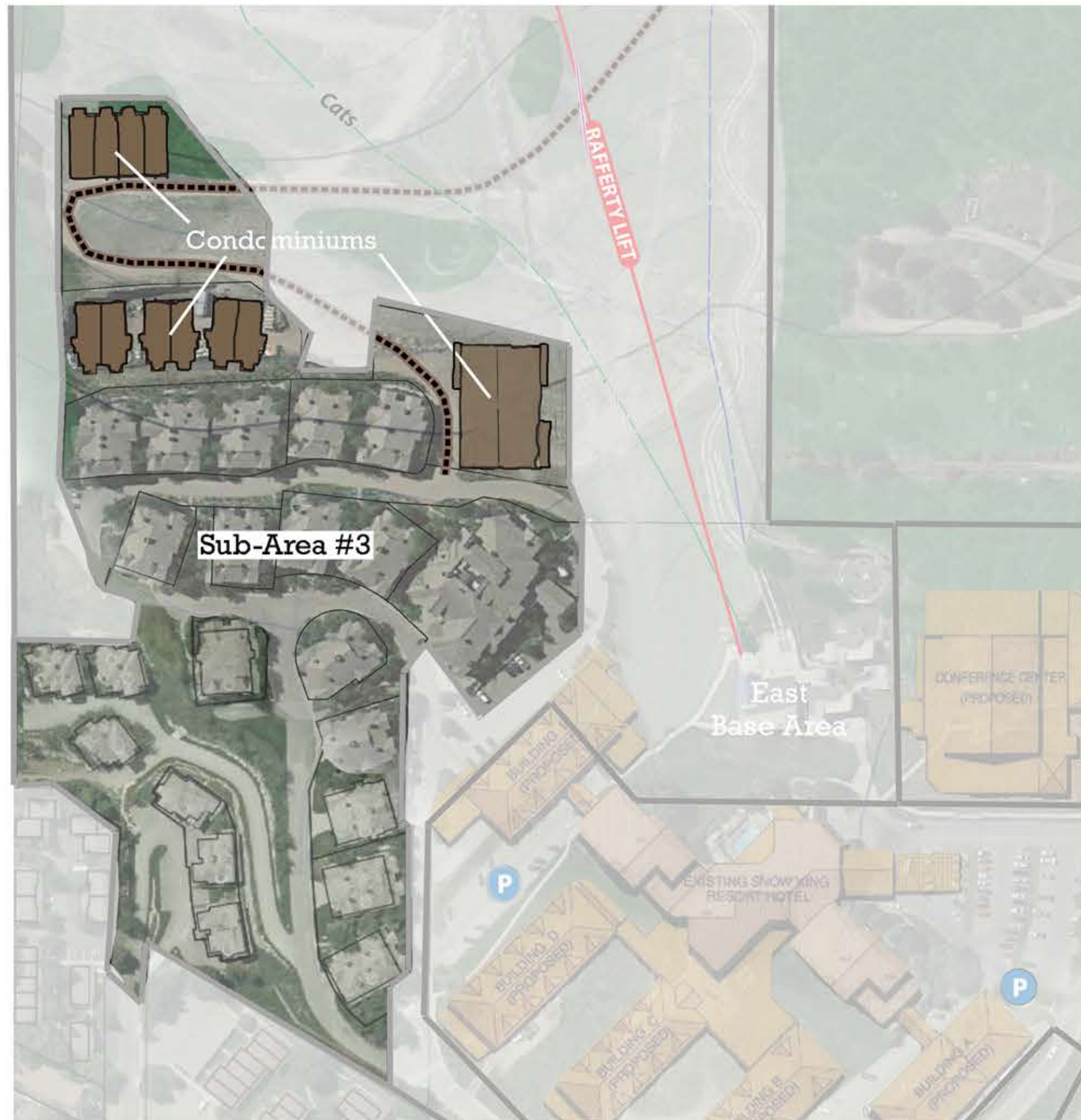
Buildings	183,000
Pavement: Roads & Parking	142,940
Walks, Pathway, Plaza, Patio	25,350
LSR	0.32
Other Impervious (Bike/Foot Paths, Tennis Courts, Etc.)	24,920

Total Impervious Coverage 376,210



D. Sub-Area #2

Sub-Area 2 KM6 Area	
Ground Surface Coverage (Example)	
Buildings	133,000
Pavement: Roads & Parking	N/A
Walks, Pathway, Plaza, Patio	17,330
LSR	0.44
Other Impervious (Bike/Foot Paths, Tennis Courts, Etc.)	7,730
Total Impervious Coverage	150,330



Sub Area #3
Existing and Proposed Condominiums

Sub-Area 3 consists of the Grand View, Love Ridge, and Simpson Patent condominium developments and the Grand View Lodge. Lots 53, 57, and 58 are the remaining lots platted for condominium development within the sub-area. These lots are proposed to be developed in a similar style to neighboring condominium developments. Buildings on these lots are proposed to be up to three stories in height with a basement. Buildings may be designed as one single complex on each lot or broken into multiple structures to best meet design needs and to take advantage of the topography.

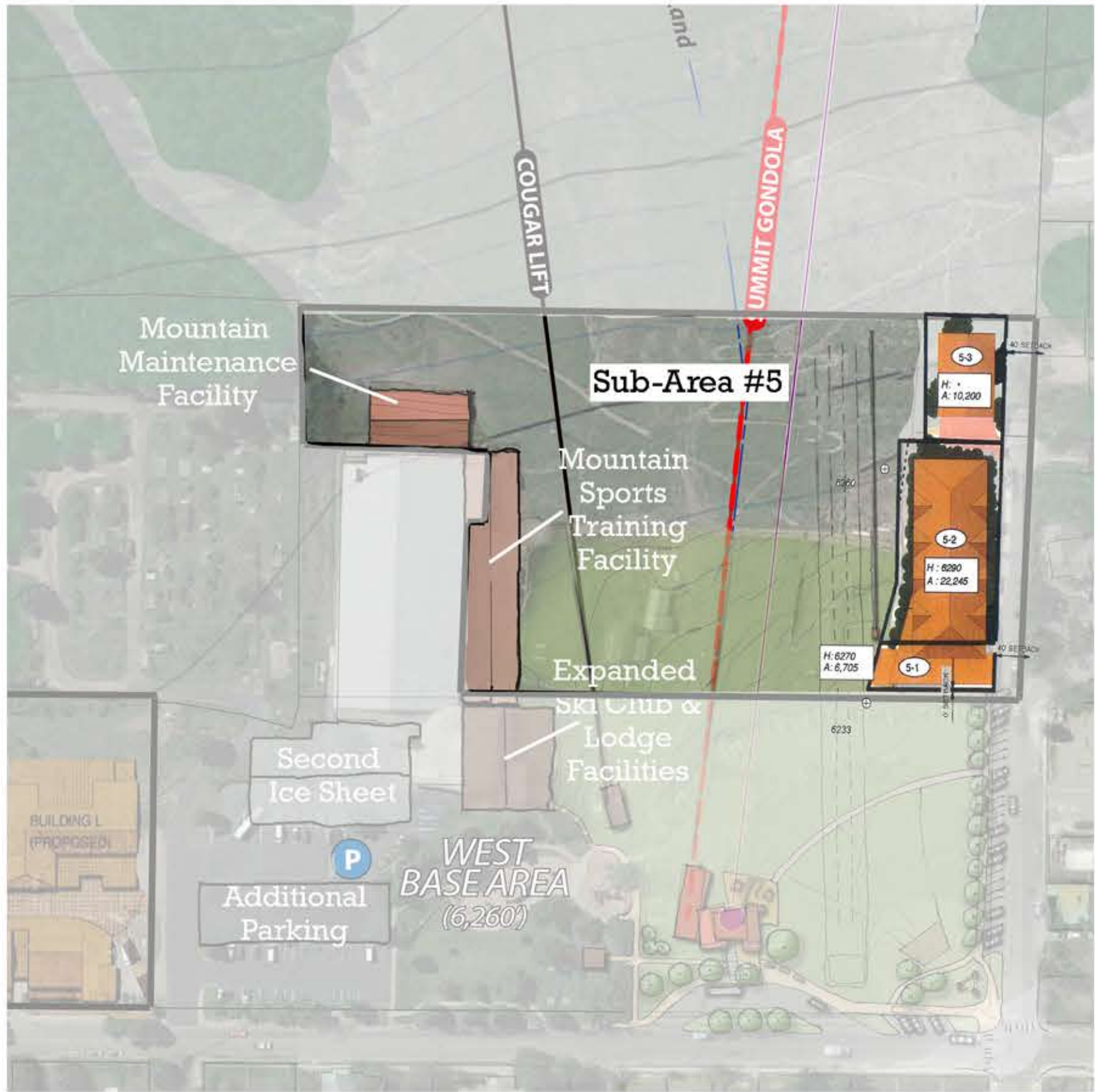


G. Sub Area #4

Sub Area #4 Snow King Mountain Recreation Area & Proposed Employee Housing

Sub-Area 4 primarily consists of Snow King Mountain recreation use area and supporting structures. In addition, this sub-area includes a proposed site for employee housing and mountain operations storage facilities on Vine Street. This building complex is proposed to house enclosed storage facilities on the street level and employee housing on upper levels.

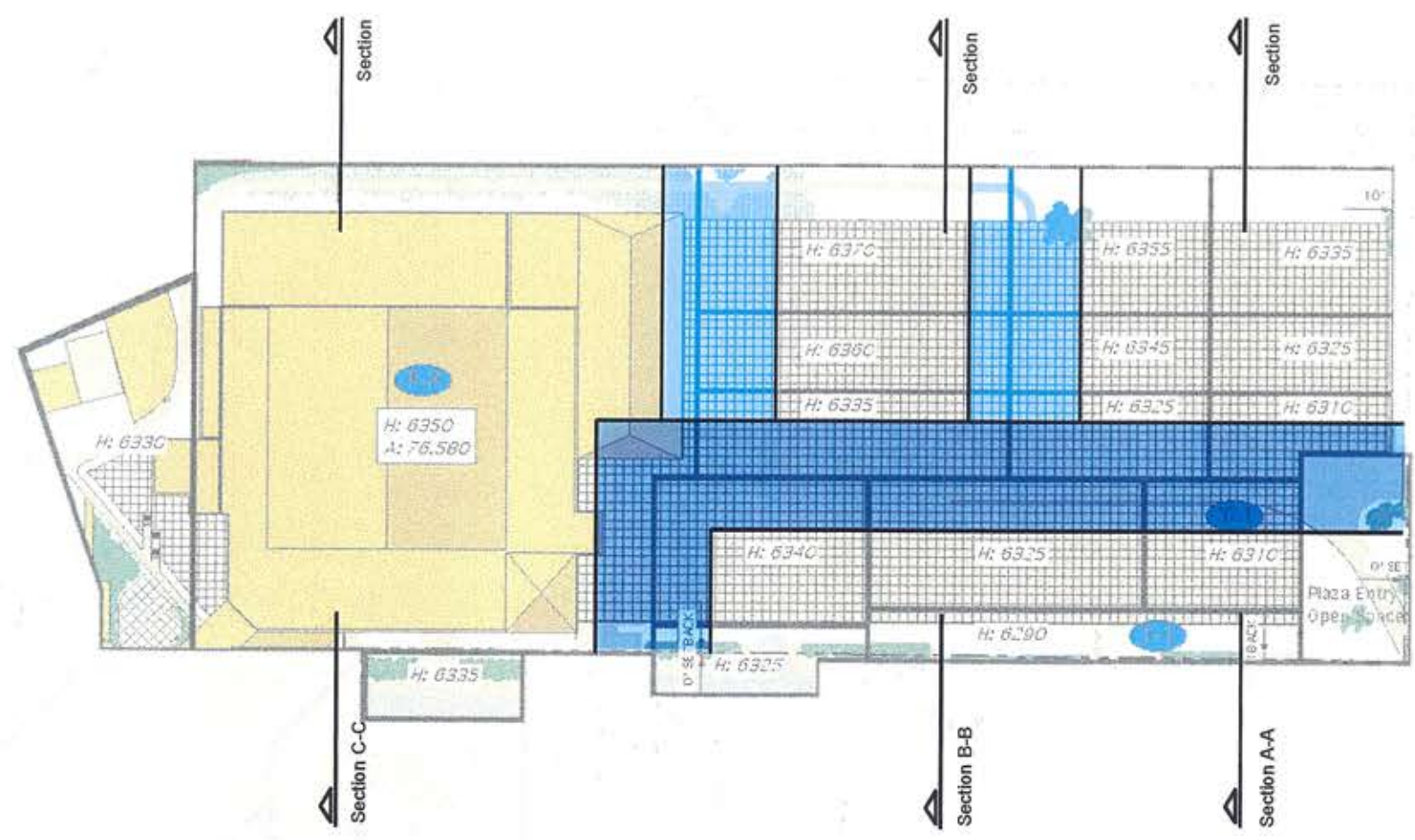
Building Envelope Dimensions • SUB-AREA #4



F. Sub-Area 5

**Sub-Area #5 - Snow King Mountain
West Base Area & One Town Hill**

Sub-area 5 contains the West base area for Snow King Mountain ski area operations and the One Town Hill condominium complex. Future development proposed for this sub-area includes a maintenance facility and office spaces for mountain operations, snowmaking pump house, and a mountain sports training complex. These additional buildings would be attached or constructed adjacent to the existing Snow King Sports and Event Center ice rink. While not directly within this sub-area, a gondola and other recreational activities are also proposed to be located in the parking lot of the existing Phil Baux park to replace the existing Summit lift located within sub-area 5. The location of the gondola in the parking lot allows for more open space at the base of the mountain and the potential for additional green space in Phil Baux park.

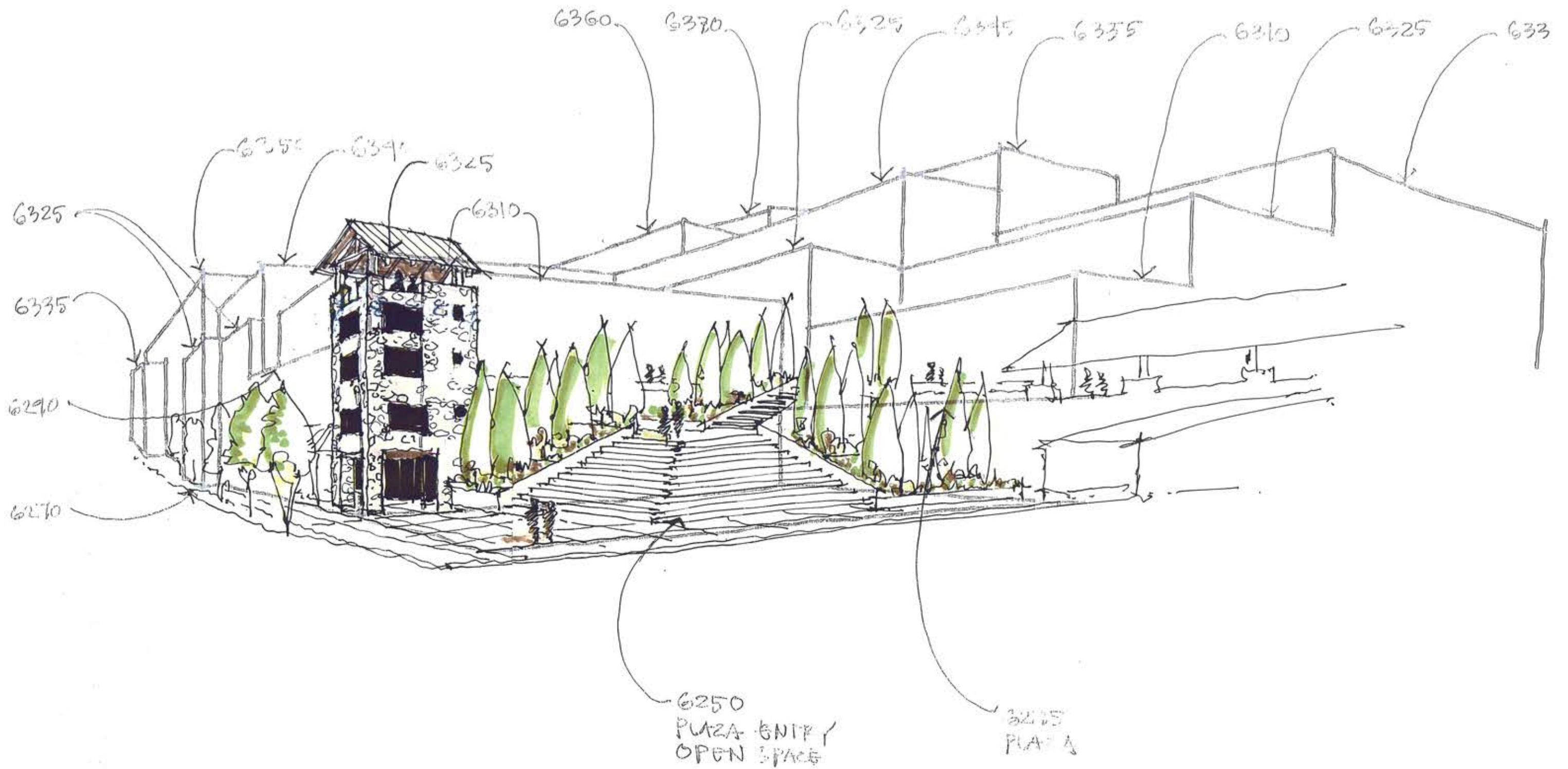


Primary Circulation

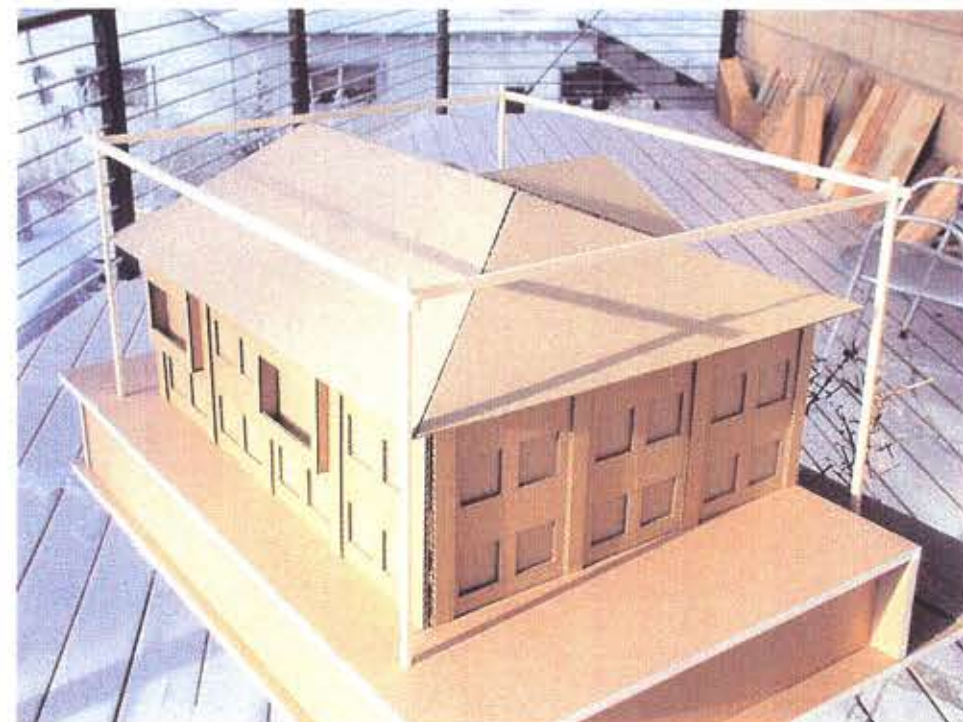
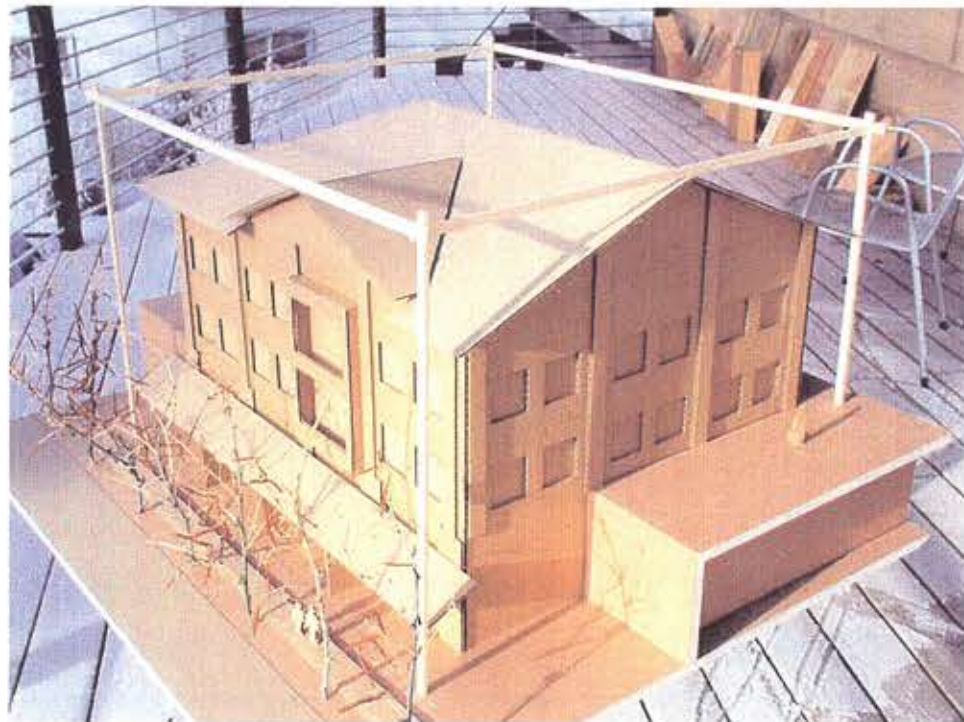


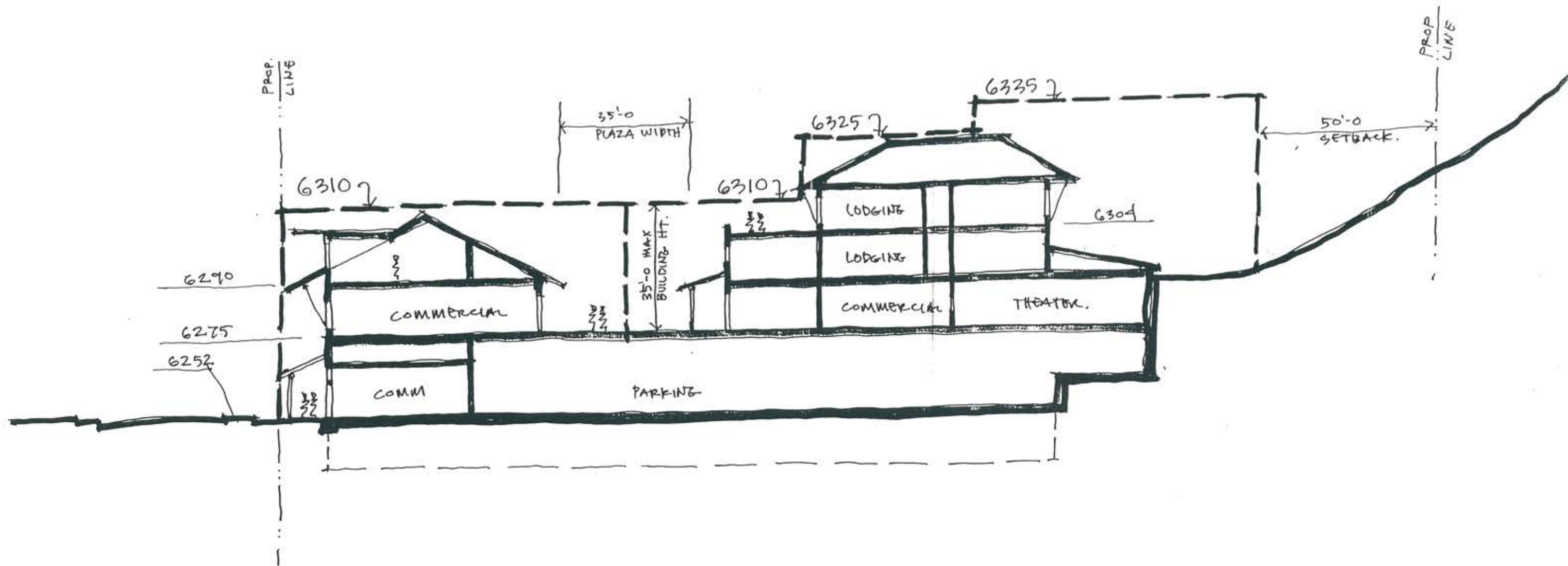
Secondary Circulation

CIRCULATION OVERLAY ZONE



SNOW KING MASTER PLAN (REVISED)
27 FEB 01



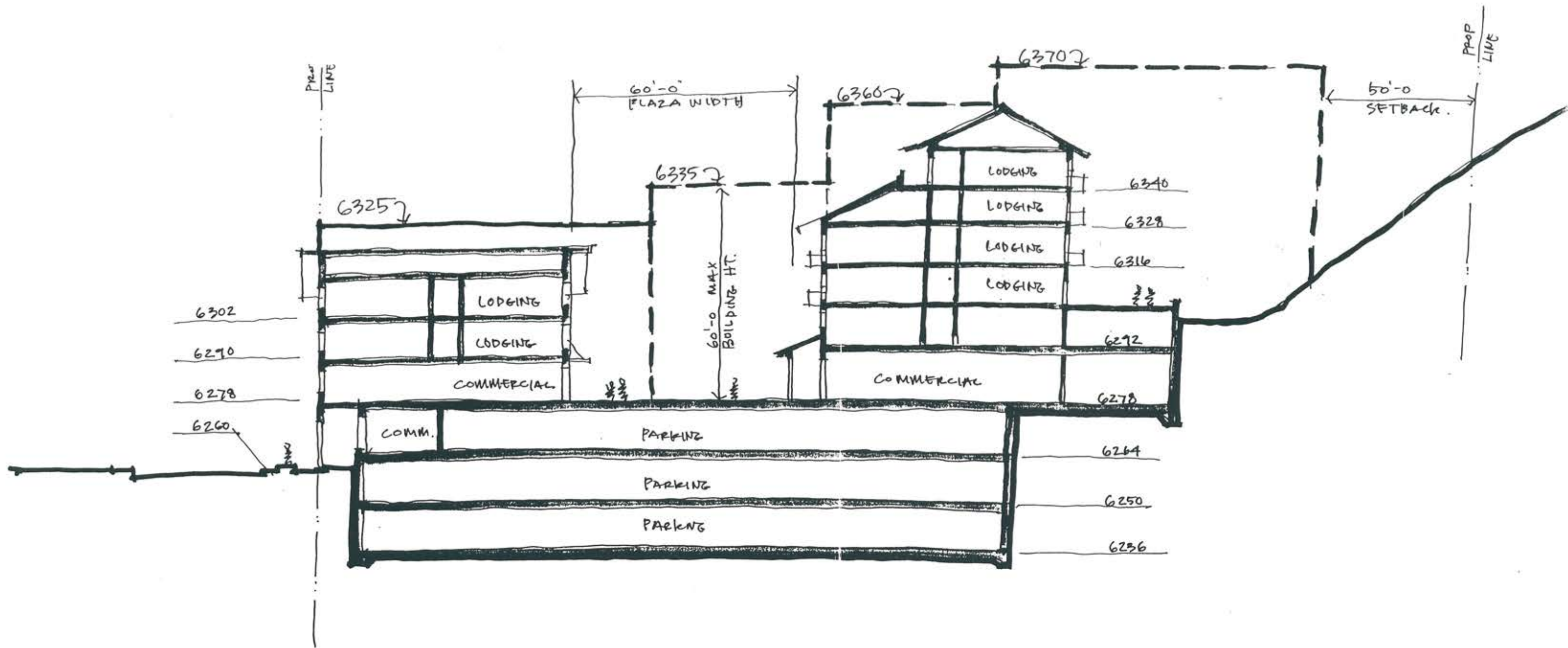


SNOW KING MASTERPLAN

PROPOSED ENVELOPE REVISIONS

14 NOV 00

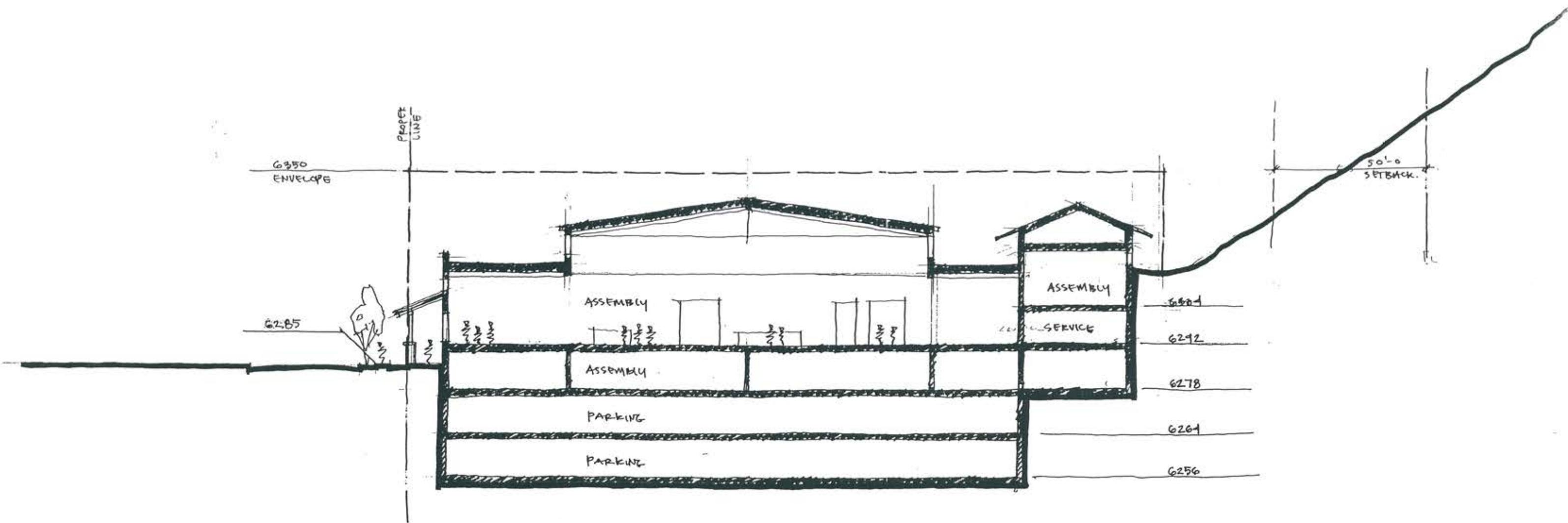
SECTION A-A



SNOW KING MASTER PLAN PROPOSED ENVELOPE REVISIONS.

14 NOV 00

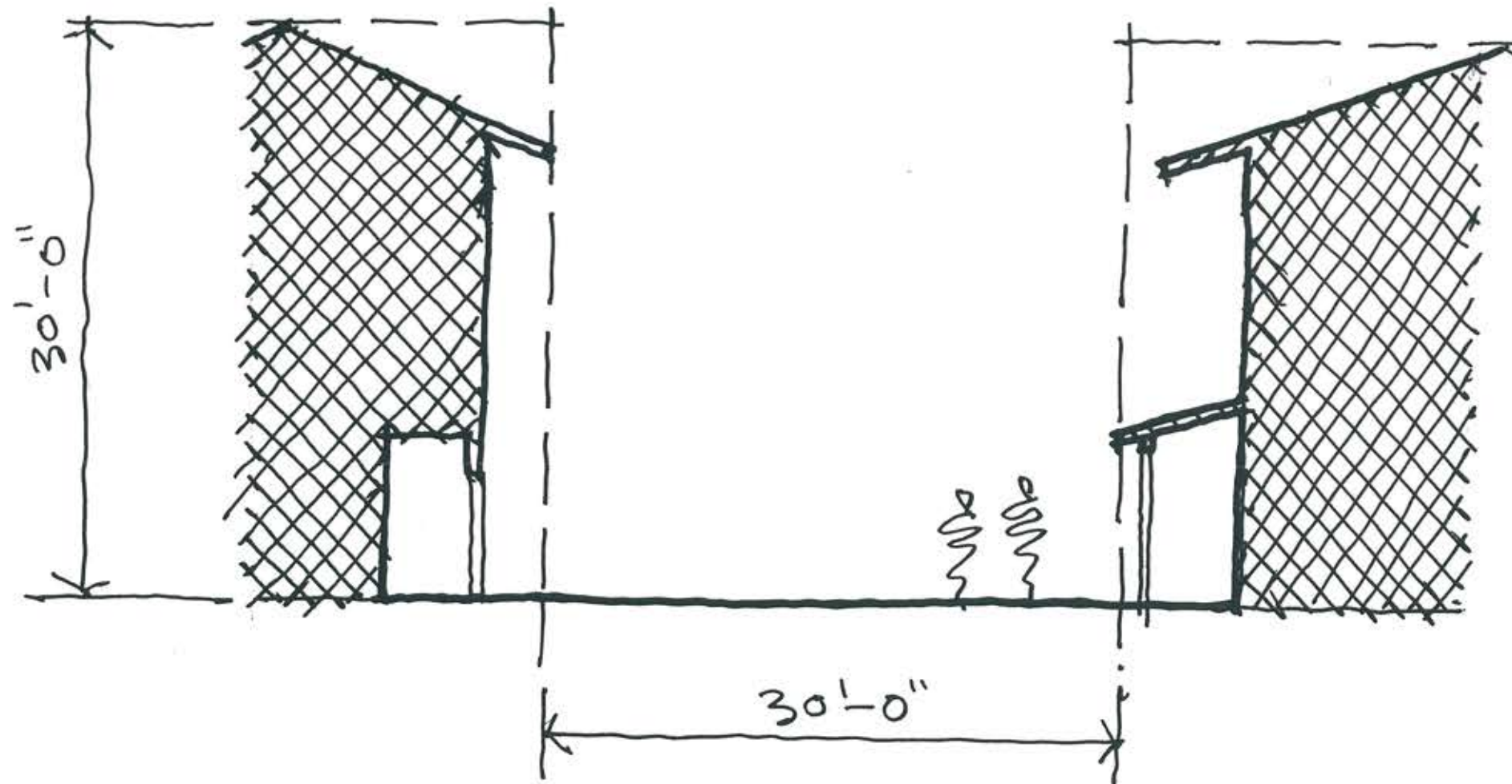
SECTION B-B



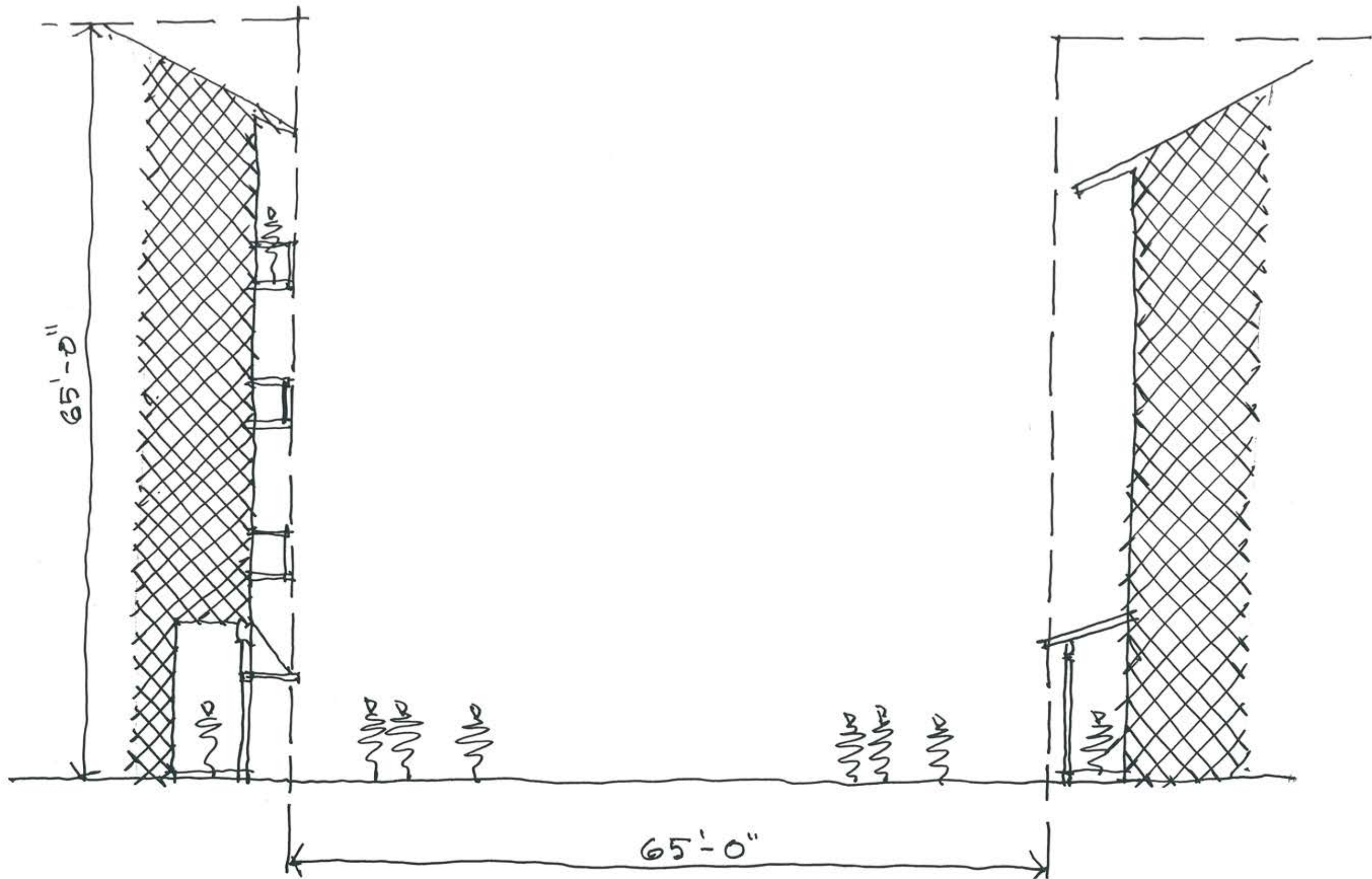
SNOW KING MASTER PLAN · TRANSVERSE SECTION KM-6 CONFERENCE CENTER 1/16" = 1'-0"

20 SEPT 00

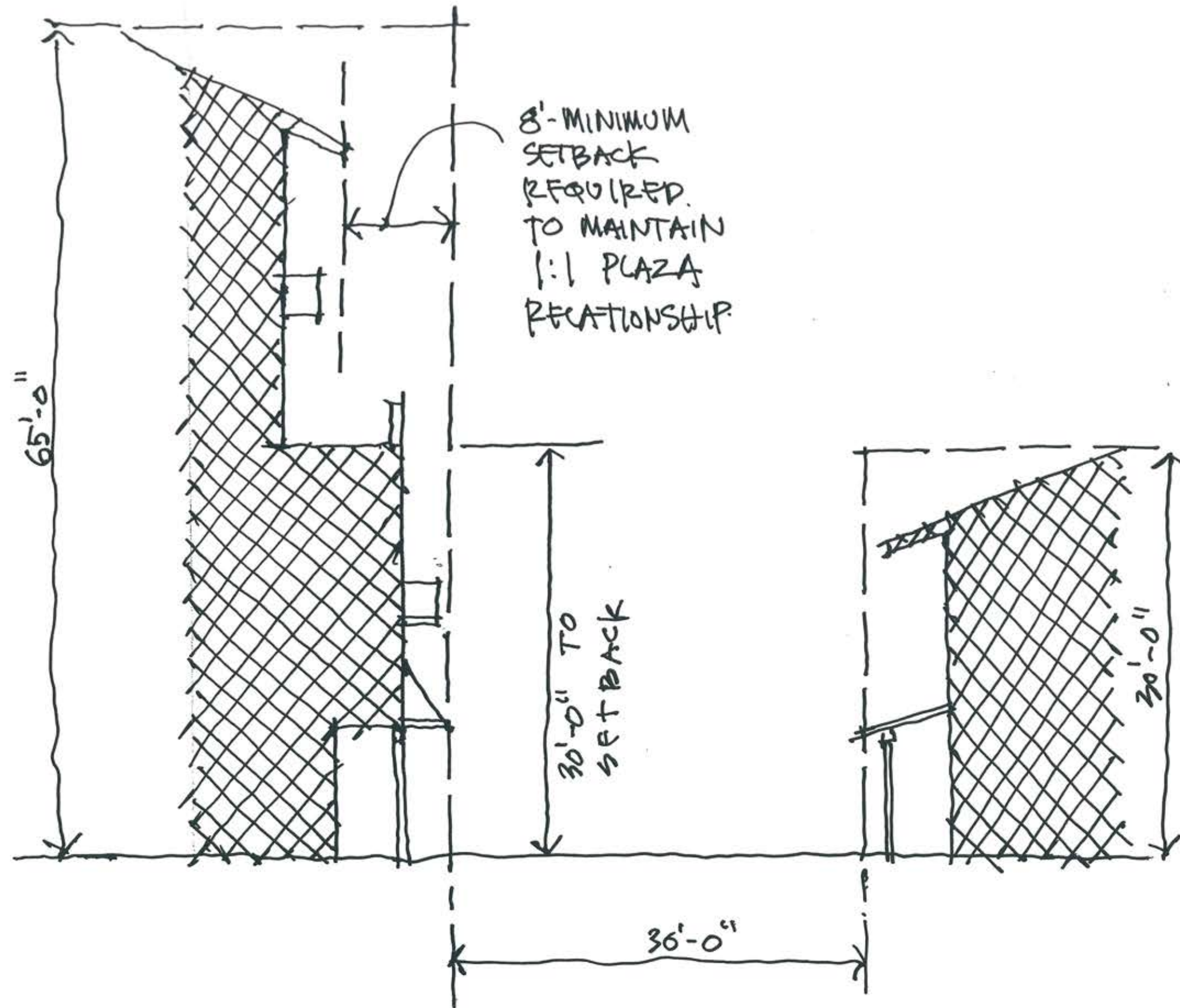
SECTION C-C



SNOW KING MASTERPLAN - PLAZA 1:1 MINIMUM



SNOW KING MASTERPLAN - PLAZA 1:1 MAXIMUM.



SNOW KING MASTER PLAN - PLAZA 1:1 ASYMMETRIC ENVELOPES EXAMPLE

VII. HOUSING ELEMENT

A. Housing Mitigation Plan

Employee housing shall be provided in conjunction with all commercial development and redevelopment at the resort in accordance with the Jackson Land Development Regulations. The applicant for each development or redevelopment permit shall submit a housing mitigation plan that demonstrates compliance with the employee housing requirements that are in effect at the time of the application. All development within the Snow King Resort District prior to 2018 has satisfied employee housing requirements under the existing Resort Master Plan and will not require any additional mitigation in the event of changes to Town and County Land Development Regulations. The following housing mitigation plan pertains to all future development within the district from 2018 into the future.

At least twenty percent (30%) of the employee-housing required for each commercial development shall be provided within the Snow King Resort District. In general, employee housing included in each development is intended to satisfy this requirement, however, the employee housing may be provided at other locations within the resort district.

Housing for Snow King Mountain employees associated with mountain operations such as lift operators, ski patrollers or groomers, is exempt from the 30% requirement and may be provided entirely off site. Administration and maintenance facilities constructed on the maintenance parcel shall also be exempt from this 30% requirement if a restriction on the maintenance parcel prohibiting this use is in place. Resort support uses not related to ski area operations and that include a physical development opportunity for creating employee housing on site, shall provide 30 percent of the required employee housing on the development site or within the resort district.

The applicant is responsible for obtaining all necessary development permits from either the Town or County, for the construction of all employee housing. Approval of all Final Development Plans for any development shall be contingent on approval of any necessary development plans to construct employee housing.

The Snow King Resort Master Association (SKRMA) will be responsible for the general implementation and administration of this Housing Element. Individual developers of specific developments or any property within the resort district will be responsible for building the required housing and SKRMA will coordinate and facilitate the locating of employee housing within the resort district when it is not possible to incorporate the housing in the individual development that generates the requirement. The required employee housing will be developed commensurate and concurrently with the free market development that generates the housing requirement.

This Housing Element will cover all the development that occurs within Sub-Areas 1 through 5 and will be managed following these guidelines:

- SKRMA will be responsible for ensuring that developers within the resort district follow the standards set forth herein and the employee housing requirements in the Jackson Land Development Regulations. Calculations will be based on 100% of the required housing being located within the Town of Jackson. A minimum of 30% must be located within the limits of the Snow King Resort PRD District and an additional 10% within 1 mile of the PRD district boundaries.
- Location of Employee Housing within the Resort District limits will be in a variety of locations to meet the minimum 30% required to be housed within the district. This Master Plan identifies tentative locations of employee housing units within the Resort District. The intent is to, where possible, locate housing in small nodes. Although sufficient areas have been identified within this resort district to accommodate 100% of the

required housing, the object would be to locate, as development occurs, up to 70% of the required housing in other locations, to be determined, within the limits of the Town of Jackson.

- SKRMA will ensure that any developers and/or landowners within the district finance, build, own or sell with required restrictions, and manage the units needed to comply with the Snow King Housing Mitigation Plan, or contract with other entities to do so. When units are owned by others, occupancy of the units will be monitored by SKRMA and deed-restricted as described. All required units will be newly built restricted units. Deed restrictions will specify that occupancy of the units required under this plan will be limited to Teton County employees and their immediate family.

- As part of the 2018 amendment to this master plan, an example development plan has been presented on associated maps indicating an employee housing complex within the resort district located on Vine Street. This location was previously indicated as a maintenance shop facility within the original master plan presentation. It is estimated that this complex would house between 50-100 seasonal employees in dorm style units that share common kitchen and living areas.

- In addition to various forms of housing such as apartments, duplex, dormitories, townhouses, or other types of housing, rental units may be configured in the form of condominiums owned by SKRMA (or its agents). These employee housing condominiums will be managed in accordance with the deed restrictions and other requirements of this Housing Mitigation Plan.
- Housing will be developed in increments in tune with commercial development phases. Developed housing will meet or exceed the required needs of each phase as computed in accordance with this section. When the developed housing exceeds the required needs, this excess developed housing will be credited towards the requirements of future phases.
- The pooling of employee housing requirements over time allows housing units that have been previously constructed and existing in the Snow King resort district to be used to satisfy employee housing requirements for up to fifteen (15) years from the time of the initial occupancy of the units. Housing units that have existed in the Snow King resort district for more than fifteen (15) years, and have not already been approved and counted to satisfy employee housing requirements, shall no longer be eligible to satisfy employee housing requirements.
- Any employee housing units that are built in advanced of requirements stated herein can be used to satisfy employee housing requirements into the future associated with development in the district.
- A housing unit in the Snow King resort district may be used to meet an employee housing requirement only one time. Once the unit has been approved, counted and duly restricted for such purpose, the unit shall not be approved or counted again to meet another employee housing requirement.
- At the time a housing unit in the resort district is approved to satisfy an employee housing requirement, said unit shall be encumbered with a deed restriction that is approved by the Jackson/Teton County Affordable Housing Department. This deed restriction shall comply with the requirements for such a restriction that are established by the LDR and/or the Affordable Housing Department, which from time to time may be amended. The deed restriction shall remain in full force and effect for as long at the encumbered housing unit is counted to satisfy the employee housing requirement.
- Irrespective of the size of the employee housing requirement that may be imposed on any one commercial development, and irrespective of the number of bedrooms that may exist in the housing units, only entire housing units consisting of rooms for sleeping, cooking and living shall be counted to satisfy employee housing requirements. Even if an employee housing obligation requires fewer bedrooms than may exist in a housing unit, the entire unit shall be encumbered with a deed restriction and individual bedrooms shall not be counted separately from the remainder of the housing unit to satisfy an employee housing requirement.
- Employees of entities located within the Snow King PRO will have priority for occupancy in the **SKRMA** controlled units. Other available units will be open for any other Teton County employees.
- All development that existed prior to the adoption of the Snow King Resort Plan is exempt from the requirements of this Housing Mitigation Plan, except for redevelopment or changes of use that would increase the number of required employee housing units. Any future redevelopment or change of use within the "Existing Condominium Parcels" that increase the number of employees within that area, will need to comply with the requirements of this Housing Element at the expense of the development entity.
- The type and layout of housing will vary as time goes by. For planning purposes, we have used averages of 150 SF per person for dormitory housing and 370 SF per person for apartment housing.
- Habitable spaces built within the Snow King Resort PRD District to comply with the requirements of this Housing Element will be exempt from consideration in any maximum development space and FAR computations.
- Since all of the resort-wide development within the District is intended to be classified as commercial,

there will not be a need for any exactions. However, all development will need to provide employee housing as per this Section. Since all residential-type development that is contemplated will be available for short-term rentals, this development will all be considered as commercial and will need to comply with this Section. Any non-commercial and non-short-term rental residential development that may be proposed in the future within the District will need to pay exactions as per the current Land Development Regulations at the time of final Development Plan **Approval**.

- Only entities authorized by SKRMA will be allowed to operate any business within the limits of the Snow King PRD District. SKRMA will require all these entities to provide information regarding the number of employees working within the Snow King PRO District and will collect dues and assessments as needed from employers to compensate SKRMA and its agents for any costs associated with this Housing Element and other requirements of this Snow King Resort **Master Plan**.

- All employee units shall be regularly maintained and kept in a safe, sanitary, livable and rentable **condition**.

VIII. TRANSPORTATION ELEMENTS

A. Snow King Resort Master Plan - Traffic Analysis and Transportation Plan

Overview

Snow King Resort has been successful at encouraging guests of the Resort to walk or utilize existing public/private transit systems for both on-site and off-site events. With moderate improvements to the street and sidewalk system in the vicinity of Snow King Resort, the addition of a convenient Town shuttle system, and implementation of an aggressive Transportation Demand Management program, the existing street system is sufficient to accommodate the projected buildout traffic.

Definitions

The principal terms used to describe the adequacy of transportation facilities are *Capacity* and *Level of Service*. Briefly, the capacity of a transportation facility reflects its ability to accommodate a stream of people or vehicles. In the Third Edition of the *Highway Capacity Manual* (Updated 1997), capacity is defined as the maximum hourly rate at which persons or vehicles can reasonably be expected to traverse a point or uniform section of a roadway during a given time period under prevailing roadway, traffic, and control conditions. Capacity is typically expressed in terms of persons per hour or vehicles per hour (vph). Person flow is important for defining the roles of pedestrian, transit, and high-occupancy vehicle treatments. As the number of buses or high-occupancy vehicles in a traffic stream increases, the number of vehicles that can pass a given point decreases, but the person flow may actually increase.

Level of Service (LOS) is a measure of the quality of the traffic flow. These qualitative measures characterize the operational conditions within a traffic stream (or intersection) and their perception by motorists and pedestrians. These conditions include speed and travel time, freedom to maneuver, traffic interruptions, and comfort and convenience. Six levels of service are defined for each facility designated by the letters A to F. LOS A represents the best operating conditions (no delays, freedom to maneuver, no conflicts, etc.) while LOS F represents the worst (grid-lock).

A variety of factors influence capacity and level of service including:

- Roadway geometry (horizontal and vertical alignment)
- Lane width
- Design speed
- Lateral clearance
- Queuing areas at intersections
- Passing zones
- Vehicle type (percentage of trucks and buses)
- Weather conditions
- Directional flow
- Signalization
- Access control
- Volume of pedestrians and bicyclists
- Land-use characteristics.

C.1 Existing Conditions

Roadway System

Major streets that serve the Snow King Resort are illustrated on **Figure C-1**. The primary access to the Resort is via Snow King Avenue. This route provides access from the west and connects with South Willow Street and South Cache Street to provide access from the northwest. There are no direct roadway connections to the Resort from the north or the east except via minor residential streets (Vine Street and Cache Creek Drive). Snow King Mountain bars access to the Resort from the south. In general, the "grid" street system provides sufficient access to the Resort. Both Cache Street and Snow King Avenue connect with US Highways 26-89-187 approximately 0.70 miles and 1.75 miles, respectively, from the Resort.

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Roadway System Traffic Volumes

Summer daily traffic volumes along Snow King Avenue, Cache Street, and Willow Streets are shown in **Table C-1**. These volumes are from the traffic count data in the 1996 Jackson Hole Transportation Study and additional traffic counts conducted by O'Malley Engineering & Mapping between August 16 and September 2, 1999. This data has also been checked with traffic counts acquired by Nelson Engineering in August/September 1997. Winter traffic volumes are significantly lower than summer volumes and have not been counted or analyzed. The July 1996 counts reflect peak trip-making while the August 1999 are more indicative of the shoulder season and summer season average that is typically used for roadway planning (30th highest hour).

Current two-way August traffic on Snow King Avenue west of South Cache Street is **4,883** vpd (vehicles per day) and **4,298** vpd immediately east of South Cache. Traffic on Snow King Avenue immediately east of Willow Street is **2,654** vpd. Estimated peak traffic volumes (mid-July equivalents) for these roadway segments along Snow King Avenue are 7,700 vpd, 6,100 vpd, and 3,800 vpd, respectively. August 1999 traffic volume on South Cache immediately north of Snow King Avenue is **2,554** vpd. Traffic volume on South Willow Street north of Snow King Avenue is **1,602** vpd. Estimated peak summer volume on South Cache Street is 3,600 vpd and the estimated peak volume on South Willow Street is 2,300 vpd. The significant increase in traffic on Willow and the apparent decrease in traffic on Cache between 1996 and 1999 is likely due to the installation of stop signs on Willow that make Willow a more attractive route into and around the downtown area. Additional improvements to Willow Street, such as extending it through the Multi Agency Campus to form a downtown bypass, will alter traffic patterns between Cache and Willow.

Table C-1

Street Segment	Location	Mid-July 1996 ADT	August 1999 ADT
Snow King Ave.	West of Cache	7658	4883
Snow King Ave.	East of Cache	6055	4298
Snow King Ave.	East of Willow		2654
S. Cache Street	North of Snow King	4863	2554
S. Willow Street	North of Snow King	1215	1602

ADT = Average Daily Traffic

Traffic volumes can fluctuate significantly in the vicinity of the Resort due to the scheduling of special events such as conferences, Rotary lunches, 4th of July fireworks, speaker series, concerts, weddings, and other factors such as poor weather conditions (bringing more visitors into town) and street maintenance. **Table C-2** shows traffic volumes on Snow King Avenue and South Willow Street compared to hotel occupancy. This table indicates that changes in hotel occupancy and alpine slide ridership do not appear to generate fluctuations in traffic volumes.

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Table C-2

Date	Hotel/ Condo	Alpine Slide	Snow King ADT	Willow St. ADT
Mon, 8/16	165 / 39	482	3048	1630
Tues, 8/17	198 / 40	1868	3026	1658
Wed, 8/18	203 / 53	911	2921	1623
Thurs, 8/19	204 / 47	971	2930	1818
Fri, 8/20	204 / 67	980	3013	1731
Sat, 8/21	204 / 65	944	2938	1186
Sun, 8/22	198 / 53	314	2771	1064
Mon, 8/23	184 / 41	1470	2813	1202
Tues, 8/24	145 / 31	744	2341	1626
Wed, 8/25	147 / 18	664	2375	1583
Thurs, 8/26	186 / 22	634	2498	1643
Fri, 8/27	145 / 17	573	2447	1822
Sat, 8/28	171 / 23	646	2112	1397
Sun, 8/29	202 / 61	464	2359	1302
Mon, 8/30	198 / 65	106	2571	1386
Tues, 8/31	205 / 64	299	2415	1988
Wed, 9/1	199 / 63	410	2532	2069
Thurs, 9/2	170 / 40	64	2662	2112

Note: Maximum Occupancy (hotel only) = 204 rooms.

Maximum condominium occupancy = 68 units.

The impact of a Rotary luncheon on traffic volumes can be seen in noontime "spike" in **Figure C-2**. Traffic volume fluctuations for weekday and weekend conditions can be seen in **Figures C-3** through **C-7**. The weekday pattern typically shows a small traffic spike around 8 AM, a larger surge at noon, and the peak traffic occurs around 5 PM. **Figures C-3** and **C-4** compare counts at three locations: Snow King Avenue east of Cache, Snow King Avenue east of Willow, and Willow Street. **Figures C-5** and **C-6** compare typical counts at Snow King Avenue east of Willow and Willow only. **Figure C-7** also includes counts on Snow King Avenue to the west of Cache Street.

Transit Systems

The primary public transportation system operating in Jackson is START (Southern Teton Area Rapid Transit). This transit system (buses and vans) serves the Town of Jackson and limited segments of Teton County (Teton Village). Several private transit and taxi companies also provide service between the Jackson Hole Airport, the Town of Jackson, and Teton Village. In addition, the major resorts and several smaller hotels (Snow King, Jackson Hole Mountain Resort, Grand Targhee Ski & Summer Resort, Spring Creek, Grand Teton Lodge Company, etc.) provide van or bus service for their guests between the airport, Town, and Teton Village.

The typical winter START schedule between Snow King and Teton Village includes round-trip, non-stop bus at 8:20 AM, 9:20 AM, 3:20 PM, and 4:20 PM. The buses pickup and drop-off guests at both the condominiums and the hotel. Other scheduled buses leave the Snow King Resort every 20 to 30 minutes beginning at 7:15 AM and ending at 10:00 PM. These buses travel between the Resort, Town Square: Teton Village and other locations. The Targhee Express bus departs Snow King for Grand Targhee at approximately 7:30 AM and returns at 5:30 PM. During the summer, buses arrive and depart from Snow King Resort every 15 to 30 minutes between 10 AM and 10 PM and at one-hour intervals from 7:30 AM to 9:30 AM. Both the winter and summer schedules will be increased as the Jackson Hole Transportation Plan places more emphasis on public transit.

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In both summer and winter, Snow King Resort utilizes their own buses and vans to shuttle guests to and from the Resort, downtown, and the airport. Depending on flight schedules and demand, Snow King runs between six and fifteen round-trip shuttles per day. For special events, the Resort occasionally charts additional buses and/or utilizes concession buses (provided by float trip operators). **Table C-3** shows the system-wide START ridership for late August 1999. Ridership numbers generated specifically by Snow King Resort as well as private taxi and transit services are not available. Conversations with START personnel indicate a high percentage of riders between the Virginian Campground and Snow King Resort. In general, Snow King generates the majority of ridership on START during the summer. **Figure C-8** shows the 1999 transit routes (summer).

Table C-3

Date	Daily Total
Monday, 8/16	351
Tuesday, 8/17	417
Wednesday, 8/18	302
Thursday, 8/19	335
Friday, 8/20	359
Saturday, 8/21	381
Sunday, 8/22	268
Monday, 8/23	304
Tuesday, 8/24	350
Wednesday, 8/25	265
Thursday, 8/26	197
Friday, 8/27	240
Saturday, 8/28	216
Sunday, 8/29	212
Monday, 8/30	270
Tuesday, 8/31	325
Wednesday, 9/1	261
Thursday, 9/2	255

Pedestrian and Other Non-Motorized Facilities

Snow King Resort is served by a series of 5-foot wide detached and 6-foot wide attached concrete sidewalks along Snow King Avenue. A short section of wooden boardwalk is located on the north side of Snow King Avenue at the Brandywine Fund building. A 3-ft. wide sidewalk is located along the east side of South Cache Street and extends from Snow King Avenue to Kelly Avenue. There are no sidewalks along Willow Street. A series of horse trails and hiking trails diverge from the resort and access various parts of Snow King Mountain and the National Forest lands to the south of the Resort. These trails and sidewalks are shown in **Figures C- 9, C-9A, C-9B, C-9C, C-10, and C-11**.

There are no clear pedestrian routes to the Town Square. Most Snow King guests walk in the street, particularly in the winter, to access other parts of the downtown. The Jackson Hole Pathway System does not access the Resort at this time. Bicyclists use the vehicle travel lanes or parking lanes of Snow King Avenue to travel to and from the Resort. A popular mountain bike and hiking route originates in the upper parking lot and follows a ski area work road up the mountain. Another trail leads easterly toward Cache Creek Drive.

Table C-4 lists pedestrian and bicycle trips in the vicinity of Snow King Resort for several days during August 1999. Conferences and other activities at the Resort significantly increase pedestrian traffic. Cold temperatures and/or precipitation significantly reduce bicycle use and, to a lesser extent, pedestrian use. **Figure C-12** shows the pedestrian count locations and typical pedestrian/bicycle use patterns during late- August 1999. **Figure C-13** shows the pedestrian and bicycle volumes for August 26, 1999. These counts

were conducted between 7 AM and 5 PM only and do not show the significant evening use that occurs between the Resort and the Town Square area. The peak non-motorized count during this study was on August 31, 1999 when 1490 pedestrians and 139 bicyclists were recorded traversing Snow King Avenue adjacent to the Resort. This volume represents approximately 40% of all trips (automobile, transit, and non-motorized) on the Vine-Willow street segment. This pattern typically occurs during major conferences when some activities occur at the Snow King Center. On non-conference days (August 26th) the average number of non-motorized trips between 7 AM and 5 PM is approximately 500. An unknown percentage of the bicycle and pedestrian trips are discretionary recreation-oriented rather than transportation-oriented and, as such, generate additional traffic on the roadway rather than remove motorized trips.

Table C-4

Date & Time	Pedestrian	Bicycle
Thursday, August 26		
7am- 9am	86	25
9am-11am	30	14
11am -1pm	77	47
1pm- 3pm	85	30
3pm - 5pm	73	42
Total	351	158
Tuesday, August 31		
7am-9am	273	14
9am-11am	149	13
11am -1pm	340	31
1pm - 3pm	403	51
3pm- 5pm	325	30
Total	1490	139

C.2 Travel Demand Analysis

Travel demand for the Snow King Resort is determined by correlating existing conditions and traffic counts at the resort with future conditions. Additional information developed includes trip generation (based on Resort buildout), estimated modal split, and peak hour calculations.

Trip Generation

Trip generation for Snow King Resort is focused on summer conditions. Trip generation for Resort buildout is calculated from several factors including: total overnight guestrooms (hotel), total condominium units, commercial uses and densities, and number of employees. **Table C-5** lists existing and proposed conditions, projection rates, and traffic projections for Snow King Avenue east of Willow Street. The Institute of Transportation Engineers (ITE) Trip Generation Manual indicates that typical projection rates for resort hotels vary between 10 and 15 trips per day per lodging unit. Removing the Vine Street traffic counts and the Phibbs Law Office counts from the Snow King Avenue counts (East of Willow) and dividing by the number of lodging units yields an average projection rate of 10.1 trips per day per unit (at full occupancy). According to ITE, hotel condominium units generate between 4 and 18 trips per day per unit with an average rate of 9.5 trips. Teton County has historically used a townhouse trip generation factor of 7.2 trips per unit per day. Dividing the number of condominium units into the number or trips accessing the condominiums yields a trip generation factor of 8.0 trips per day. For these projections a hotel rate of 10.2 and a condominium rate of 8.0 are used. The floor area, guest numbers and conference seats are shown for comparison purposes.

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Table C-5

Use Description	Existing	Proposed	Gen. Rate	Projected Existing ADT	Final ADT
Hotel Rooms	204 ¹	654	10.2	2,080	8,752
Condo Units	38 ²	95	8.0	304	1,064
Employee Housing		65 ³	4		260
Alpine Slide (Rides/day)	900	1,350	*		
Restaurant Seats	47	0	*		
Lounge/Bar Seats	50	0	*		
Total				2,384	10,076
Floor Area	160,000	730,000			
Total Guests	616	1,844			
Conference Seats	250	1,000			

¹ - Indicates maximum occupancy accessed from the Resort.

² = Indicates 204 employees to be housed on-site in 65 - 3 and 4 bedroom units.

* = Indicates projection included in resort (hotel) rate.

ADT = Average Daily Traffic

In general, the trip generation factor of 10.2 yields traffic volumes consistent with the recorded volumes. Minor differences between the recorded and projected ADTs maybe due to several factors including lower hotel occupancy rates, shared uses, and high pedestrian and transit activity.

The projected final ADTs in **Table C-5** reflect a "worst-case" scenario. The Resort may build more condominiums and fewer hotel rooms resulting in lower projected traffic volumes. Also, as shown in **Table C- 2**, changes in room occupancy and alpine slide ridership do not appear to significantly impact traffic volumes. There is a certain amount of "background" traffic along East Snow King Avenue that exists whether the hotel has guests or not. Consequently, the traffic projections in **Table C-5** likely overstate the future traffic volumes.

The traffic volume on Willow Street averages 51% of the volume on Snow King Avenue east of Willow. Assuming no changes to Willow Street (improvements at the MAC campus, installation of one-way pairs, etc.) and no changes in pedestrian, transit, or land uses, the projected traffic volume on Willow Street at Resort buildout is approximately 4,100 ADT. Analysis of **Figures C-2** through **C-7** and on-site observation indicate a significant flow of traffic eastbound on Snow King Avenue and then northbound on Cache and Willow Streets around 8 AM. Between 4 PM and 6 PM there is a similar flow in a southerly direction (on Willow) and a westerly direction (on Snow King).

Modal Split

Lack of data regarding ridership on private bus services, taxis and START at Snow King Resort and incompatible modal counting methodologies make it difficult to accurately determine modal split between automobiles, transit, pedestrians, and bicycles. The available data and conversations with START personnel indicate that Snow King Resort enjoys a high level of transit ridership compared to other areas in Teton County. The best estimate of current transit share is between 1% and 4% of vehicular trips at Snow King Resort. Improvements to summer transit operations (both public and private), emphasis on transportation demand management strategies, improved pedestrian facilities, and the additional of a frequent intra-town shuttle system should increase the transit mode share to 15-20%.

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Snow King Resort is favorably located to reduce the percentage of automobile trips and increase percentages of transit and non-motorized trips. Pedestrian and bicycle trips varied from a low of 17% to a high of 40% of all trips on Snow King Avenue between the Resort and Willow Street. A typical modal split for this roadway segment during the summer is 20% ped/bike and 80% motorized. Estimated modal split of non-motorized trips between the Resort and Town Square is 2%-5% of all trips. Improved sidewalk and trail facilities coupled with frequent and convenient transit facilities will increase summer non-motorized mode share to 15% of all trips. At buildout, transit and non-motorized facilities are estimated to account for 35% of all trips for streets immediately adjacent to the Resort and 25% for other segments. **Figure C-14** shows the proposed Transit and Pathways system for the Resort area. **Table C-6** shows the estimated vehicular traffic for adjacent roadways with 25%-35% modal split.

Table C-6

Street Segment	Current ADT	Projected Trips (No Additional Modal Split)	Projected Trips (25%-35% Modal Split)
SKA - East of Willow	2,384	10,076	6,549
SKA - East of Cache	4,672	12,627	9,470
SKA - West of Cache	5,046	13,637	10,228
Willow	1,627	4,091	2864
Cache	2,991	8,083	6062

Peak Hour Forecasts

Peak hour and 30th highest hour is often a more useful measure of a roadway's capacity than ADT. Roadway planning efforts utilize the projected 30th highest hour to determine whether a roadway segment needs improvement. The 30th highest hour is typically between 70% and 80% of the peak hour(s) and reflects a break in the curve below which the majority of the hours in a year fall. Designing for the 30 highest hour provides the best balance between cost and function. The peak hour in Jackson is likely to occur around the July 4th holiday weekend. The 30th highest hour for Jackson would typically represent the highest daily hour in June or August. It is reasonable to assume that the peak hours identified in the traffic counts conducted at Snow King Resort during August 1999 reflect the 30th highest hour.

The peak hour averages 9.1% of the 24-hour total for the streets in the study area. The directional flow split at peak hour can be as great as 65/35. This directional split occurs during the AM and PM peaks when people are going to or from work. The projected peak hour counts for the study area are shown in **Table C-7**. These peak hours are based on the 25%-35% modal split projections listed in Table C-6.

Table C-7

Street Segment	Current Peak-Hour Traffic Per Lane	Projected Peak-Hour Traffic Per Lane
SKA - East of Willow	141	387
SKA- East of Cache	276	560
SKA - West of Cache	298	605
Willow	96	169
Cache	177	359

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C.3 Level of Service

Street and Intersection Level of Service (LOS)

This analysis utilizes the *Highway Capacity Manual* prepared by the Transportation Research Board for two-way and four-way, stop-controlled, non-signalized intersections. Steps required to determine intersection capacity include:

- Define existing geometry and traffic conditions for the intersection.
- Determine the conflicting traffic through which each minor road movement and major road left turn movement must cross.
- Determine the size of the gap in the conflicting traffic stream needed by vehicles in each movement crossing a conflicting traffic stream.
- Determine the capacity of the gaps in the major road traffic stream to accommodate each of the subject movements that will use these gaps.
- Adjust the calculated capacities to account for impedance and the use of shared lanes.
- Estimate the average total delay for each of the subject movements and determine the level of service for each movement and for the intersection.

Specific information required for the calculations include:

- Volumes by movement for the hour of interest.
- Vehicle classification for the hour of interest.
- Peak Hour Factor.
- Number of lanes for minor and major streets.
- Grade of all approaches.
- Other geometric features of interest.

The methodology outlined in the *Highway Capacity Manual* utilizes gap acceptance modeling to determine the interaction of minor street and major street drivers. This modeling technique assumes that Two-way, Stop-Controlled intersections (TWSC) give no positive indication or control to the driver on the minor road as to when it is safe to leave the stop line and enter the major traffic stream. This modeling is based on three elements: the size and availability of gaps, the value of these gaps, and the relative priority of the various traffic streams.

The level of service criteria is given in **Table C-8**. Total delay is defined as the total elapsed time from when a vehicle stops at the end of the queue until the vehicle departs from the stop line. The average total delay for any particular minor movement is a function of the service rate or capacity of the approach and the degree of saturation.

Table C-8

Level of Service	Average Total Delay (seconds/vehicle)
A	<5
B	> 5 and <10
C	>10 and <20
D	> 20 and < 30
E	> 30 and < 45
F	> 45

The *Highway Capacity Manual* does not include a methodology for determining level of service for urban streets that are stop-controlled rather than signalized. Extrapolating from the methodologies for arterial streets, it appears that all streets in the vicinity of Snow King Resort are functioning at a level of service of NB. During peak hour congestion, the intersections at Willow - Snow King Avenue (for the Willow Street southbound leg) and Cache - Snow King Avenue degrade briefly to LOS C. The conditions on Cache Street will be influenced more by land use decisions for the downtown core than by the Snow King Resort.

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Estimates of level of service for this street and Snow King Avenue to the west of Cache are based on the traffic projections in the Jackson Hole Transportation Plan. At Resort build-out, Snow King Avenue west of Cache will reach LOS *C/D* for several hours during the day and the intersection at Cache will also function at LOS D during peak hours. The intersection at Willow will reach LOS D at peak hour. Presumably, the Willow - Snow King Avenue intersection will be converted from two-way stop-controlled intersection to four-way stop controlled intersection - improving the level of service to 8/C.

Sidewalk/Pathway Level of Service

Methodologies for determining LOS for sidewalks and pathways are poorly developed at this time. Until the fall of 2000, lack of sidewalks along Snow King Avenue and Willow Streets forced pedestrians *to* share the roadway with automobiles, buses, and trucks - for a LOS of D-F. The addition of sidewalks to these streets has raised the pedestrian LOS to A/8. (See **Figures 9, 9A, 9B, and 10**)

C.4 Transportation Demand Management Program.

Transportation Demand Management Strategies

The purpose of a Transportation Demand Management program is to establish strategies that influence travel mode choice and minimize the use of single-occupant automobiles. These strategies are typically a combination of incentives (to transit and non-motorized modes) and disincentives (to single-occupancy automobiles). These TOM strategies are often financially based but can also utilize other management techniques such as marketing and housing. The primary goals are to reduce traffic congestion by reducing vehicular trips, reduce air pollution, and increase mode choice. Snow King Resort has already adopted some of these strategies, in particular the Resort provides free shuttle service for its guests to the airport, Teton Village, and downtown. The following list outlines some of the strategies necessary to influence mode choice and reduce automobile trips.

- Provide free or reduced-rate bus passes to employees and hotel guests (as part of the room package). Inform guests of the availability of transit and non-motorized modes prior to arrival.
- Continue (and increase frequency of) shuttle to Teton Village and Airport to encourage guests to use transit rather than renting automobiles.
- Provide employee ride-share incentives. Provide free parking for multi-occupancy vehicles and paid parking for single-occupancy vehicles.
- Continue to have groups as a large percentage of the lodging business.
- Construct the majority of development in a dense pattern near the shared parking area.
- Support and participate in community wide mass transportation invitations.
- Promote alternative travel modes through advertising and marketing.
- Provide "town" bikes at a nominal rate for guests.
- Coordinate with Town to provide a frequent and convenient Town Square - MAC Campus - Snow King shuttle system.
- Coordinate with the Town to provide improved sidewalk and pathway systems along Willow, King, and Cache.
- Provide information and reservation services and staging areas for float trips, snowmobile operators, and other tour operations.
- Develop parking district with combination of free and fee parking.
- Provide on-site and nearby employee housing.

A combination of two or more of the above strategies is essential if the modal-split assumptions listed in **Table C-6** are to be realized.

Another strategy to reduce vehicle trips in the downtown (although not necessarily along Snow King Avenue) is to provide additional parking at the Resort to be used for downtown employee parking. In combination with a convenient in-town shuttle system, capturing employees at Snow King will help reduce traffic along West Broadway, Pearl Avenue, and Cache Street. Employees will be less likely to use their vehicles during the day for errands and more likely to walk or use the shuttle. An employee parking lot at the Resort is likely to generate only two trips per day per parking space (incoming and outgoing) rather than the more typical six to

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ten trips per day. During the winter, this extra parking could also be used as an in-town Teton Village parking lot. In combination with a non-stop bus to the Jackson Hole Mountain Resort, this parking area will be more convenient for Town residents than the Stilson lot and will minimize trips along West Broadway, Highway 22, and Highway 390.

Travel Demand Management Monitoring system

A TOM monitoring program helps insure that the TOM program meets the goals of reducing single-occupancy vehicle trips and increasing the use of alternative travel modes. The following items should be considered as part of the monitoring program:

- Prior to issuance of a building permit for the first approved Final Development Plan, conduct baseline traffic counts for all modes.
- Every three years, conduct 24-hour traffic counts, pedestrian counts, bicycle counts, parking counts, and transit counts. These counts shall begin two years following completion of the first Final Development Plan project.
- Conduct guest and employee surveys to determine mode choice, success of alternative traffic modes, and satisfaction with transportation options.
- Conduct parking surveys to determine parking utilization by employees, guests, locals, and other visitors.
- Correlate hotel occupancy with traffic counts and available transportation options.
- Survey transit providers (public and private) to determine utilization during peak travel periods. Maintain a database of transit ridership.

The primary gauge of the effectiveness of the TOM program will be whether or not there is a relative reduction in the peak hour traffic counts. The goal of the TOM program is to reduce the projected build out trips by 25%- 35%. Other measures of effectiveness will include the number of transit riders vs. hotel occupancy and/or traffic counts, parking counts vs. hotel occupancy, and ped/bike volumes vs. traffic counts.

C.5 Recommendations and Proposed System Improvements

Figure C shows proposed street parking, sidewalks, and bicycle lanes on Snow King Avenue associated with conceptual changes to the parking and pick-up/drop off area associated with Phil Baux Park. The goal of these changes is to continue providing accessible parking for Phil Baux Park while increasing the green space of the park. With the growth of bike use on Snow King Avenue, a clearly delineated bike lane is an important addition for improving safety and increasing the use of alternative modes of transportation to and from the resort. The Snow King Mountain Resort expects to participate with the Town in funding the street improvements on Snow King Ave adjacent to Phil Baux Park and on South Cache adjacent to the park.

Snow King Resort will participate with the Town in developing the most effective transportation network for the Snow King area and the downtown. The Resort looks forward helping formulate the best routes between the Resort and the MAC/Town Square area as well as determining an equitable cost-sharing arrangement for transit, streets, and sidewalks.

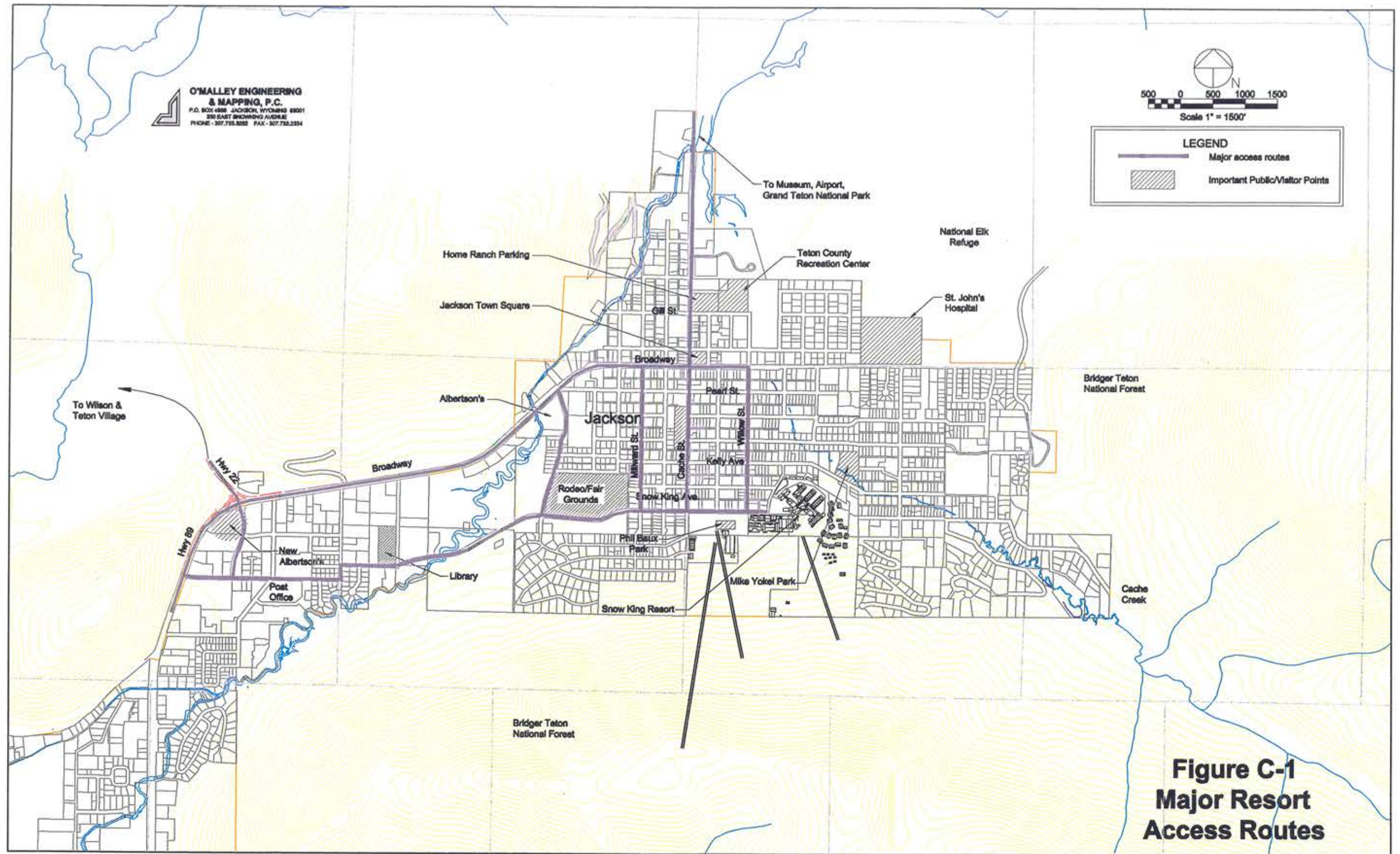
C.6 Phasing Plan

Snow King Resort anticipates coordinating sidewalk and street improvements with the Jackson Transportation Improvement Projects (JTIP). The final sidewalk and landscaping along the south side of Snow King Avenue will be constructed with the parking and plaza facilities. Depending on funding for Jackson sidewalks in the Capital Improvement Fund, intersection improvements at Willow Street will be constructed prior to major reconstruction at the Resort. Sidewalk improvements to South Cache Street, South King Street, and South Willow Street will also depend on the Jackson Capital Improvement Fund. Snow King Resort anticipates cost-sharing some of the improvements at Willow-Snow King intersection.

Actual timing of improvements will be influenced by the results of the Transportation Demand Management Monitoring Program. However, it must be recognized that the success of both the pedestrian and transit

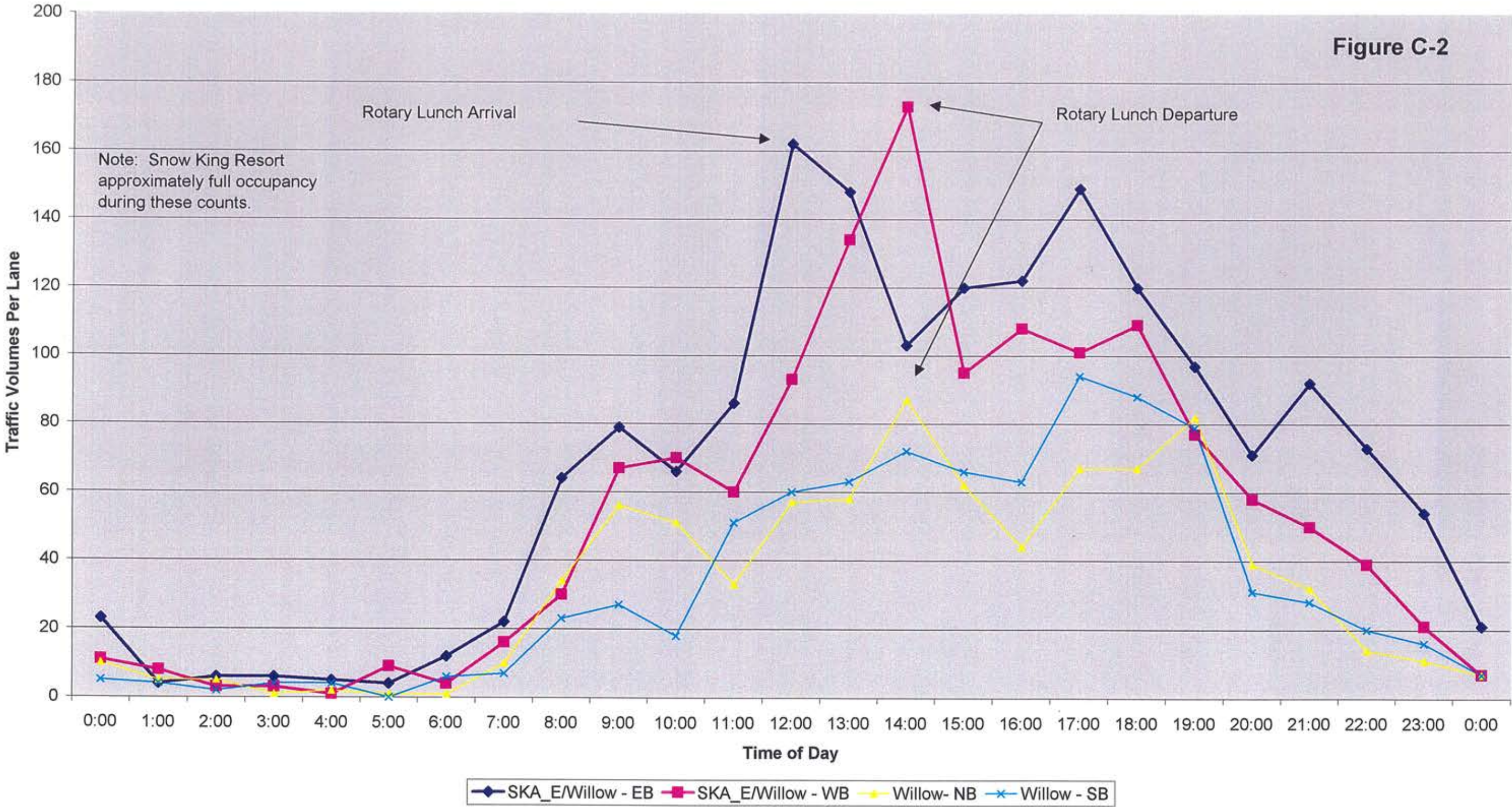
systems are interrelated. It is unlikely that shuttle and transit ridership will increase without improvement to pedestrian and bicycle facilities. People are more willing to walk if they have the option to ride (on a shuttle) some of their route. Studies indicate that most people are unwilling to leave their vehicles and walk or use transit unless these facilities are convenient, safe, go to the desired destinations (Town Square, Teton Village, Airport, etc.), and function (in the case of transit) in a timely manner. Town land use patterns and the Town Parking Masterplan also influence the transit program. Aggressive efforts to minimize employee parking in the downtown core will only succeed with convenient satellite parking (including Snow King Resort), safe and well-maintained sidewalks, and efficient transit facilities.

As part of the Resort Transportation Demand Management Program and in cooperation with the Town of Jackson, a town shuttle system should be begun as soon as possible. Construction of sidewalks (South Cache, South King, and South Willow) and intersection improvements adjacent to the resort should be completed prior to the traffic volumes along Snow King Avenue reaching 1.5 times current volumes - and sooner if possible.

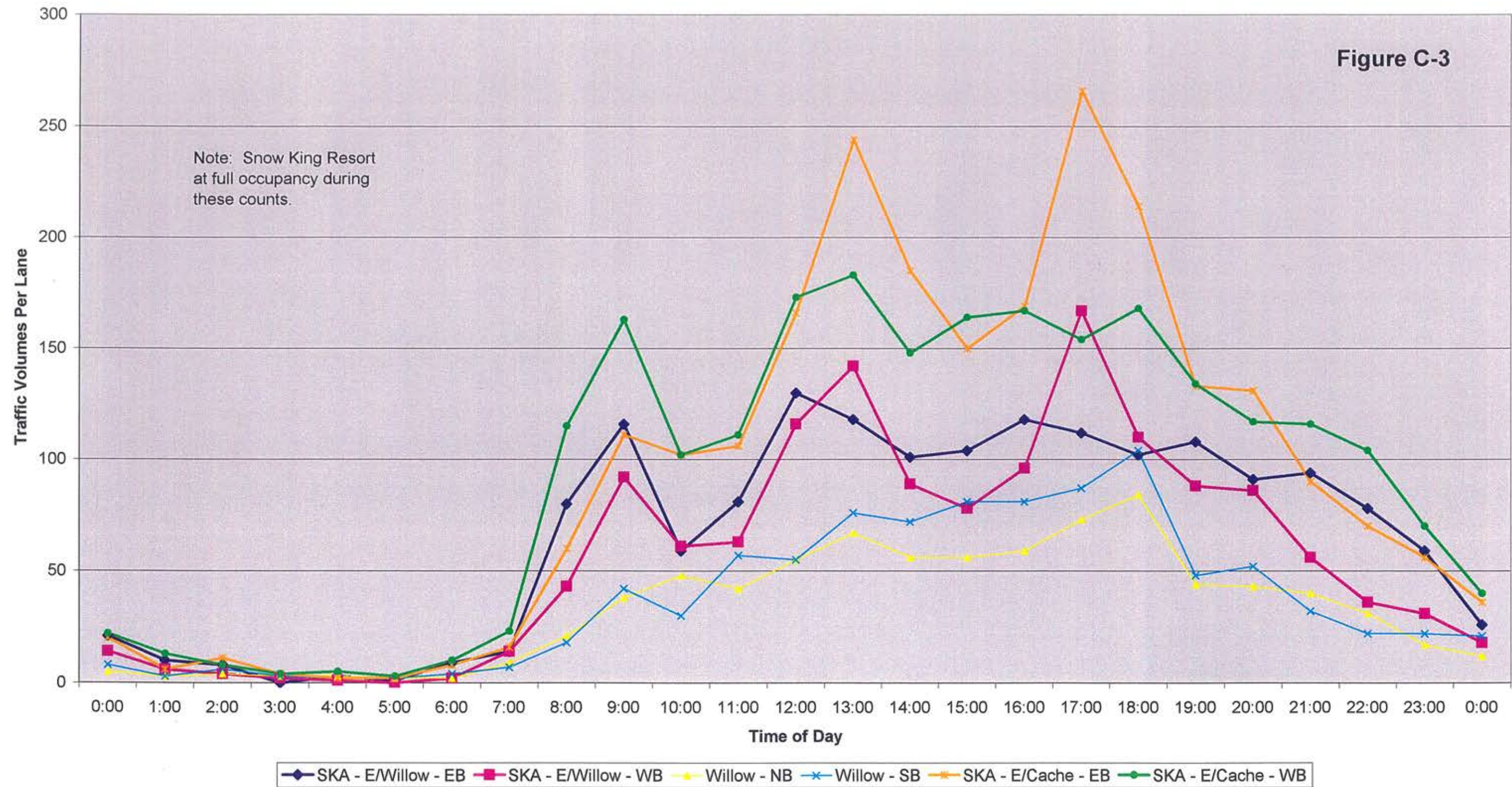


**Figure C-1
Major Resort
Access Routes**

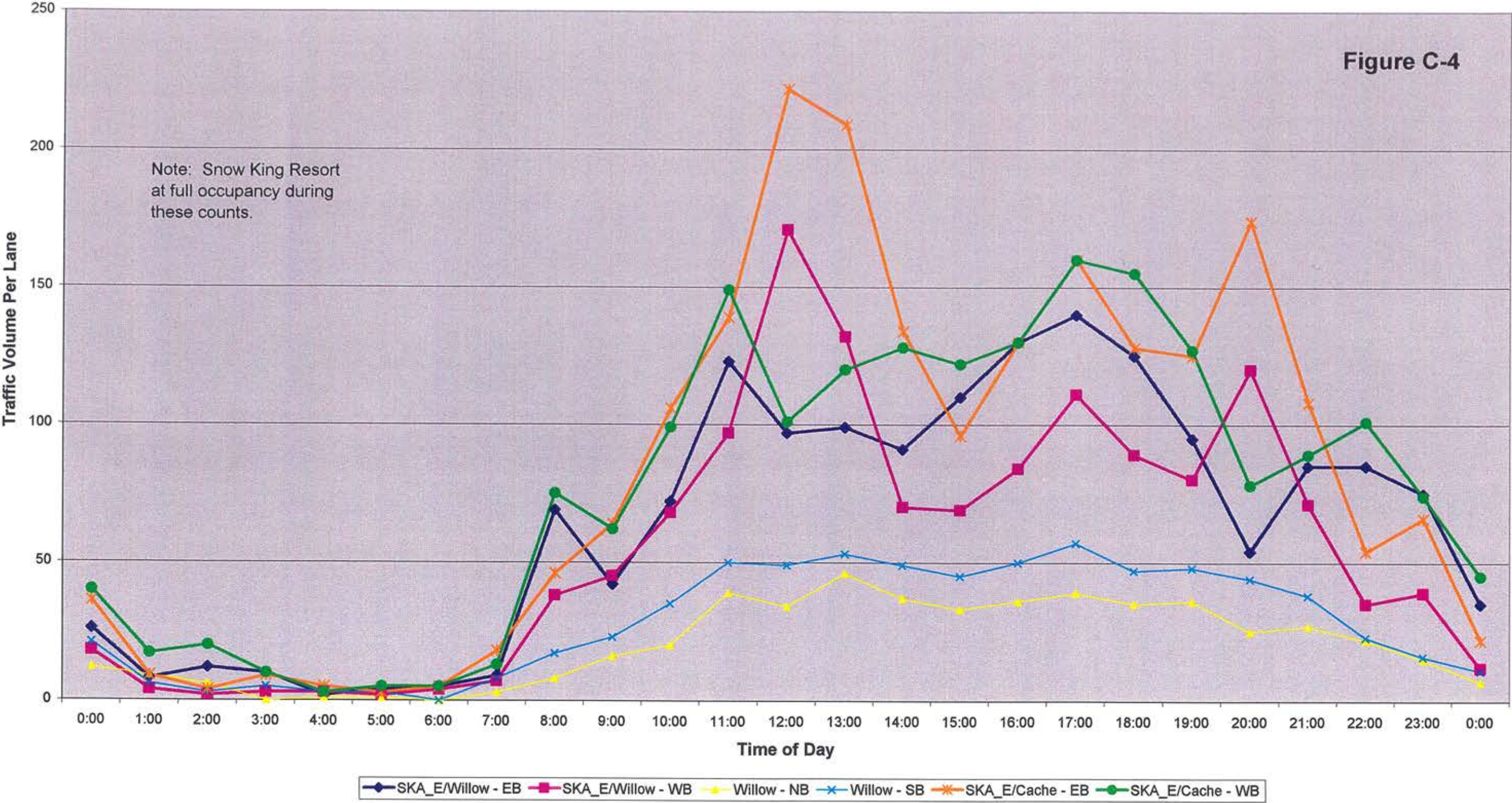
Snow King Avenue Hourly Traffic Volumes - Tuesday, August 17, 1999



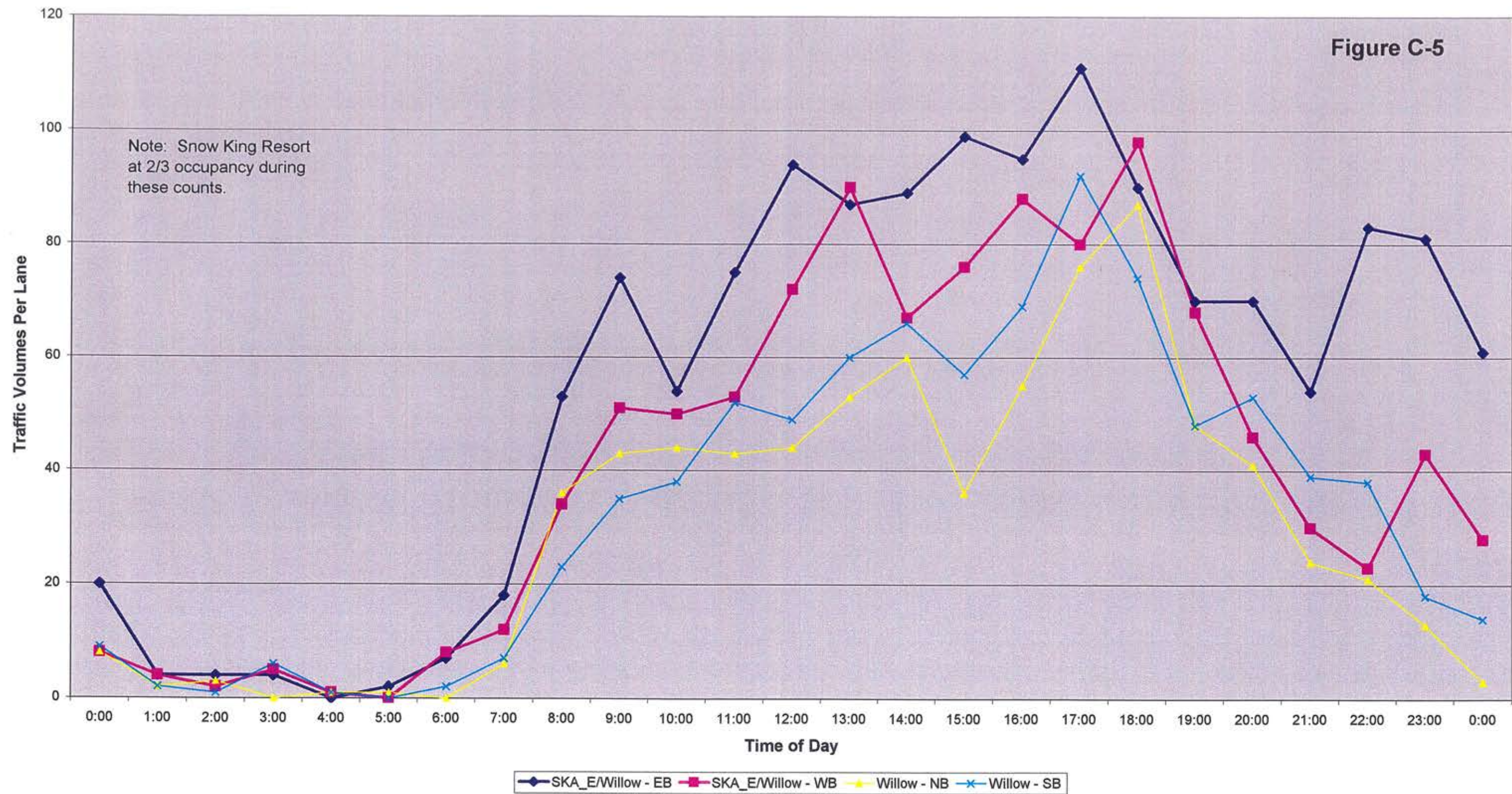
Snow King Avenue Hourly Traffic Volumes - Friday, August 20, 1999



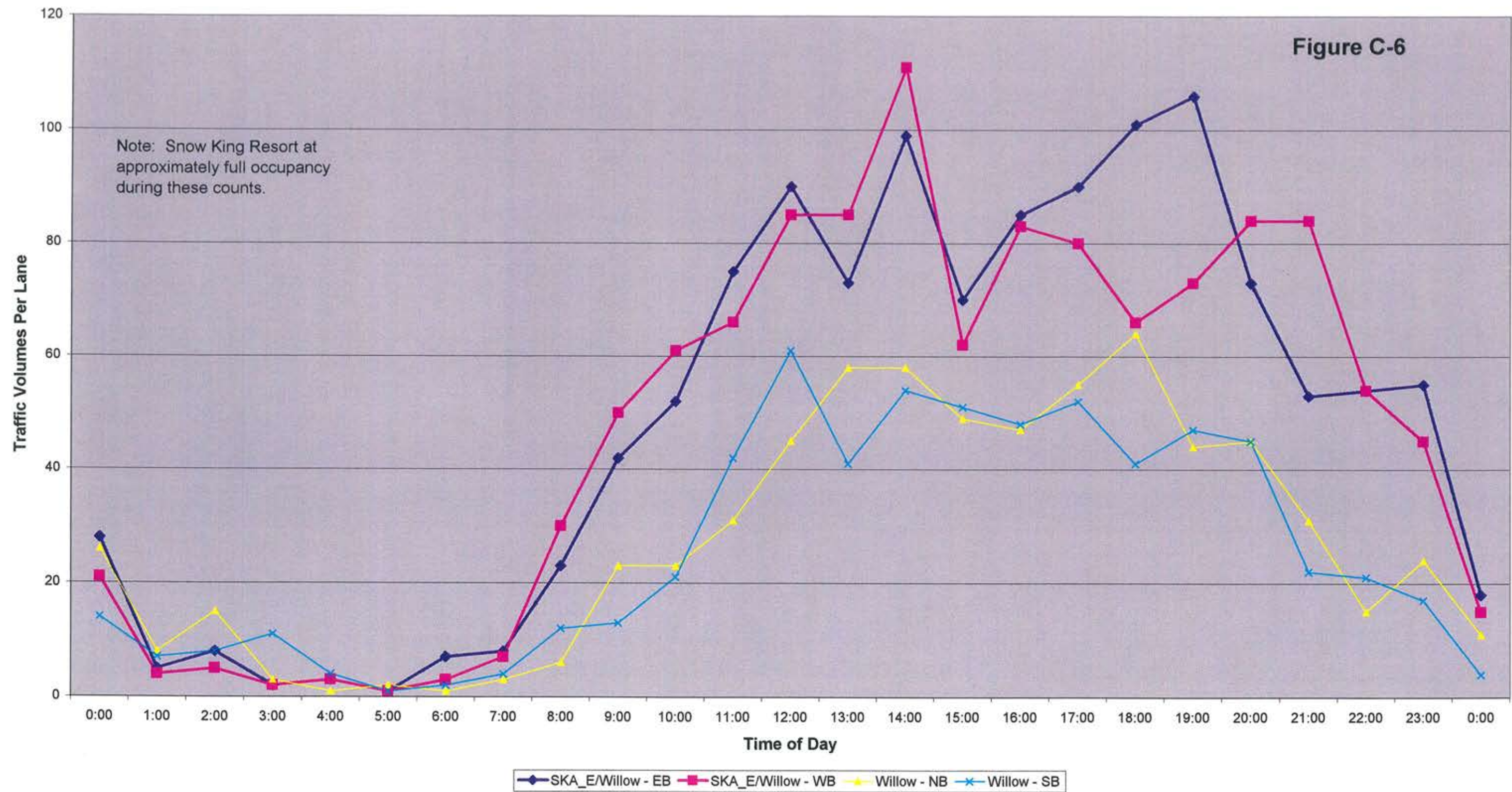
Snow King Avenue Hourly Traffic Volumes - Saturday, August 21, 1999



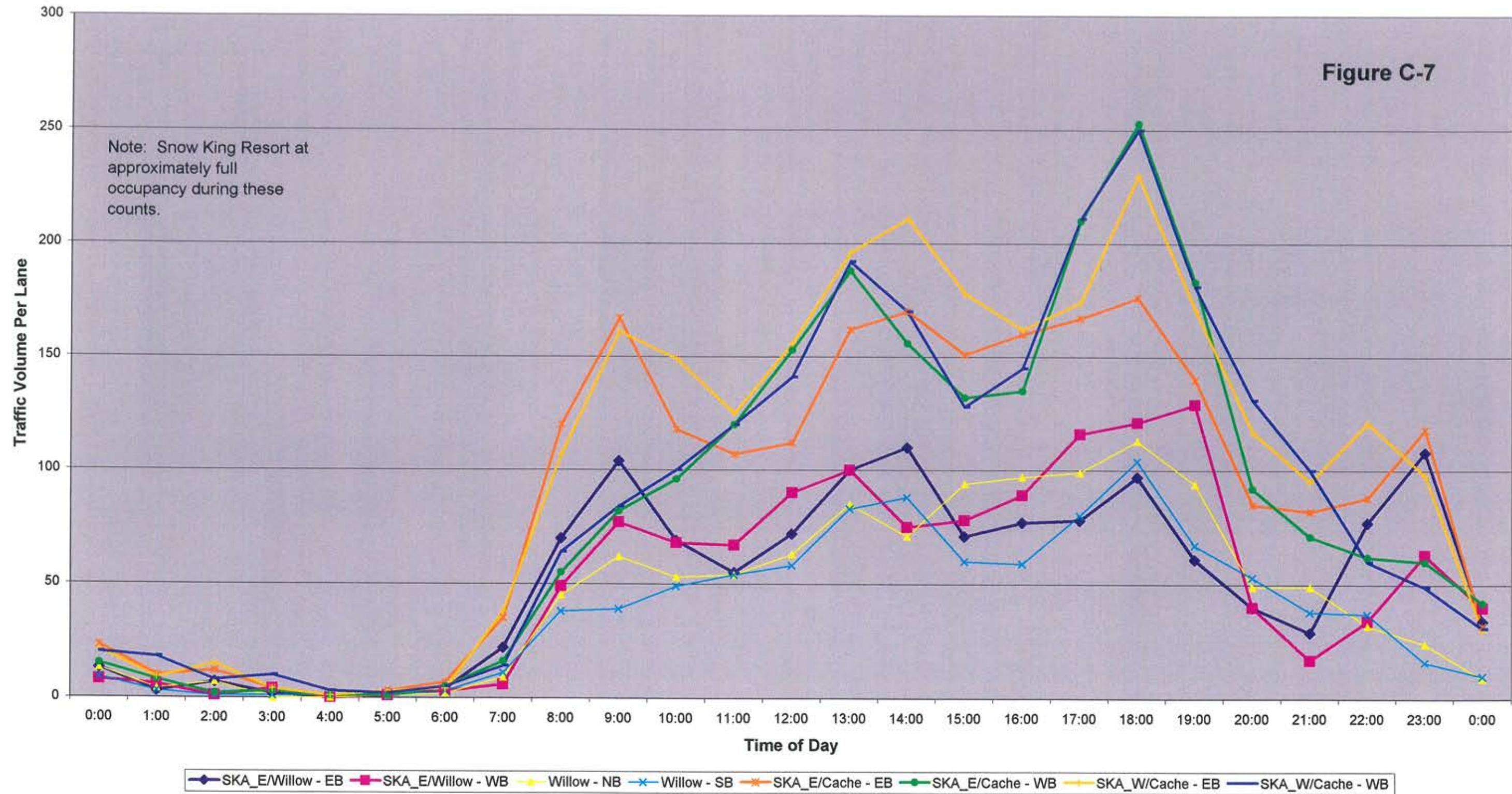
Snow King Avenue Hourly Traffic Volumes - Wednesday, August 25, 1999

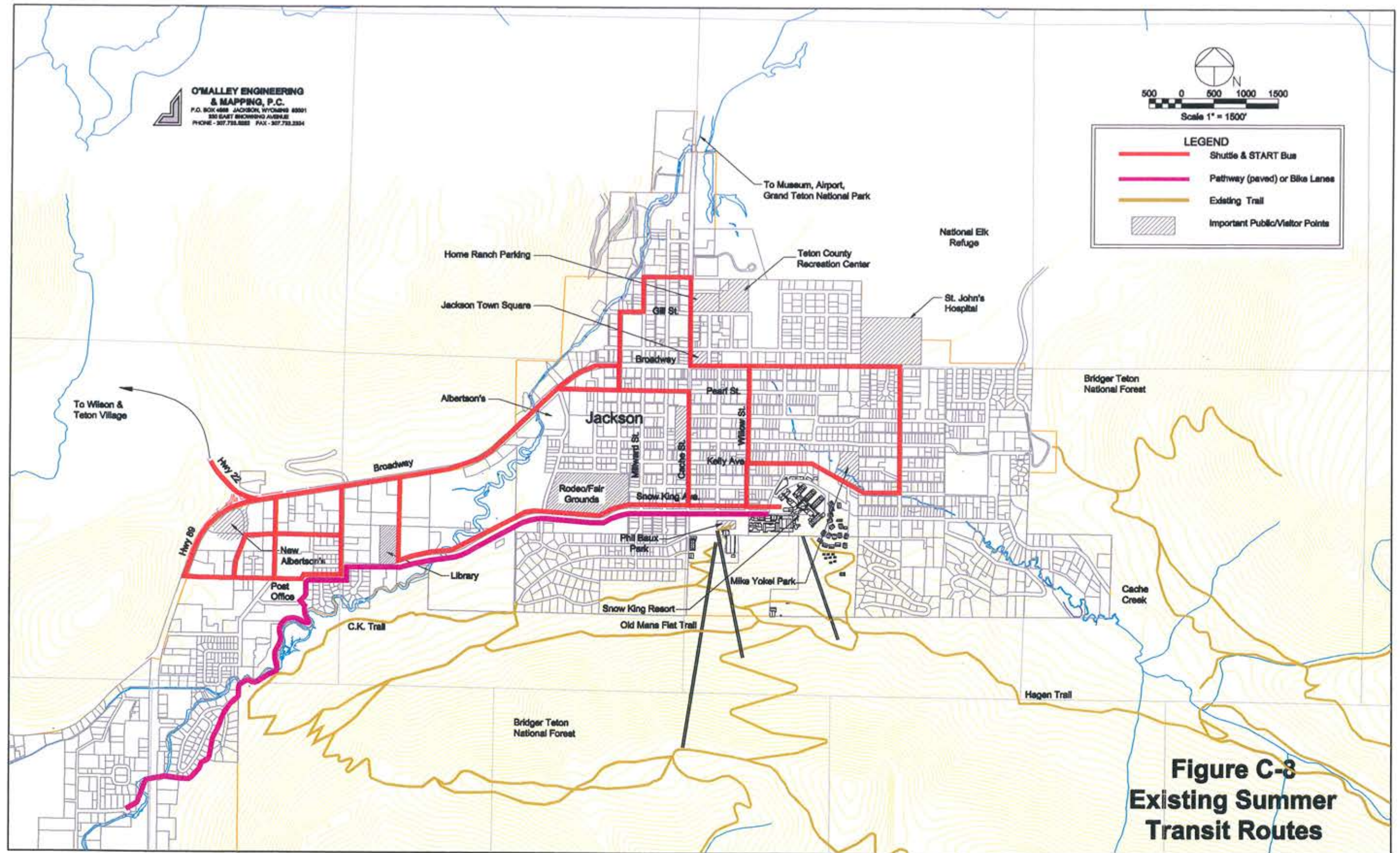


Snow King Avenue Hourly Traffic Volumes - Sunday, August 29, 1999

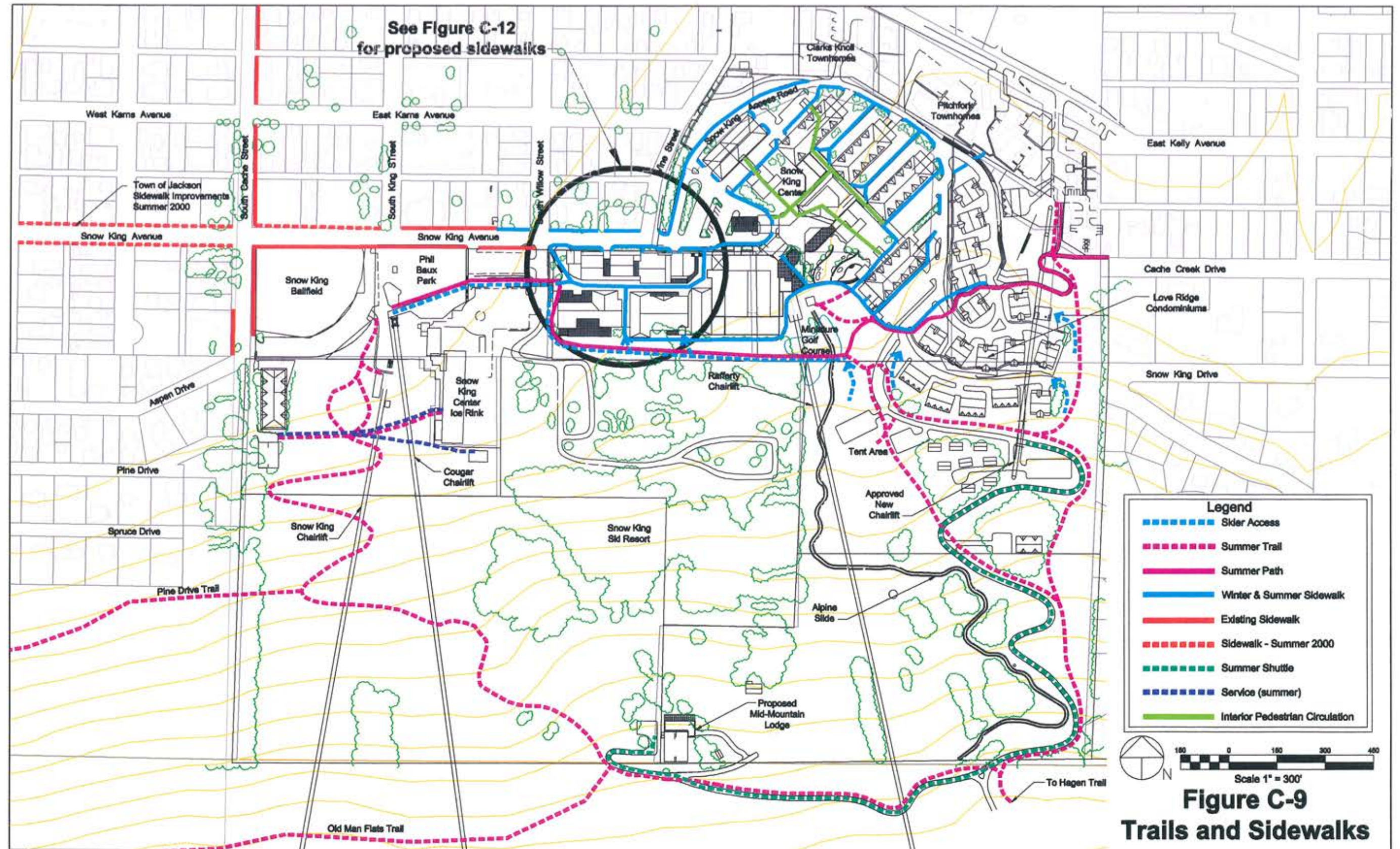


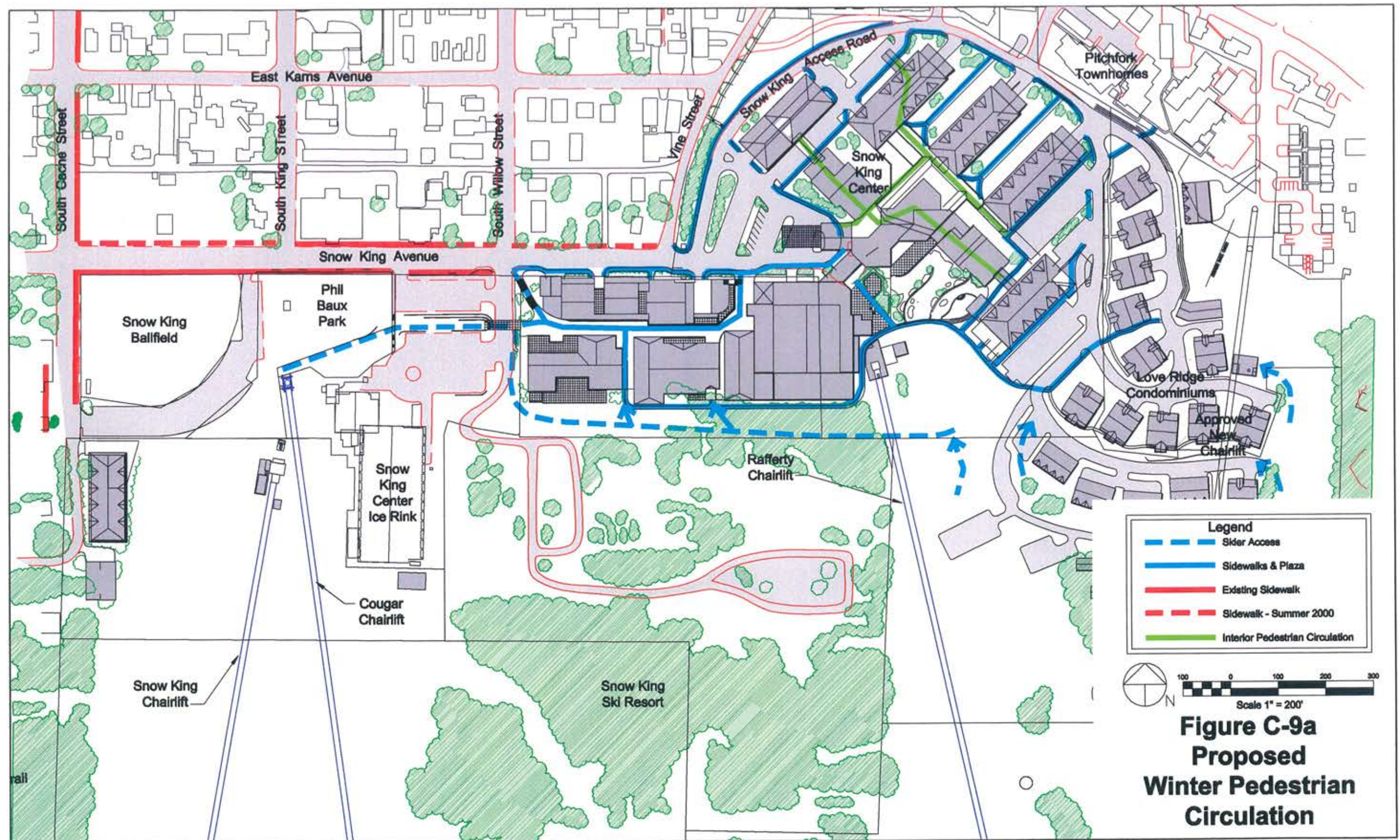
Snow King Avenue Hourly Traffic Volumes - Wednesday, September 1, 1999

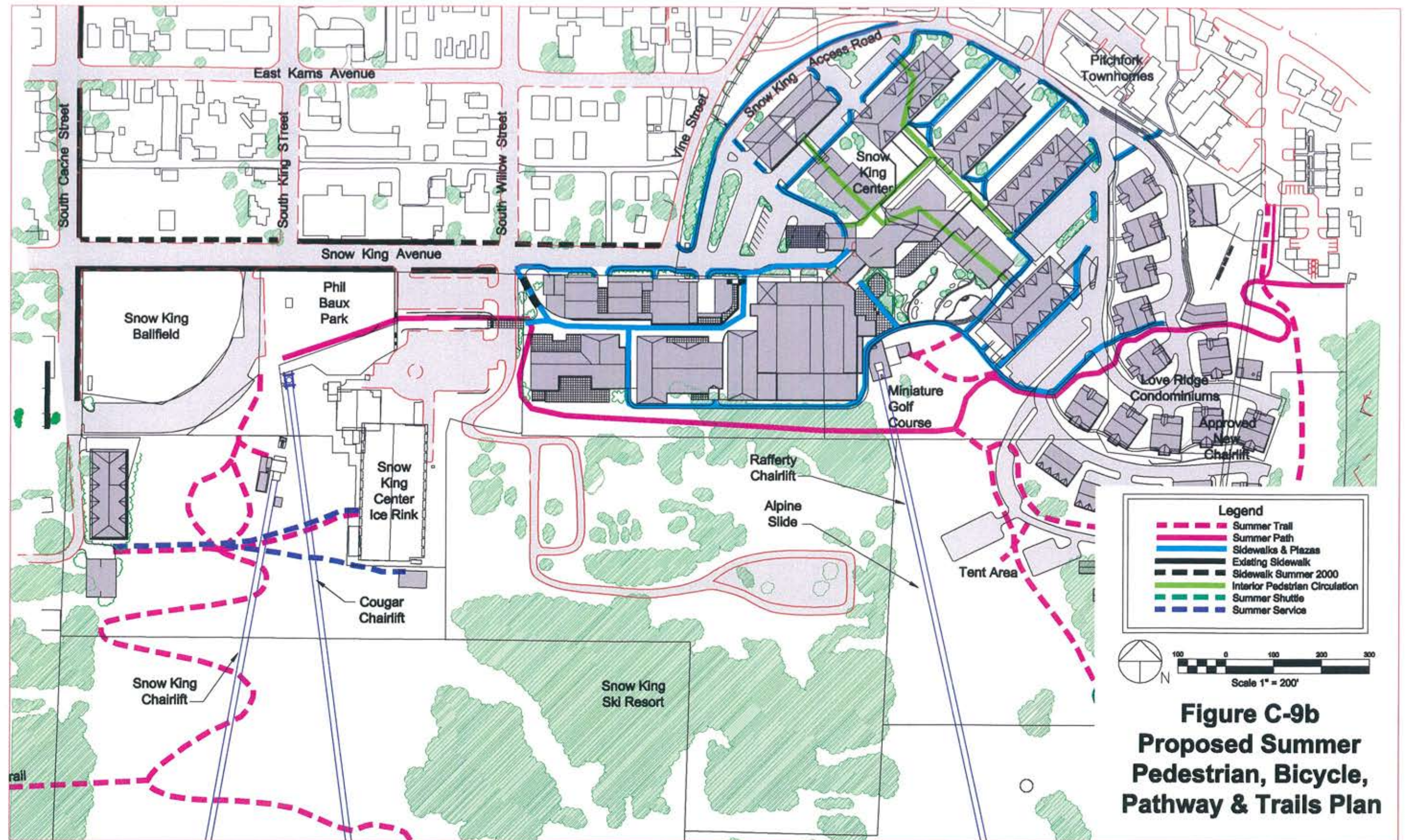




**Figure C-3
Existing Summer
Transit Routes**







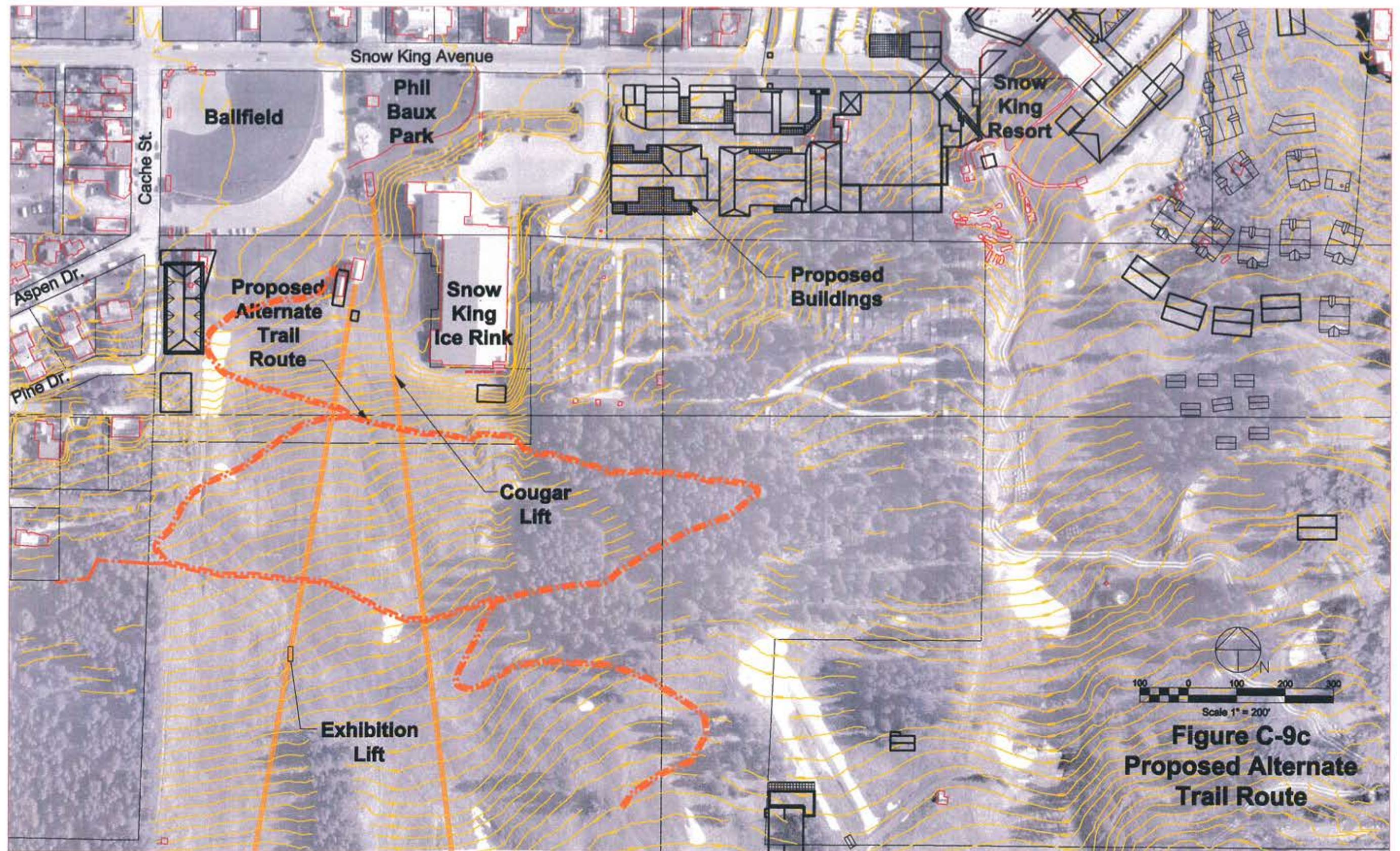
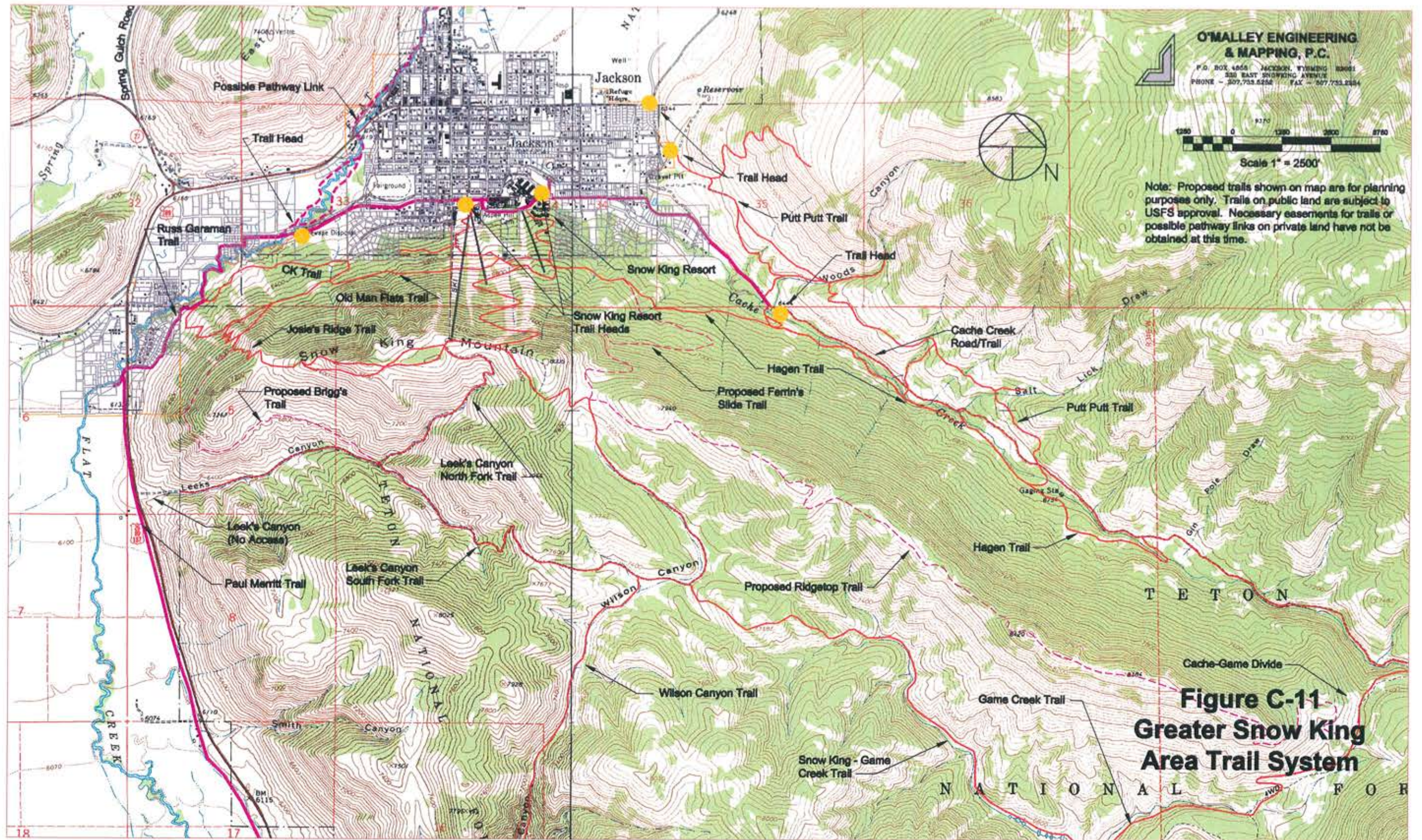


Figure C-9c
Proposed Alternate
Trail Route



Snow King Resort Master Plan - Parking Elements

Snow King Resort Master Plan - C. Parking Elements

P.1 Parking Summary

Snow King Resort's parking plan provides a surplus of daytime and evening parking for both summer and winter. During both seasons, a larger parking surplus is available during the day. The Town of Jackson and/or Teton Village could use these extra spaces for downtown employee parking or a transit hub parking area. There will be 1,783 summer spaces and 1,643 winter spaces. Of these spaces, 1,415 summer spaces and 1,275 winter spaces will be available for shared parking. The peak shared parking demand on Snow King facilities will be 947 in the summer and 720 in the winter. The smallest surplus of spaces in the summer and winter evenings is 468 and 555 respectively. A significantly larger surplus exists during the daytime. **Table P-1** shows the estimated proposed parking at Resort build-out.

	Summer Number of Spaces	Winter Number of Spaces
AREAS AVAILABLE FOR SHARED PARKING		
New Hotel and Condominium Wings - Underground	240	240
- Surface	215	150
KM6 Area - Underground	640	640
KM6 Area (Add. Alternate) - Underground	105	105
Ice Rink & Ballfield - Surface	169	140
Periphery Buildings - Surface	46	0
Shared Parking Subtotal:	1415	1275
AREAS NOT AVAILABLE FOR SHARED PARKING		
Periphery Buildings - Underground	88	88
- Covered	40	40
Love Ridge - Underground	106	106
- Covered	5	5
Existing Condominiums	126	126
Maintenance Building	3	3
Non-shared Parking Subtotal:	368	368
Total Proposed Parking Available:	1783	1643

Summary of Proposed Parking to be Provided
Table P-1

Summary of Proposed Parking to be Provided

Table P-1

Using the Town of Jackson parking ratios as a guide, the Urban Land institute's shared parking model was used to generate the hourly parking demand for weekdays and weekends during the summer and winter seasons. **Tables P-2 & P-3** summarize the hourly and peak hour parking demands generated by the shared parking model. Additionally, these tables indicate the peak parking demand occurs on weekday evenings. Summer parking demands are higher than winter. According to the shared parking model, a parking surplus exists both summer and winter. These surplus spaces will be available for other shared uses. Due to improved *efficiency*, the proposed shared parking will provide an adequate number *of* parking spaces while reducing the amount of land dedicated to parking.

Snow King Resort Master Plan - Parking Elements

Summer Weekday

	Shared Guest Parking Spaces	Shared Employee Parking Spaces	Total Shared Parking Spaces
6:00 AM	569	156	725
7:00 AM	551	156	707
8:00 AM	545	156	701
9:00AM	550	140	691
10:00 AM	530	125	655
11:00 AM	523	125	648
12:00 PM	568	125	693
1:00 PM	566	125	691
2:00 PM	556	125	681
3:00 PM	503	140	644
4:00 PM	557	140	698
5:00 PM	642	140	782
6:00 PM	763	140	904
7:00 PM	807	125	932
8:00 PM	832	109	947
9:00 PM	810	109	920
10:00 PM	764	140	904
11:00 PM	630	156	786
12:00 AM	590	156	746
$\begin{aligned} \text{a Max Shared Parking Space Demand} &= 947 \\ \text{a,b Shared Parking Space Supply} &= 1415 \\ \text{c Parking Surplus at Peak Hour} &= 468 \end{aligned}$			

Summer Weekend

	Shared Guest Parking Spaces	Shared Employee Parking Spaces	Total Shared Parking Spaces
6:00 AM	567	156	723
7:00 AM	448	156	604
8:00 AM	483	156	639
9:00 AM	474	140	615
10:00 AM	441	125	565
11:00 AM	439	125	564
12:00 PM	508	125	633
1:00 PM	553	125	678
2:00 PM	563	125	688
3:00 PM	545	140	686
4:00 PM	563	140	703
5:00 PM	615	140	756
6:00 PM	710	140	850
7:00 PM	782	125	906
8:00 PM	799	109	908
9:00 PM	776	109	886
10:00 PM	752	140	892
11:00 PM	656	156	812
12:00 AM	629	156	785
$\begin{aligned} \text{a Max Shared Parking Space Demand} &= 908 \\ \text{a, b Shared Parking Space Supply} &= 1415 \\ \text{c Parking Surplus at Peak Hour} &= 507 \end{aligned}$			

^a Does not include condominium parking because of its low ability to function as shared parking

^b Shared parking supply from table P-1

^c Represents minimum parking surplus

Summer Shared Parking Summary Table P-2

Snow King Resort Master Plan - Parking Elements

Winter Weekday

	Shared Guest Parking Spaces	Shared Employee Parking Spaces	Total Shared Parking Spaces
6:00 AM	371	156	527
7:00 AM	390	156	546
8:00 AM	403	156	559
9:00 AM	386	140	526
10:00 AM	339	125	464
11:00 AM	334	125	459
12:00 PM	396	125	520
1:00 PM	408	125	532
2:00 PM	360	125	484
3:00 PM	318	140	458
4:00 PM	387	140	527
5:00 PM	463	140	603
6:00 PM	575	125	700
7:00 PM	595	125	720
8:00 PM	595	109	704
9:00 PM	548	109	657
10:00 PM	484	140	624
11:00 PM	401	156	557
12:00 AM	372	156	528
^a Max Shared Parking Space Demand = 720 ^{a, b, d} Shared Parking Space Supply = 1275 Parking Surplus at Peak Hour = 555			

Winter Weekend

	Shared Guest Parking Spaces	Shared Employee Parking Spaces	Total Shared Parking Spaces
6:00AM	344	156	500
7:00 AM	372	156	528
8:00 AM	385	156	541
9:00 AM	376	140	517
10:00 AM	330	125	455
11:00 AM	301	125	426
12:00 PM	406	125	531
1:00 PM	414	125	538
2:00 PM	391	125	516
3:00 PM	347	140	488
4:00 PM	385	140	526
5:00 PM	447	140	587
6:00 PM	551	140	692
7:00 PM	559	125	683
8:00 PM	579	109	688
9:00 PM	538	109	647
10:00 PM	503	140	644
11:00 PM	449	156	605
12:00 AM	426	156	582
^a Max Shared Parking Space Demand = 692 ^{a, b, d} Shared Parking Space Supply = 1275 Parking Surplus at Peak Hour = 583			

^a Does not include condominium parking because of its low ability to function as shared parking

^b Shared parking supply from table P-1

^c Represents minimum parking surplus

^d 82 summer spaces deducted from available parking supply

Winter Shared Parking Summary

Table P-3

Snow King Resort Master Plan - Parking

P.2 Shared Parking Design Process:

A shared parking model, developed by The Urban Land Institute (ULI), was used to determine the parking requirement for Snow King. Snow King is well suited for a shared parking model because of its multiple land uses with varied peak parking times. The proposed large, centralized parking facility also improves the efficiency of shared parking by creating a large number of spaces with high turnover. This will enable the motorist to find parking with minimal effort.

The shared parking model tracks the required parking for various land uses in order to optimize the number of spaces. Shared parking reduces the amount of parking required compared to the standard computational methods which determine parking based on isolated single land use. Shared parking can improve the accuracy of the parking estimates and improve the efficiency of parking facilities. The ULI shared parking model follows four distinct steps as shown in **Figure P-4**. A more detailed illustration of the shared parking methodology is shown in **Figure P-5**. The first step evaluates the existing and proposed land uses. Each use will have its own set of parking requirements that will affect the amount of parking.

The second step involves compiling data on the land uses and parking. During this step, parking ratios are determined (**Table P-6**, Column D) for each land use using the Town of Jackson standards as a guide. These ratios are then applied to the size or number of units (**Table P-6**, Column A) proposed for each use resulting in the required number of parking spaces (**Table P-6**, Columns E and K). Although this parking space number represents the minimum number of spaces required by the town, in effect, this number will represent the maximum. This is because a combined use parking lot allows multiple uses during a single trip which, in turn, allows the parking lot to function more efficiently.

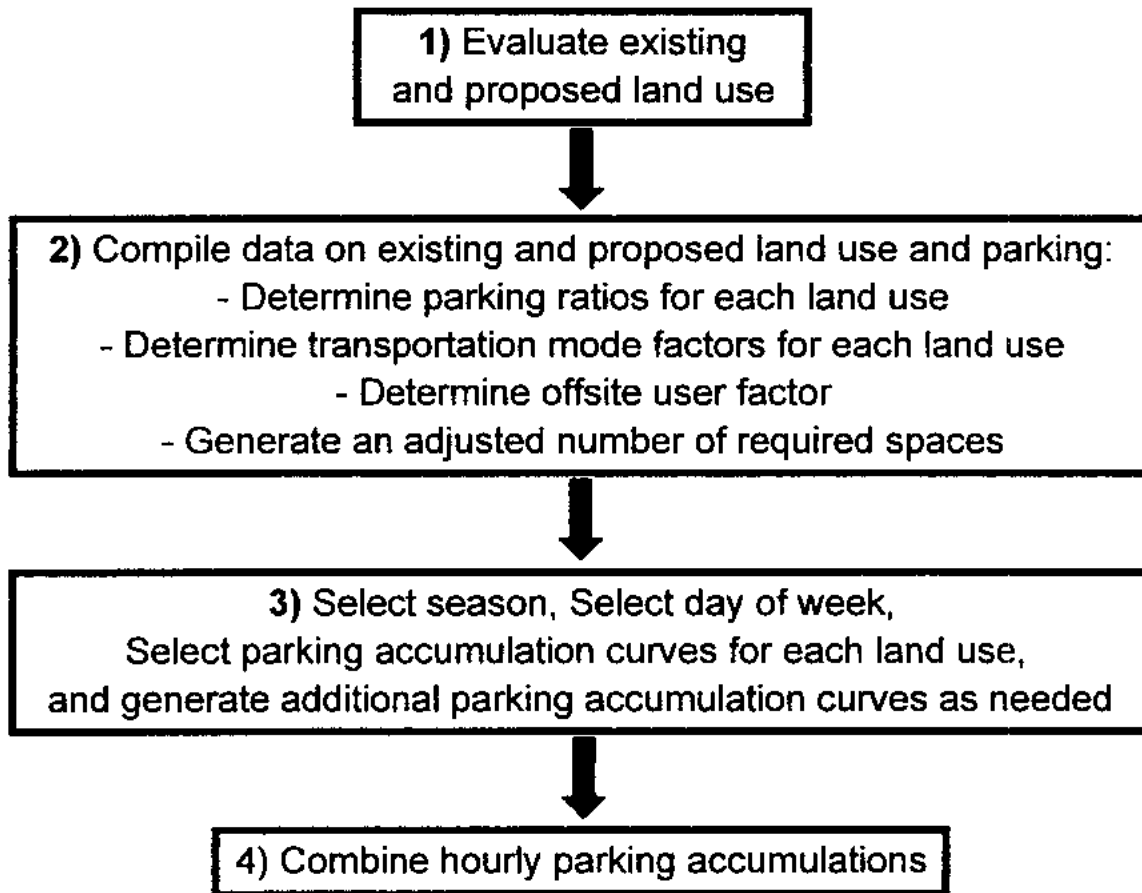
To more accurately predict the parking demand, the model needs to be adjusted to compensate for factors such as multiple use and businesses that are compatible with non-automobile use. This adjustment is made by using two factors, a "transportation mode factor" (TMF) and an "offsite user factor" (OUF). The TMF (**Table P-6**, Columns H & N) adjusts the required number of spaces to compensate for land uses that are compatible with non-auto use. The OUF (**Table P-6**, Columns I & O) adjusts the required number of parking spaces for combined uses within the area and prevents an automobile from being counted more than once for visits involving more than one land use. These factors are included in the calculations on **Table P-6**, which is discussed in **Appendix B**, and applied to the "Number of Spaces Required (Unadjusted)" already discussed. It is important to note that the "Adjusted Number of Spaces Required" (**Table P-6**, Columns J & P) does not yet represent any shared parking for varied hourly peaks. Thus, the "adjusted number of spaces required" is the parking required after adjusting for the mode of transportation used and if guests use more than one facility. The "adjusted number of spaces required" represents the peak parking which is a single value that cannot vary.

Snow King Resort Master Plan - Parking

The third step requires the determination of parking accumulation curves for each land use, which are shown and discussed in Appendix A. These curves are a function of how busy a given facility is each hour. The values for the curves indicate parking needs during the day and when a facility needs the most parking. With these curves, it is possible to see how a land use impacts the parking demand at each hour throughout the day. These curves can be used to represent seasonal use, daily use, or monthly use. In this study, weekday versus weekend use and summer versus winter use were examined. For convenience, summer and winter parking accumulation curve data has been compiled in **Table P-7**. The goal of using these curves is to maximize parking efficiency by locating a decline in parking by one land use and allowing the resulting excess parking to be utilized by a different use.

The fourth step uses static peak parking requirements from **Table P-6** with parking accumulation percentages from **Table P-7** to produce the adjusted shared peak parking for summer and winter shown in **Table P-8** and **Table P-9** respectively. These values are the parking spaces required for each land use at each hour of the day. In this fourth step, every hour is examined to determine how many cars will need to be parked for each use based on the parking accumulation curves. Tracking the variation of parking peaks as seen in the accumulation curves, allows for improved parking efficiency by allowing shared use. By generating parking demands for each hour of the day, the peak parking hour and demand are identified. A chart of the shared parking demands is provided with **Graphs 1, 2, 3, & 4**. These charts indicate how shared parking can utilize the peaks and valleys in hourly demand to improve parking efficiency.

When the four steps of the design process are complete comparisons can be made between the proposed parking and the required parking. **Table P-10** summarizes the required at various steps along the design process. The number of the spaces required with and without credit for the TMF and OUF is included in this table as well as the parking requirement with shared parking. These comparisons are made for both the town and the composite parking requirements during the summer and winter season. The required amount of shared parking shows a significant reduction from the unadjusted numbers. The composite requirement, which is slightly higher than the town requirement, would require a maximum of 2,989 winter spaces if numbers were based on separate individual land use. After modeling the hourly shared parking demands, it was calculated that 947 parking spaces would be required for the summer weekday shared parking peak demand. Peak shared parking demands and the corresponding surplus of spaces are shown on **Tables P-2 and P-3**.



**Shared Parking Design Process
Figure P-4**

Benefits of Shared Parking Discussion

Determining the proper amount of parking for new development requires balancing the needs of the business, the needs of the community, and the community parking standards. Businesses, of course, do not want to "under-park". Under-parking frustrates customers, hurts business, and limits the flexibility of a development. Under-parking can also negatively impact surrounding residential areas because of "spill-over" during peak times. Over-parking generates other problems:

- Not counting land costs, surface parking costs the developer from \$2,500 to \$5,000 per space to construct.
- Structured parking can cost between \$10,000 and \$25,000 per space.
- Land used for parking is unavailable for other activities - including open space.
- Parking lots generate storm water runoff that is laced with pollutants such as oil, radiator coolant, and asbestos from brake linings. The cost to the developer and the community to collect and dispose of this pollution is high. Oil separator storm water units can cost between \$5,000 and \$50,000 depending on the volume of runoff.
- Over-parking encourages automobile use and discourages alternative transportation means such as transit, walking, and bicycling. This automobile use generates additional air pollution.
- Unnecessarily large parking areas are unfriendly, intimidating, and alienating. Pedestrians are forced to maneuver between destinations unless the lots include designated pedestrian facilities.

Blind adherence to national parking standards tends to encourage over-parking. A number of communities in the United States have begun revising their standards and the trend is toward reducing total parking spaces and developing alternative transportation. For example, metropolitan Portland and the State of Oregon are instituting new standards after determining that over-parking results in less efficient land usage and lower floor to area ratios. They have found that in areas where transit is provided and other non-auto modes are convenient, less parking can be provided and yet accessibility and mobility remain high - even for auto traffic. Shared parking helps reduce total parking demand. The key to shared parking is good transit, good pedestrian facilities, and different peak hours between adjacent uses. Minimizing impacts to surrounding neighborhoods can be challenging. Many communities form neighborhood parking districts in which stickers are required to park along residential streets. Successfully protecting adjacent neighborhoods requires increased parking enforcement as well as implementing the items necessary for a successful shared parking system.

Fregonese Calthorpe Associates, regional and urban planning specialists, recently completed a report for the Town of Jackson titled, "Redevelopment Opportunities & Parking Analysis". This report proposes several changes to the Town of Jackson Parking Code and recommends, among other things, reducing the minimum parking requirements for commercial/office and lodging units. Shared parking allows for a net reduction in parking area while still providing adequate parking. **Table P-2** shows the Resort has the ability to provide 1415 shared spaces for a net surplus of 468 shared parking spaces during the peak hour of parking demand. This surplus represents one floor of the proposed structured parking lot in the KM6 area. As mentioned in Section C.4, providing additional parking at Snow King Resort to be used for downtown employee parking may be desirable for the community. In addition, this surplus parking could be used in the winter to provide an in-town transit parking lot for skiers heading to the Jackson Hole Mountain Resort in Teton Village. Snow King Resort looks forward to working with the Town of Jackson to develop effective transportation and parking solutions for the Resort and the community.

Snow King Resort Master Plan - Parking Elements

Appendix A

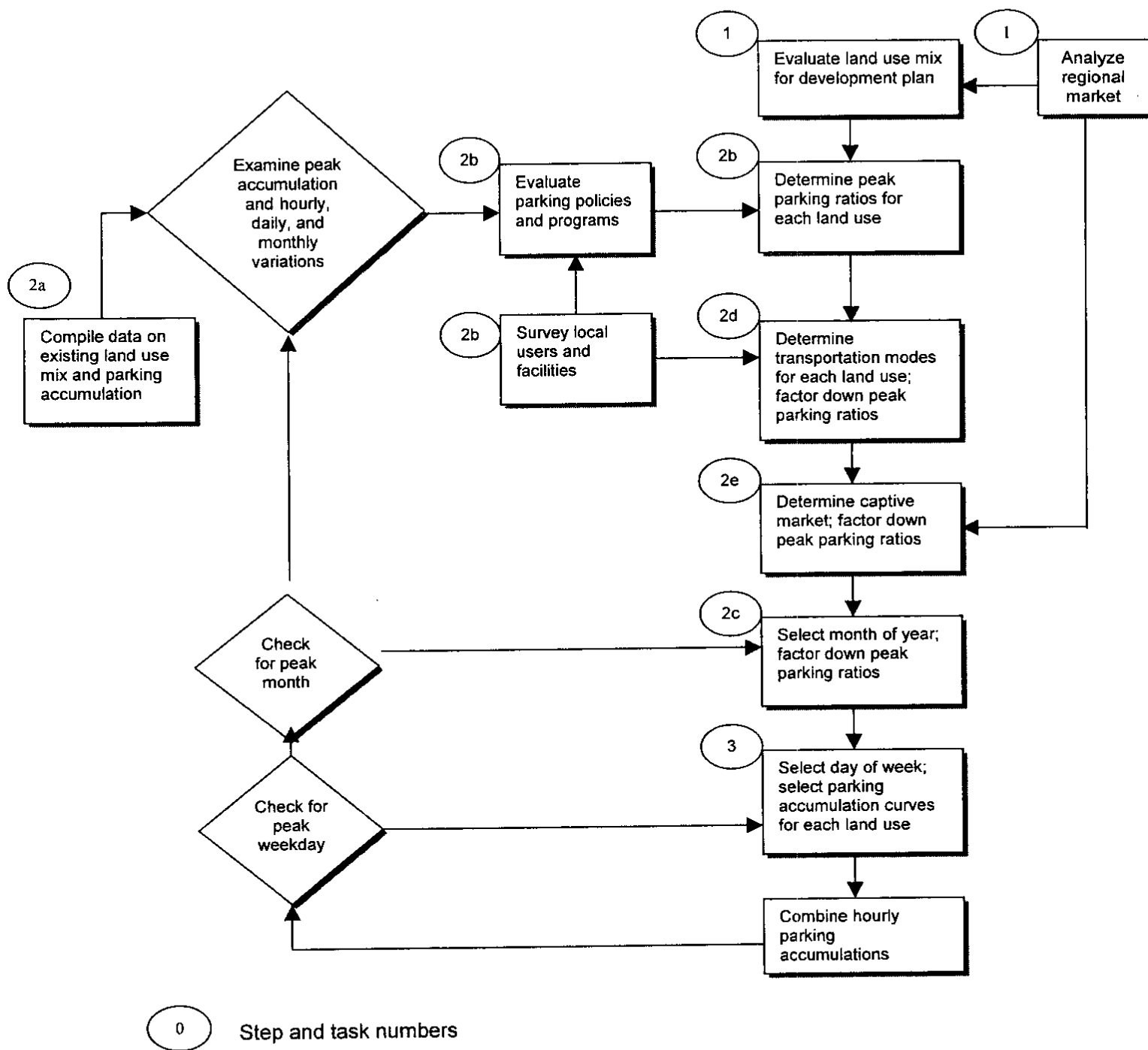
Parking Accumulation Curves

Parking accumulation represents the percent of peak parking utilized and is a function of how busy a land use is. Parking accumulation curves are based on those available in the ULI Shared Parking handbook. Some curves were modified to more accurately reflect the Jackson community by considering factors such as the hours of operation and pattern of use. Parking accumulation curves were created for the conference facilities, entertainment activities, ski area, health club, and resort staffing since no values for these activities were available in the Urban Land Institute literature.

Hotel:

Parking accumulation for hotel guests is based on the Urban Land Institute parking accumulation curves. These curves represent the scenario that parking accumulation increases as guest's check-in causing a peak in parking after guests have checked-in that remains high during the night until the morning when the accumulation drops due to guests leaving during the day. The summer parking accumulation was taken directly from ULI information. Based on past experience, the winter accumulation represents approximately 75% of the summer figures.

Snow King Resort Master Plan – Parking



Shared Parking Methodology
 (Source: Shared Parking, Urban Land Institute)
Figure P-5

	Units or SF	Required Town of Jackson Parking Ratio per unit (B)	Urban Land Institute Parking Ratio per unit (C)	Proposed Composite Parking Ratio per unit (D)	Summer						Winter						
					Max. Parking Spaces Required (Unadjusted) (E)	Parking Demand Eligible for Sharing (F)	Parking Demand Not Eligible for Sharing (G)	Transport. Mode Factor ^a (H)	Offsite User Factor ^b (I)	Adjusted Number of Spaces Required (J)	Max. Parking Spaces Required (Unadjusted) (K)	Parking Demand Eligible for Sharing (L)	Parking Demand Not Eligible for Sharing (M)	Transport. Mode Factor ^a (N)	Offsite User Factor ^b (O)	Adjusted Number of Spaces Required (P)	
Condominiums:	(A)																
Existing / Approved ¹	103	1.5	2.5	2.0	206	0	206					206	0	206			
Love (3 bedroom) ¹	53	1.5	2.5	2.0	106	0	106	0.80	1.00	0		106	0	106	0.80	1.00	0
Hotel Guest Rooms																	
Existing	204	0.75	1.25	1.00	204	204	0	0.60	1.00	122	204	204	0	0.50	1.00	102	
New	714	0.75	1.25	1.00	714	714	0	0.60	1.00	428	714	714	0	0.50	1.00	357	
Subtotal Guest Units:	1074																
Conference (SF) (1/150)	76000	0.00667	0.5 ^d	0.00667	507	507	0	1.00	0.50	253	507	507	0	1.00	0.50	253	
Theaters (Seats)	460	0.33	0.30	0.33	152	152	0	0.95	0.90	130	152	152	0	1.00	0.90	137	
Resort Amenities:																	
Miniature Golf (holes)	18	n/a	n/a	n/a	13	13	0	1.00	0.70	9	0	0	0	n/a	n/a	0	
Horseback Rides (Horses)	20	0.25	n/a	0.25	5	5	0	1.00	0.80	4	0	0	0	n/a	n/a	0	
Alpine Slide (person/hr)	143	n/a	n/a	0.33	47	47	0	1.00	0.70	33	0	0	0	n/a	n/a	0	
Restaurant (Seats)	850	0.33	10 ^e	0.33	281	281	0	0.90	0.20	50	281	281	0	1.00	0.20	56	
Lounge/Bar (Seats)	250	0.5	10 ^e	0.5	125	125	0	0.90	0.40	45	125	125	0	1.00	0.40	50	
Commercial (SF) (1/250)	67200	0.002	4 ^e	0.004	269	269	0	0.90	0.50	121	269	269	0	1.00	0.50	134	
Health Club		n/a ^h	n/a	100	100	100	0	1.00	0.90	90	100	100	0	1.00	0.90	90	
Employees (1.0#/rooms)	1074	n/a	n/a														
With Housing on Site ^e	204	1.0	1.0	1.0	204	156	48	1.00	1.00	156	196	148	48	1.00	1.00	156	
Snow King Ski Area		n/a ^g	n/a	130	0	0	0	1.00	1.00		130	130	0	1.00	1.00	130	
TOTALS:		n/a ⁱ	n/a ⁱ	n/a ⁱ	2932	2572	360	n/a	n/a	1442	2969	2629	360	n/a	n/a	1465	

* Transportation Mode Factor = % of people driving

^b Offsite User Factor = % of users from offsite (not staying at the resort)

^c During winter 8 dedicated employee spaces will not be available

^d Refers to parking spaces per seat/person

^e Parking spaces per 1,000 sf

^f Parking ratio represents 2 units, assuming condos can be split into 2 separate rental units

^g Ski area parking ratio is broken down between employees, hotel rooms, and skiers

^h Health club parking ratio is based on workout machines, saunas, and square footage of other area

ⁱ See Table P-10 for parking totals using different parking ratios

Snow King Resort - Required Parking Spaces
Table P-6

SUMMER												
Hotel	Conference & Meeting	Theater	Skii Area & Other	Resort Activities	Restaurant /Lounge	Retail & Commercial	Health Club	Office	Employees Onsite Housing	Employees Offsite Housing	Hotel	Conference & Meeting
6:00 AM	100%	0%	0%	0%	0%	0%	20%	0%	30%	100%	90%	0%
7:00 AM	87%	0%	0%	0%	50%	5%	20%	20%	45%	100%	70%	0%
8:00 AM	66%	25%	0%	0%	85%	16%	20%	60%	70%	100%	60%	0%
9:00 AM	55%	45%	0%	10%	80%	32%	15%	82%	65%	100%	50%	0%
10:00 AM	45%	60%	0%	80%	35%	50%	10%	100%	100%	100%	40%	0%
11:00 AM	35%	70%	0%	80%	20%	85%	20%	98%	100%	100%	35%	0%
12:00 PM	30%	80%	0%	70%	55%	73%	30%	98%	100%	100%	30%	0%
1:00 PM	30%	80%	0%	50%	60%	75%	30%	91%	100%	100%	30%	0%
2:00 PM	35%	70%	0%	70%	50%	75%	30%	97%	100%	100%	35%	0%
3:00 PM	35%	50%	0%	80%	50%	72%	15%	83%	100%	100%	40%	0%
4:00 PM	45%	30%	0%	80%	20%	68%	25%	74%	85%	90%	50%	0%
5:00 PM	60%	30%	0%	80%	25%	60%	40%	48%	85%	90%	60%	0%
6:00 PM	70%	40%	0%	50%	50%	61%	50%	28%	85%	90%	70%	0%
7:00 PM	75%	40%	0%	50%	50%	68%	50%	8%	70%	80%	80%	0%
8:00 PM	90%	30%	0%	0%	50%	65%	35%	5%	60%	70%	90%	0%
9:00 PM	95%	30%	0%	0%	35%	43%	20%	3%	30%	70%	95%	0%
10:00 PM	100%	20%	0%	0%	20%	22%	10%	1%	30%	90%	100%	0%
11:00 PM	100%	0%	0%	0%	15%	0%	0%	0%	15%	100%	100%	0%
12:00 AM	100%	30%	0%	0%	0%	0%	0%	0%	15%	100%	100%	0%

Summer - Weekend & Weekday

WINTER												
Hotel	Conference & Meeting	Theater	Skii Area & Other	Resort Activities	Restaurant /Lounge	Retail & Commercial	Health Club	Office	Employees Onsite Housing	Employees Offsite Housing	Hotel	Conference & Meeting
6:00 AM	75%	0%	0%	0%	0%	0%	30%	0%	30%	100%	75%	0%
7:00 AM	65%	0%	0%	0%	50%	5%	35%	20%	45%	100%	65%	0%
8:00 AM	50%	15%	0%	0%	85%	10%	30%	80%	70%	100%	50%	0%
9:00 AM	40%	25%	0%	10%	80%	20%	30%	82%	65%	100%	40%	0%
10:00 AM	35%	30%	0%	80%	35%	35%	20%	100%	100%	100%	35%	0%
11:00 AM	25%	40%	0%	80%	20%	45%	40%	88%	100%	100%	25%	0%
12:00 PM	25%	40%	0%	50%	55%	50%	60%	88%	100%	100%	25%	0%
1:00 PM	25%	0%	0%	50%	60%	55%	60%	81%	100%	100%	25%	0%
2:00 PM	25%	35%	0%	50%	50%	50%	40%	87%	100%	100%	25%	0%
3:00 PM	25%	25%	10%	55%	30%	50%	30%	93%	100%	100%	25%	0%
4:00 PM	35%	15%	45%	80%	20%	45%	50%	74%	85%	90%	35%	0%
5:00 PM	45%	15%	50%	80%	25%	40%	85%	48%	85%	90%	45%	0%
6:00 PM	55%	20%	50%	50%	50%	45%	100%	25%	85%	90%	55%	0%
7:00 PM	65%	20%	80%	50%	50%	50%	100%	8%	70%	80%	65%	0%
8:00 PM	75%	15%	40%	0%	50%	45%	70%	5%	60%	70%	75%	0%
9:00 PM	75%	10%	5%	0%	35%	30%	40%	3%	30%	70%	75%	0%
10:00 PM	75%	0%	0%	0%	20%	15%	0%	0%	15%	100%	75%	0%
11:00 PM	75%	0%	0%	0%	0%	0%	0%	0%	15%	100%	75%	0%
12:00 AM	75%	20%	0%	0%	0%	0%	0%	0%	15%	100%	75%	0%

WEEKDAY

Winter - Weekend & Weekday

WEEKEND

Parking Accumulation
by Percent of Peak Parking

Table P-7

Summer Weekday	Condominiums Existing/ Approved	Proposed	Hotel Guest Rooms Existing	New	Lodging Sub-Totals	Conferences, Meetings, & Groups	Theater	Ski Area & Other	Miniature Golf	Horseshoe	Rides	Alpine Slide	Activity Sub-Totals	Restaurant	Bar	Retail & Commercial	Health Club	Amenities Sub-Totals	Total of Guest Spaces	Employees with Onsite Housing	Total Shared Non-Shared Spaces	Max Adjusted Non-Shared Spaces Req
Peak Parking	n/a	n/a	122	428	551	253	130	0	9		4	33	46	50	45	121	90	256	1286	156	n/a	1442
6:00 AM	n/a	n/a	122	428	551	0	0	0	0	0	0	0	0	0	0	0	18	18	569	156	725	1442
7:00 AM	n/a	n/a	106	373	479	0	0	0	0	0	0	0	0	25	23	8	18	47	551	156	707	1442
8:00 AM	n/a	n/a	81	283	364	63	0	0	0	0	0	0	0	43	38	19	18	76	545	156	701	1442
9:00 AM	n/a	n/a	67	236	303	114	0	0	0	0	0	0	0	5	40	39	14	88	530	140	691	1442
10:00 AM	n/a	n/a	55	193	248	152	0	0	0	0	0	0	0	18	16	16	9	85	530	125	655	1442
11:00 AM	n/a	n/a	43	150	193	177	0	0	0	0	0	0	0	10	9	79	18	106	523	125	648	1442
12:00 PM	n/a	n/a	37	129	166	203	0	0	0	0	0	0	0	28	25	88	27	140	568	125	683	1442
1:00 PM	n/a	n/a	37	129	166	203	0	0	0	0	0	0	0	30	27	91	27	143	568	125	691	1442
2:00 PM	n/a	n/a	43	150	193	177	0	0	0	0	0	0	0	25	23	88	18	128	556	125	681	1442
3:00 PM	n/a	n/a	43	150	193	177	0	0	0	0	0	0	0	15	14	87	14	114	503	140	644	1442
4:00 PM	n/a	n/a	55	193	248	152	0	0	0	0	0	0	0	10	9	73	23	111	557	140	696	1442
5:00 PM	n/a	n/a	73	257	330	76	0	0	0	0	0	0	0	13	11	73	38	120	642	140	782	1442
6:00 PM	n/a	n/a	86	300	386	101	0	0	0	0	0	0	0	25	23	74	45	150	703	140	894	1442
7:00 PM	n/a	n/a	92	321	413	101	0	0	0	0	0	0	0	25	23	82	45	150	807	125	932	1442
8:00 PM	n/a	n/a	110	386	496	76	108	0	0	0	0	0	0	25	23	79	32	133	837	105	947	1442
9:00 PM	n/a	n/a	118	407	525	76	108	0	0	0	0	0	0	18	16	52	18	86	810	109	920	1442
10:00 PM	n/a	n/a	122	428	551	51	108	0	0	0	0	0	0	10	9	27	9	45	764	140	904	1442
11:00 PM	n/a	n/a	122	428	551	0	65	0	0	0	0	0	0	8	7	0	0	7	630	156	786	1442
12:00 AM	n/a	n/a	122	428	551	0	39	0	0	0	0	0	0	0	0	0	0	0	580	156	746	1442

Summer Weekend	Condominiums Existing/ Approved	Proposed	Hotel Guest Rooms Existing	New	Lodging Sub-Totals	Convention	Movie Theater	Ski Area & Other	Miniature Golf	Horseshoe	Rides	Alpine Slide	Activity Sub-Totals	Restaurant	Bar	Retail & Commercial	Health Club	Amenities Sub-Totals	Total of Guest Spaces	Employees with Onsite Housing	Total Shared Non-Shared Spaces	Max Adjusted Non-Shared Spaces Req
Peak Parking	n/a	n/a	122	428	551	253	130	0	9		4	33	46	50	45	121	90	256	1286	156	n/a	1442
6:00 AM	n/a	n/a	110	386	496	0	71	0	0	0	0	0	0	0	0	0	0	38	567	156	723	1442
7:00 AM	n/a	n/a	86	300	386	0	0	0	0	0	0	0	0	25	23	6	8	71	448	156	694	1442
8:00 AM	n/a	n/a	73	257	330	63	0	0	0	0	0	0	0	43	38	19	14	88	483	156	639	1442
9:00 AM	n/a	n/a	61	214	275	117	0	0	0	0	0	0	0	40	36	39	14	90	474	140	615	1442
10:00 AM	n/a	n/a	49	171	220	76	0	0	0	0	0	0	0	18	16	60	14	101	441	125	565	1442
11:00 AM	n/a	n/a	43	150	193	88	0	0	0	0	0	0	0	10	9	79	14	131	438	125	584	1442
12:00 PM	n/a	n/a	37	129	166	101	39	0	0	0	0	0	0	28	25	88	18	136	508	125	633	1442
1:00 PM	n/a	n/a	37	129	166	101	39	0	0	0	0	0	0	28	25	88	18	136	508	125	633	1442
2:00 PM	n/a	n/a	43	150	193	88	0	0	0	0	0	0	0	15	14	87	9	110	553	125	678	1442
3:00 PM	n/a	n/a	49	171	220	63	91	0	0	0	0	0	0	15	14	80	14	106	545	140	703	1442
4:00 PM	n/a	n/a	61	214	275	38	91	0	0	0	0	0	0	10	9	73	23	114	563	140	756	1442
5:00 PM	n/a	n/a	73	257	330	38	91	0	0	0	0	0	0	13	11	73	23	114	615	140	800	1442
6:00 PM	n/a	n/a	86	300	386	51	104	0	0	0	0	0	0	25	23	82	14	118	681	125	806	1442
7:00 PM	n/a	n/a	98	343	441	51	117	0	0	0	0	0	0	25	23	79	18	118	710	140	850	1442
8:00 PM	n/a	n/a	110	386	496	39	130	0	0	0	0	0	0	25	23	76	9	128	782	125	906	1442
9:00 PM	n/a	n/a	118	407	525	38	130	0	0	0	0	0	0	18	16	52	0	138	810	109	915	1442
10:00 PM	n/a	n/a	122	428	551	25	130	0	0	0	0	0	0	10	9	27	0	148	832	140	952	1442
11:00 PM	n/a	n/a	122	428	551	0	65	0	0	0	0	0	0	8	7	0	0	158	854	156	1010	1442
12:00 AM	n/a	n/a	122	428	551	0	39	0	0	0	0	0	0	0	0	0	0	168	876	156	1032	1442

Summer Adjusted & Shared
Hourly Peak Parking
Table P-8

Winter Weekly	Condominiums		Hotel Guest Rooms Existing	New	Looping Totals	Convention	Movie Theater	Sil Area & Other	Resort Activities					Activity Totals	Resort Amenities					Amenities Sub- Totals	Total of Guest Spaces	Employees w/ Onsite Housing	Total Shared Housing Spaces	Max Adjusted Non Shared Spaces Req
	Existing/Approved	Proposed							Miniature Golf	Horseshoe Rides	Alpine Slide	Bar	Retail & Commercial		Health Club	Guest Spa								
Peak Parking	n/a	n/a	102	357	459	253	137	130	0	0	0	0	130	56	50	134	90		1309	156	n/a	1465		
6:00 AM	n/a	n/a	77	268	344	0	0	0	0	0	0	0	0	28	0	7	32	27	63	371	156	527	1465	
7:00 AM	n/a	n/a	66	232	298	0	0	0	0	0	0	0	0	28	25	0	32	87	390	156	546	1465		
8:00 AM	n/a	n/a	51	179	230	36	0	13	0	0	0	0	0	48	43	13	32	94	403	156	559	1465		
9:00 AM	n/a	n/a	41	143	184	63	0	13	0	0	0	0	0	45	40	27	27	83	396	140	526	1465		
10:00 AM	n/a	n/a	36	125	161	76	0	39	0	0	0	0	0	20	18	47	18	106	339	125	464	1465		
11:00 AM	n/a	n/a	28	89	115	101	0	52	0	0	0	0	0	11	10	60	38	149	334	125	459	1465		
12:00 PM	n/a	n/a	26	89	115	101	0	65	0	0	0	0	0	31	28	67	54	156	366	125	520	1465		
1:00 PM	n/a	n/a	26	89	115	101	0	65	0	0	0	0	0	34	30	74	54	126	408	125	532	1465		
2:00 PM	n/a	n/a	26	89	115	89	0	72	0	0	0	0	0	28	25	67	36	109	390	125	484	1465		
3:00 PM	n/a	n/a	26	89	115	63	14	72	0	0	0	0	0	17	15	67	27	115	318	140	458	1465		
4:00 PM	n/a	n/a	36	125	161	38	61	65	0	0	0	0	0	11	10	60	45	143	387	140	527	1465		
5:00 PM	n/a	n/a	48	181	207	38	61	65	0	0	0	0	0	14	13	54	77	175	463	140	603	1465		
6:00 PM	n/a	n/a	56	186	252	51	68	65	0	0	0	0	0	28	25	60	90	182	575	125	700	1465		
7:00 PM	n/a	n/a	66	232	298	36	82	52	0	0	0	0	0	28	25	67	90	148	595	125	720	1465		
8:00 PM	n/a	n/a	71	250	321	38	75	26	0	0	0	0	0	20	18	80	63	84	546	109	704	1465		
9:00 PM	n/a	n/a	77	268	344	25	55	7	0	0	0	0	0	11	10	40	36	48	484	140	624	1465		
10:00 PM	n/a	n/a	77	268	344	25	41	0	0	0	0	0	0	8	8	0	0	0	401	156	557	1465		
11:00 PM	n/a	n/a	77	268	344	0	27	0	0	0	0	0	0	0	0	0	0	0	372	156	528	1465		
12:00 AM	n/a	n/a	77	268	344	0	0	0	0	0	0	0	0	0	0	0	0	0	372	156	528	1465		

Winter Weekend	Condominiums		Hotel Guest Rooms		Lodging Totals	Convention	Movie Theater	St/ Area & Other	Resort Activities				Activity Totals	Restaurant	Resort Amenities			Amenities Sub- Totals	Total of Guest Spaces	Employees w/ Onsite Housing	Total Shared Spaces	Max Adjusted Non Shared Spaces Req
	Existing/	Proposed	Existing	New					Miniature Golf	Horseshack	Rides	Alpine Slide			Bar	Retail & Commercial	Health Club					
Peak Parking	n/a	n/a	102	357	459	253	137	130	0	0	0	0	130	56	50	134	90	274	1309	156	n/a	1465
6:00 AM	n/a	n/a	77	266	344	0	0	0	0	0	0	0	0	28	25	7	14	45	344	156	500	1465
7:00 AM	n/a	n/a	66	232	298	0	0	0	0	0	0	0	0	28	25	7	14	82	372	156	528	1465
8:00 AM	n/a	n/a	51	179	230	25	0	0	0	0	0	0	0	48	43	22	18	110	365	156	541	1465
9:00 AM	n/a	n/a	41	143	184	38	0	39	0	0	0	0	0	45	40	43	27	112	376	140	517	1465
10:00 AM	n/a	n/a	36	125	161	36	0	65	0	0	0	0	0	20	18	67	27	124	330	125	455	1465
11:00 AM	n/a	n/a	26	89	115	51	0	85	0	0	0	0	0	11	10	87	27	162	301	125	426	1465
12:00 PM	n/a	n/a	26	89	115	51	48	85	0	0	0	0	0	31	28	98	38	187	406	125	531	1465
1:00 PM	n/a	n/a	26	89	115	51	48	85	0	0	0	0	0	34	30	101	36	150	414	125	538	1465
2:00 PM	n/a	n/a	28	89	115	51	48	91	0	0	0	0	0	28	25	98	27	130	391	125	516	1465
3:00 PM	n/a	n/a	28	89	115	38	48	78	0	0	0	0	0	17	15	97	18	128	347	140	488	1465
4:00 PM	n/a	n/a	36	125	161	13	75	65	0	0	0	0	0	11	10	89	27	138	385	140	528	1465
5:00 PM	n/a	n/a	46	161	207	13	75	62	0	0	0	0	0	14	13	81	45	143	447	140	547	1465
6:00 PM	n/a	n/a	56	196	252	25	102	52	0	0	0	0	0	28	25	82	36	143	551	140	602	1465
7:00 PM	n/a	n/a	66	196	252	25	109	52	0	0	0	0	0	28	25	87	18	130	559	125	683	1465
8:00 PM	n/a	n/a	66	232	298	13	109	39	0	0	0	0	0	20	18	93	0	75	579	109	689	1465
9:00 PM	n/a	n/a	71	250	321	13	109	39	0	0	0	0	0	20	18	93	0	40	547	109	647	1465
10:00 PM	n/a	n/a	77	266	344	13	96	13	0	0	0	0	0	11	10	30	0	8	503	140	644	1465
11:00 PM	n/a	n/a	77	266	344	0	89	0	0	0	0	0	0	8	8	0	0	0	449	156	605	1465
12:00 AM	n/a	n/a	77	266	344	0	82	0	0	0	0	0	0	8	8	0	0	0	426	156	582	1465

Winter Adjusted & Shared Hourly Peak Parking Table P-9

Summer	Winter	
2256	2321	Town of Jackson Parking Requirement (Total Parking) ^a
n/a ^c	n/a ^c	Urban Land Institute Parking Requirement (Total Parking) ^a
2932	2989	Composite Parking Requirement (Total Parking) ^a
1292	1376	Town of Jackson Parking Requirement with Transportation Factor and Non-Resort User Factor ^b
n/a ^c	n/a ^c	Urban Land Institute with Transportation Factor and Non-Resort User Factor ^b
1442	1465	Estimated Composite Parking Required with Transportation Factor and Non-Resort User Factor ^b
947	720	Estimated Composite Parking Required with Transportation Factor and Non-Resort User Factor and shared parking
1415	1275	Proposed Shared Parking
1783	1643	Proposed Total Parking

^a Required parking numbers represent the parking required for each use separately with no credit given for combined trips or alternative transportation

^b Parking numbers represent the required parking based on parking ratios with credit given for combined trips and alternative transportation

^c Complete parking demands can not be computed since several land uses exist in Jackson which are not included in the ULI parking ratios

**Required Parking Summary
Table P-10**

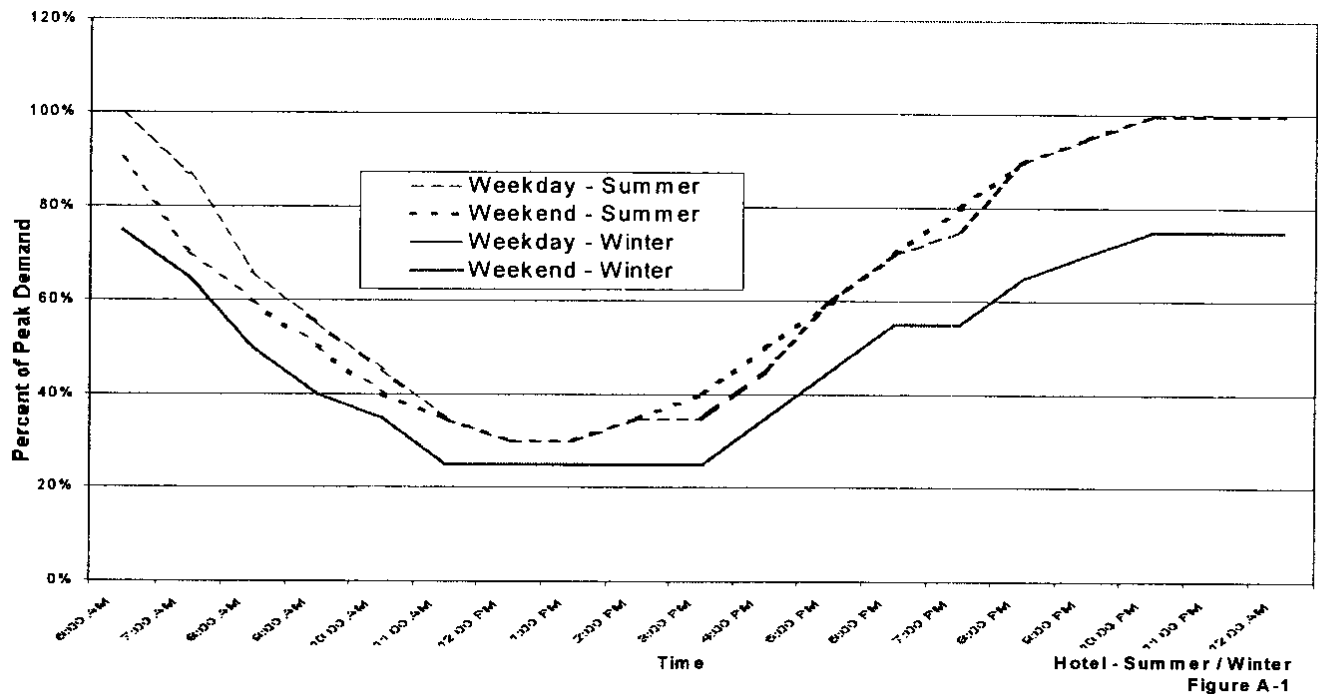
Snow King Resort Master Plan – Parking Elements

Appendix A Parking Accumulation Curves

Parking accumulation represents the percent of peak parking utilized and is a function of how busy a land use is. Parking accumulation curves are based on those available in the ULI Shared Parking handbook. Some curves were modified to more accurately reflect the Jackson community by considering factors such as the hours of operation and pattern of use. Parking accumulation curves were created for the conference facilities, entertainment activities, ski area, health club, and resort staffing since no values for these activities were available in the Urban Land Institute literature.

Hotel:

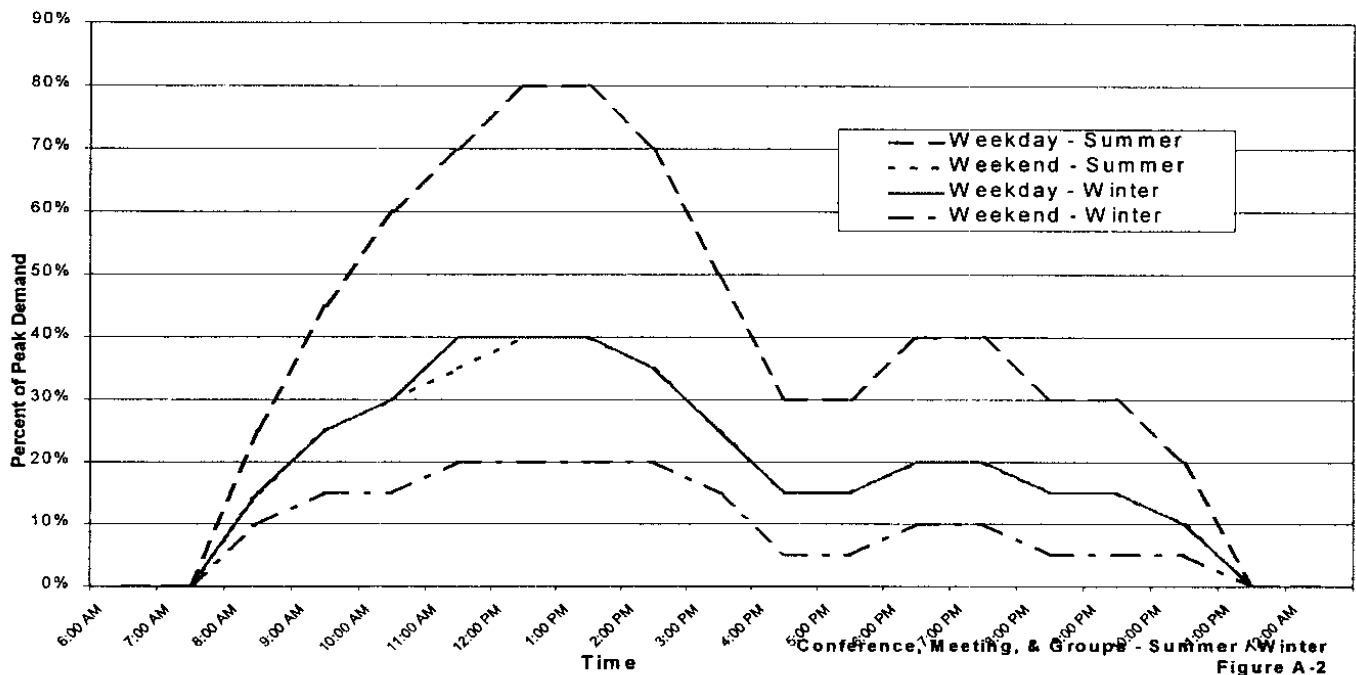
Parking accumulation for hotel guests is based on the Urban Land Institute parking accumulation curves. These curves represent the scenario that parking accumulation increases as guests check-in causing a peak in parking after guests have checked-in that remains high during the night until the morning when the accumulation drops due to guests leaving during the day. The summer parking accumulation was taken directly from ULI information. Based on past experience, the winter accumulation represents approximately 75% of the summer figures.



Snow King Resort Master Plan – Parking

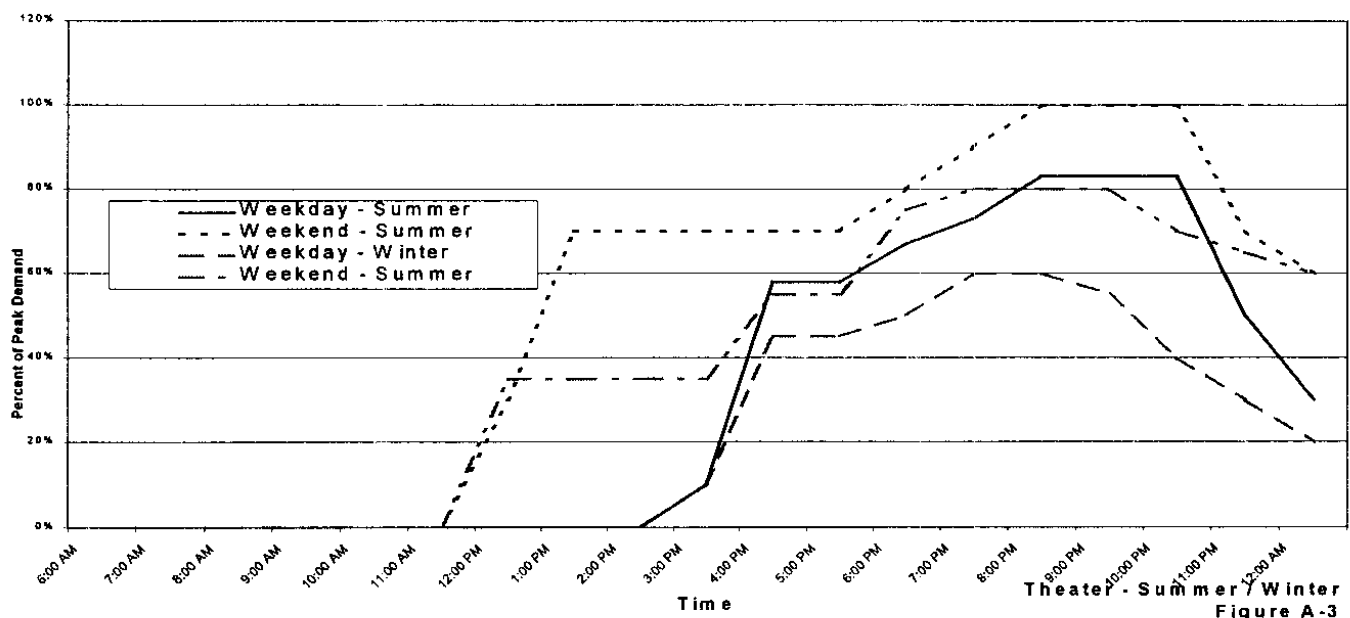
Conference, Meetings, & Groups:

No parking accumulation curves were available from the Urban Land Institute for hotel conference space. Parking accumulation curves were generated based on past and projected use. Summer weekday provided the heaviest use of the facilities peaking between 12:00 p.m. and 1:00 p.m. with an additional peak in the evening hours between 6:00 p.m. and 7:00 p.m. summer weekend use is approximately half of the weekday use. Winter use is approximately half of the summer use.



Theater:

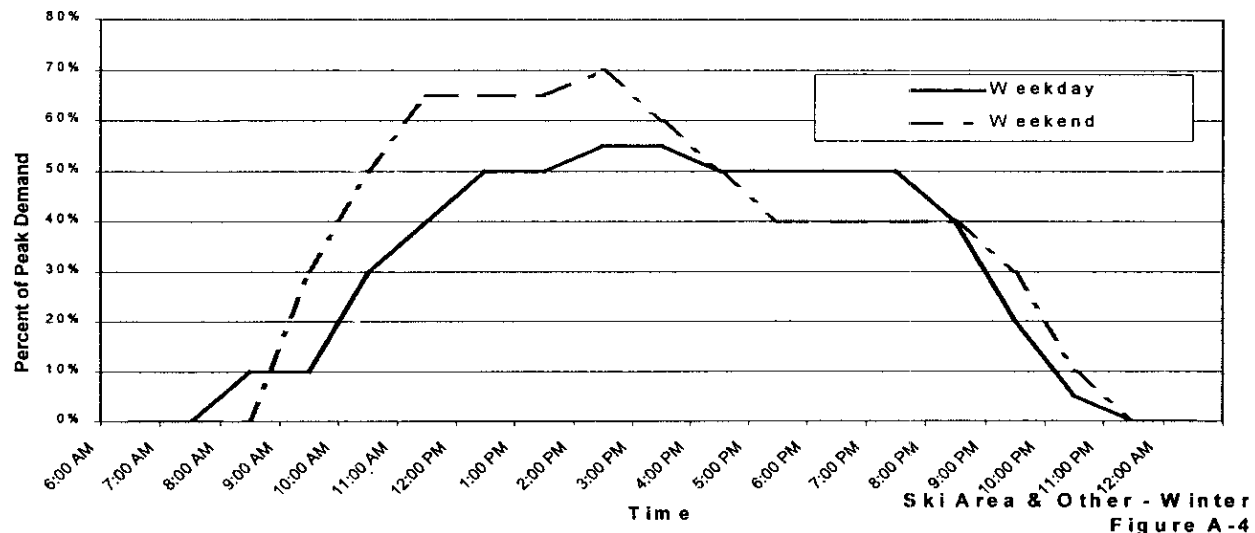
Parking accumulation curves come directly from the ULI recommendations. Summer months represent the busiest season because of the summer releases. Additionally, increased visitor traffic also increases demand on theater parking. Heaviest use occurs during the summer weekend evenings, with summer weekdays having slightly less use. Winter is represented with less use than the summer months.



Snow King Resort Master Plan – Parking

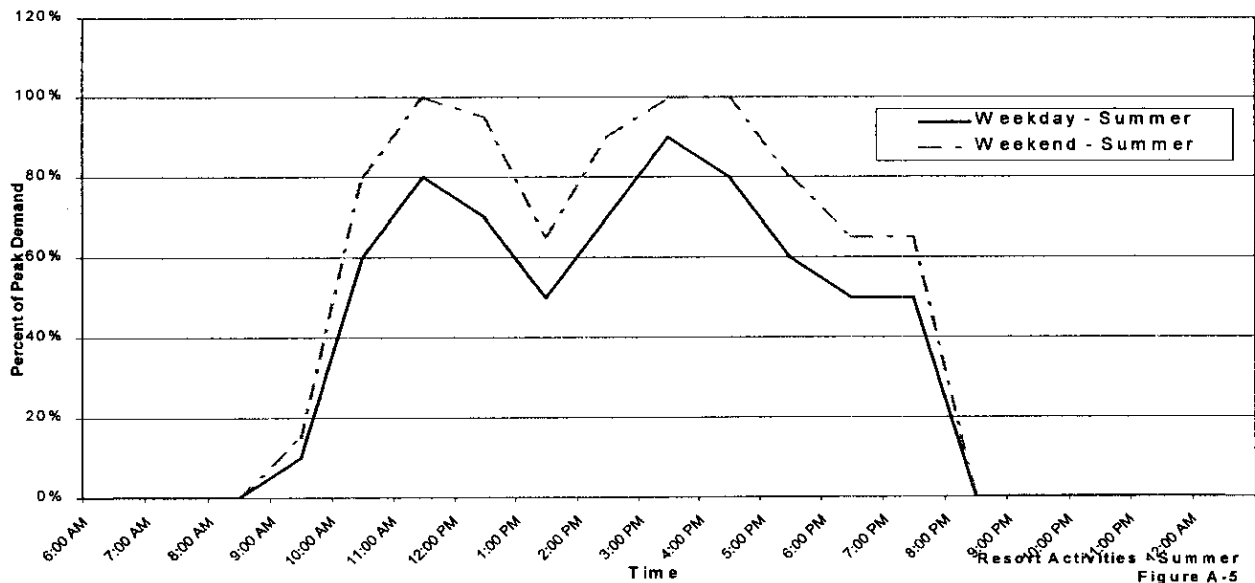
Ski Area & Other:

No parking accumulation curves were available from the ULI to represent demand on ski areas. Parking accumulation curves were generated based on experience with past use. Snow King typically sees two daily peaks corresponding to use during lunch as well as after school. The later peak generally continues into the evening hours. Weekends have a higher peak use with lower use in the evening.



Resort Activities:

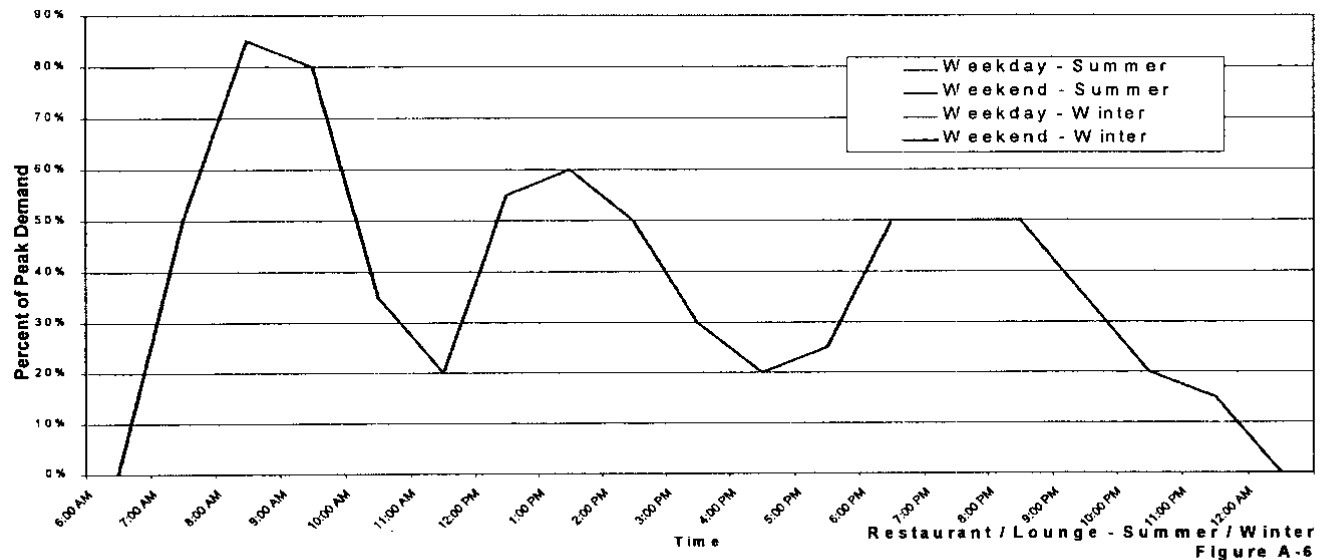
No parking accumulation curves were available from the ULI to represent demand on resort activities. Parking accumulation curves were generated based on experience with past use. The ski area typically sees two daily peaks corresponding to use before lunch as well as before dinner. Weekends have a higher use than weekdays.



Snow King Resort Master Plan – Parking

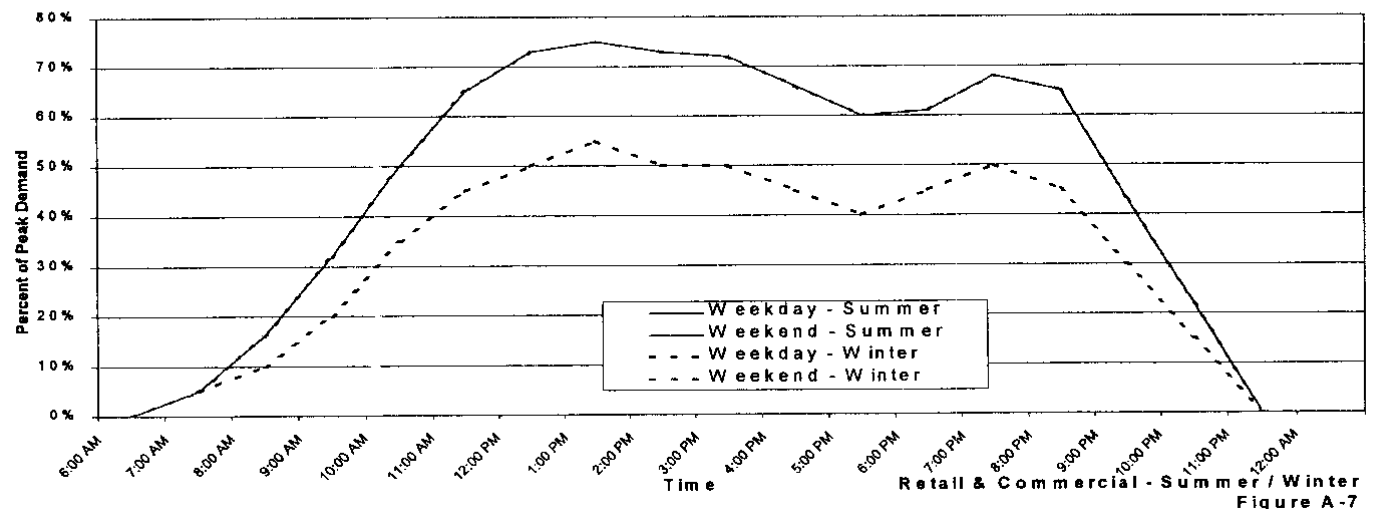
Restaurant & Lounge:

ULI hotel restaurant and lounge parking accumulation curves were consulted, however, the different hours of Snow King's restaurant and lounge required a new curve. The new parking accumulation curve was generated based on past experience and represented composite use of both the restaurant and the bar. The curve shows three peaks corresponding to meal times. Breakfast is the largest of the peaks followed by lunch and dinner. The dinner peak extends until approximately 9:00 p.m. to compensate for evening use of the bar.



Retail & Commercial:

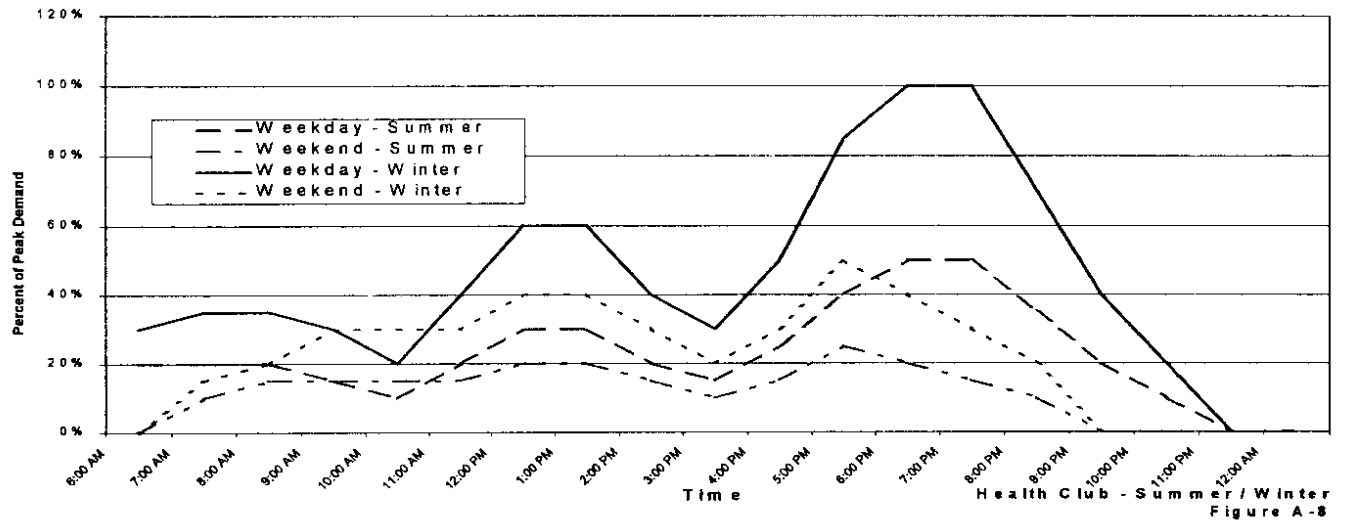
Parking accumulation curves come from the ULI recommendations with an increase in evening use to correspond with visitor shopping patterns. Summer represents the highest demand during the midday with a second peak in the evening. Winter demand is reduced from the summer demand.



Snow King Resort Master Plan – Parking

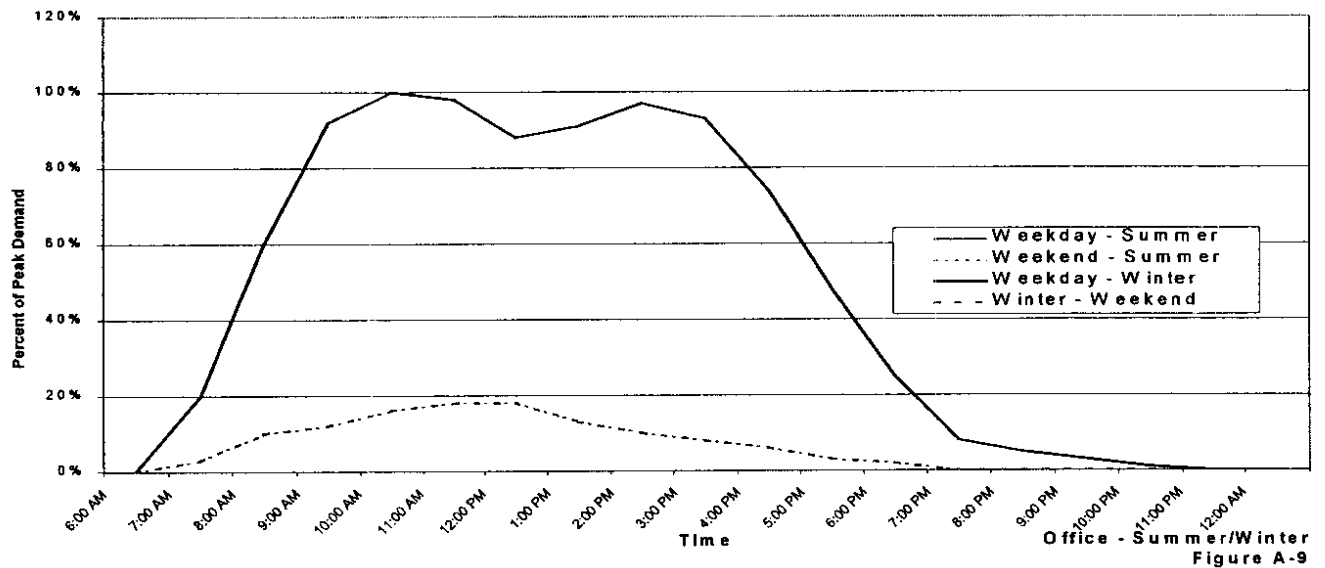
Health Club:

No parking accumulation curves were available from the ULI to represent demand on health clubs. Seasonal demand varied significantly. The largest demand occurs during winter weekdays after work. Weekends and summer weekdays have significantly smaller peaks. Peaks during the weekdays represent times before and after work as well as during lunch.



Office:

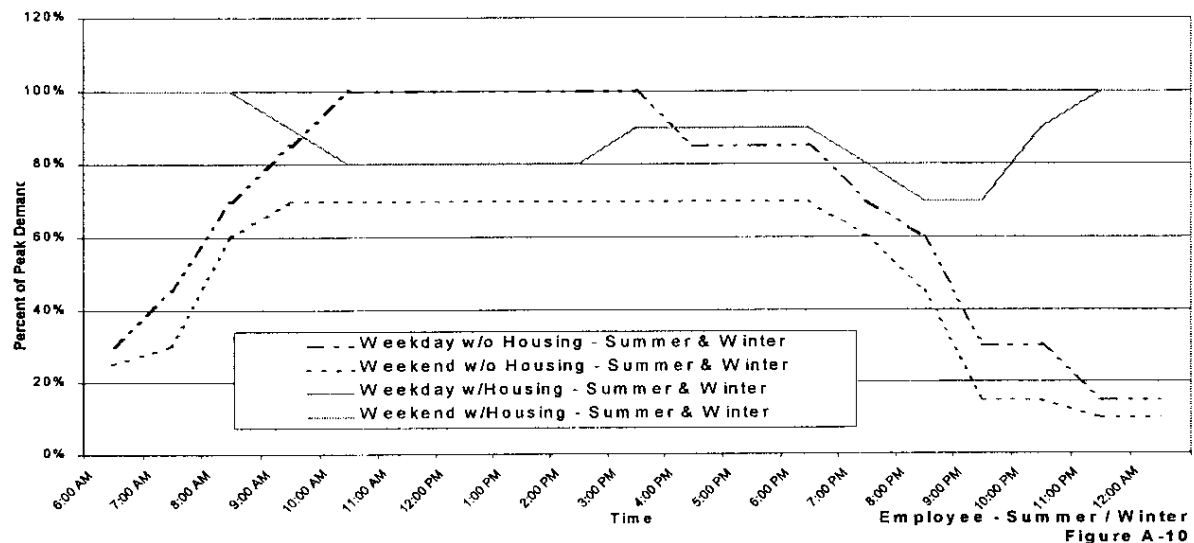
Parking accumulation for office use is based on the Urban Land Institute parking accumulation curves. This category of use has little influence on the overall parking because there are no offices located within the proposed use.



Snow King Resort Master Plan – Parking

Employee:

No parking accumulation curves were available from the ULI to represent parking demand created by hotel employee use. Additionally, there are two types of employees to be considered, those housed on site and those coming from offsite. For the employees housed on site, the parking accumulation was about 80% for most of the day with a slight drop in the evening which increases again starting at 9:00p.m. For the employees with offsite housing, parking accumulation was created using the staffing schedule. Offsite employees parking showed an accumulation of 100% by 10:00a.m. which remained high until about 3:00 p.m. when employees began leaving.



Snow King Resort Master Plan - Parking Elements

Appendix 8

A Discussion of Assumptions in Table P-4: Required Parking Spaces

Each land use and corresponding parking ratio is examined to determine the required number of parking spaces for both the summer and winter season. It is proposed that some of these parking spaces are available for a shared parking system. The parking quantities are split into shared parking and non-shared parking. These quantities are adjusted further to compensate for alternative transportation use and multi-stop auto trips. The computations produce the "adjusted number of spaces required" which represents the number of spaces that would be required if each land had to provide its own separate parking lot.

Parking ratios (Table P-4, Column D):

The parking ratio relates the required number of parking spaces to units of a land use (i.e. the number of hotel rooms or number of theater seats). The parking ratios utilize the Jackson Comprehensive Plan parking standards except as noted.

The exceptions include parking ratios for lodging, miniature golf, and the alpine slide. Other ratios including the Snow King Ski Area and the health club are based on a maximum number of users likely to be using the facilities at a given time.

The lodging ratio was revised upward from 0.75 parking spaces per unit to 1.0 parking spaces per unit to compensate for employees not housed on site. This increase improves parking capacity since the comprehensive plan appears to already include employees in the parking ratio.

The comprehensive plan does not include a miniature golf parking ratio. This analysis utilized 0.7 spaces per miniature golf hole. This ratio assumes that the golf course is frequented by larger groups who typically carpool and that the course can accommodate slightly less than one group per hole.

The alpine slide ratio assumes a similar ratio to a theater, which requires a ratio of 0.33 spaces per user. The number of users is based on revenue from the slide, which is converted to users per hour. The number calculated is likely to be conservative since it cannot account for users who typically ride the slide more than once.

The Snow King Ski Area and skating rink parking spaces are based on past use. The ski area has excess capacity to serve its users, a pattern, which is likely to continue. The anticipated parking requirement is 130 parking spaces. Most large functions such as the fireman's ball and the ski club ball occur during the off- season when excess parking is available.

The health club parking is based on the number of users expected. It is expected that a large percentage of locals will use the club with most driving independently. The health club will require 100 parking spaces.

Number of spaces required (unadjusted) (Table P-4, Columns E & K):

This number represents the parking required for each land use if it were standing alone. The amount of parking is generated by applying the parking ratio to the appropriate number of units. This number is larger than what will ultimately be required since many of the land uses will share the parking area allowing users to park once and use several facilities.

Number of spaces available/not available for sharing (Table P-4, Columns F/G & UM):

A portion of the proposed parking will be available for shared use. In order for shared use to work, it is best if there is a central, easily accessed parking area. Since the periphery buildings have parking lots in various locations and sizes, these will not be included in the available shared parking space number. Furthermore, existing condos or approved condos with their own parking will not be included in any of the shared parking.

Transportation mode factor (Table P-4, Columns H & N):

Snow King Resort's use of shuttle busses and its proximity to the START bus system allow guests travel around the town and county without depending on automobiles. In fact a large percentage of guests do not impact the parking facilities since they fly or are bused to Jackson. The TMF enables the parking to be

Snow King Resort Master Plan - Parking

adjusted for the low use of cars by guests visiting the resort. This factor can also be applied to any land use where alternative transportation modes are used. A factor of 1.0 indicates that every user is driving a car, while the summer lodging factor of 0.60 indicates 60% of the guests drive. A justification of the lodging's transportation mode factor based on existing use is available in **Figure 8-1**.

Typical Summer Day

Number of Rooms Occupied	Type of Guest	Mode of Transport	Percent	Number of Parking Spaces Occupied
30	Bus Tour	Bus	100%	6
145	Convention	Fly & Bus	49%	
		Fly & Drive	21%	30
		Drive	30%	44
25	independent Traveler	Drive	100%	25
200	Total Rooms	Total Spaces =		105

Transportation Mode Factor total Occupied Car Spaces

Total Occupied Rooms

= 105

200

= 52%

Therefore, **60% appears a reasonable Transportation mode Factor**

Typical Winter Day

Number of Rooms Occupied	Type of Guest	Mode of Transport	Percent	Number of Parking Spaces Occupied
5	Bus Tour	Bus	100%	3
35	Convention	Fly & Van	56%	
		Fly & Drive	24%	8
		Drive	20%	7
60	independent Traveler	Fly & Van	56%	
		Fly & Drive	14%	8
		Drive	30%	18
100	Total Rooms	Total Spaces =		45

Transportation Mode Factor total Occupied Car Spaces

Total Occupied Rooms

= 45

100

= 45%

Therefore, 50% appears a reasonable Transportation mode Factor

Lodging Transportation Mode Factor
Snow King Resort: Present Situation
Table 8-1

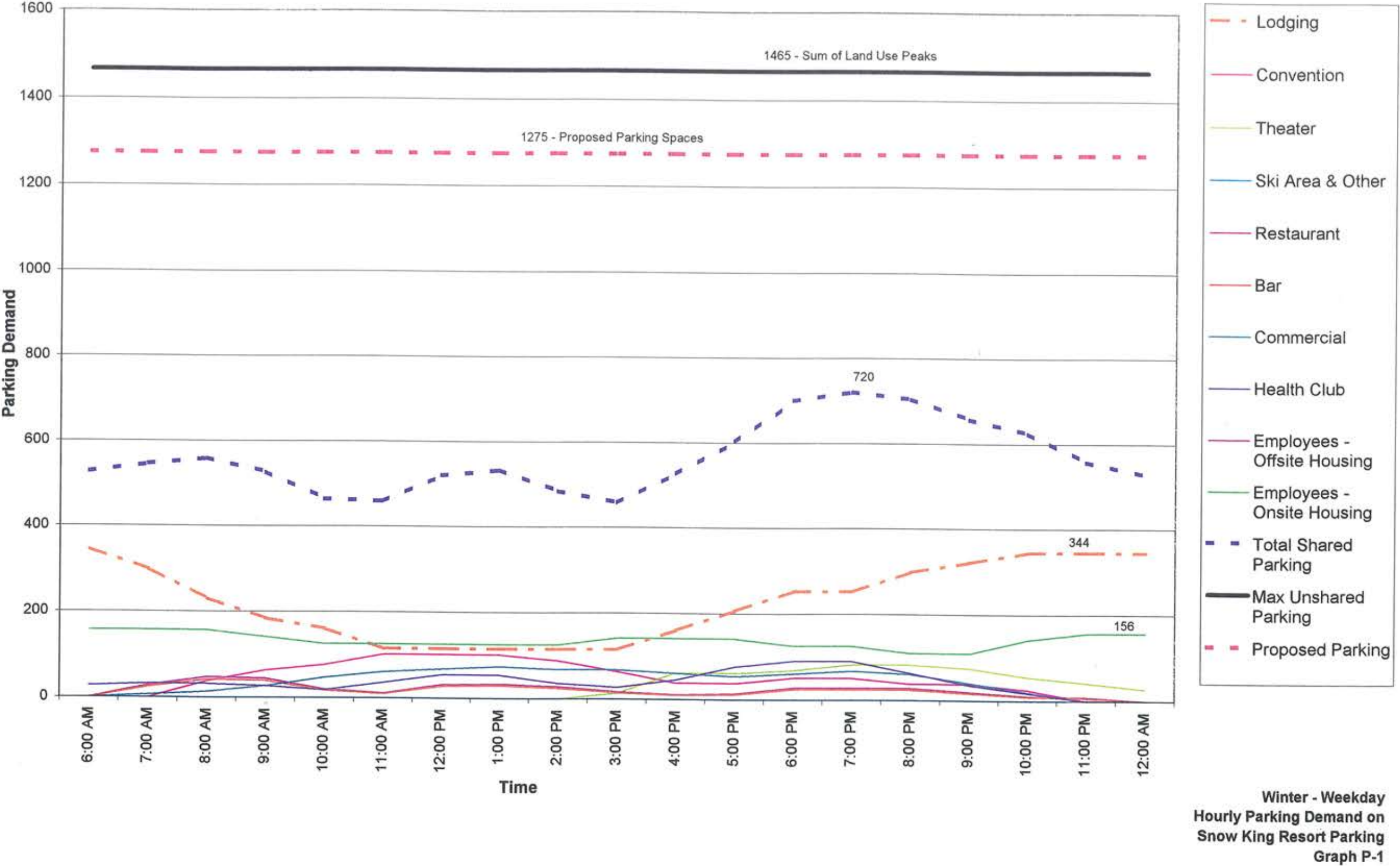
Snow King Resort Master Plan - Parking

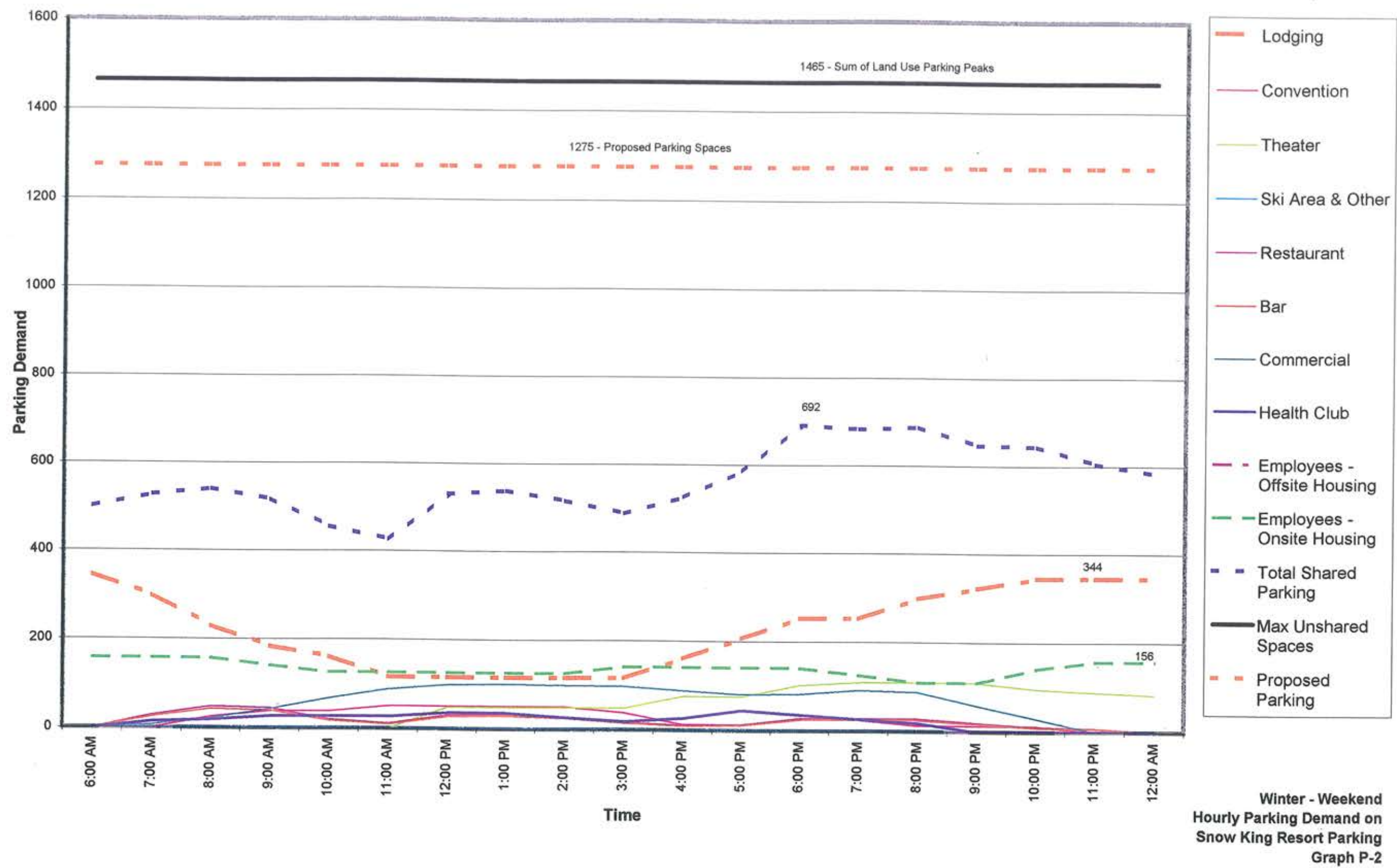
Offsite user factor (Table P-4, Columns I & O):

This factor indicates how many users come from offsite to use a facility. It is likely that many of the conference participants or restaurant and bar patrons will also be hotel guests, so the OUF will allow the required parking to be adjusted for this internal trip. An OUF of 1.0 indicates that 100% of the users come from offsite, while the summer conference factor of 0.50 indicates that 50% of conference attendees come from offsite. This factor allows the required parking to be adjusted so that guests are not counted twice in the parking demand.

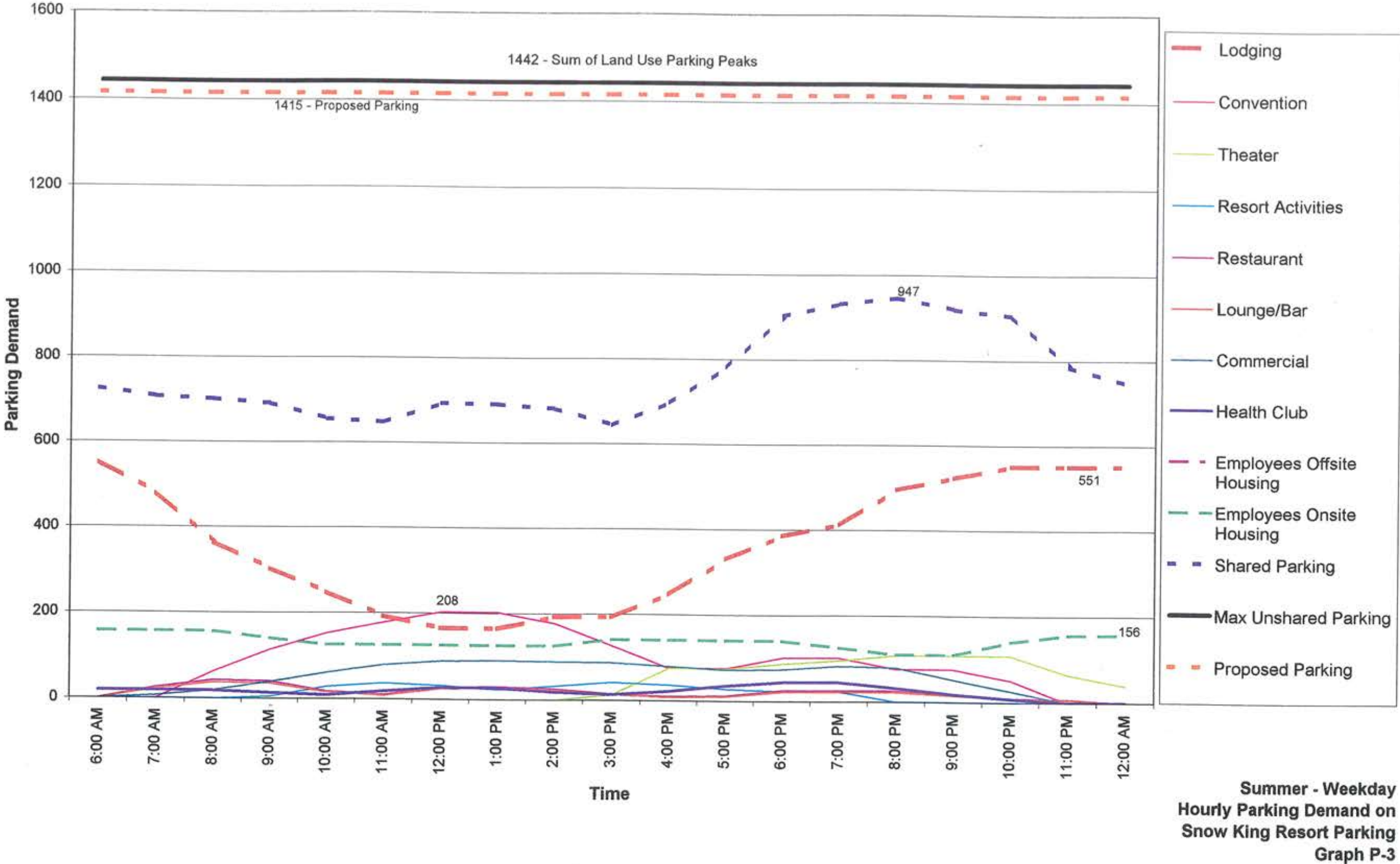
Adjusted number of spaces (Columns J & P):

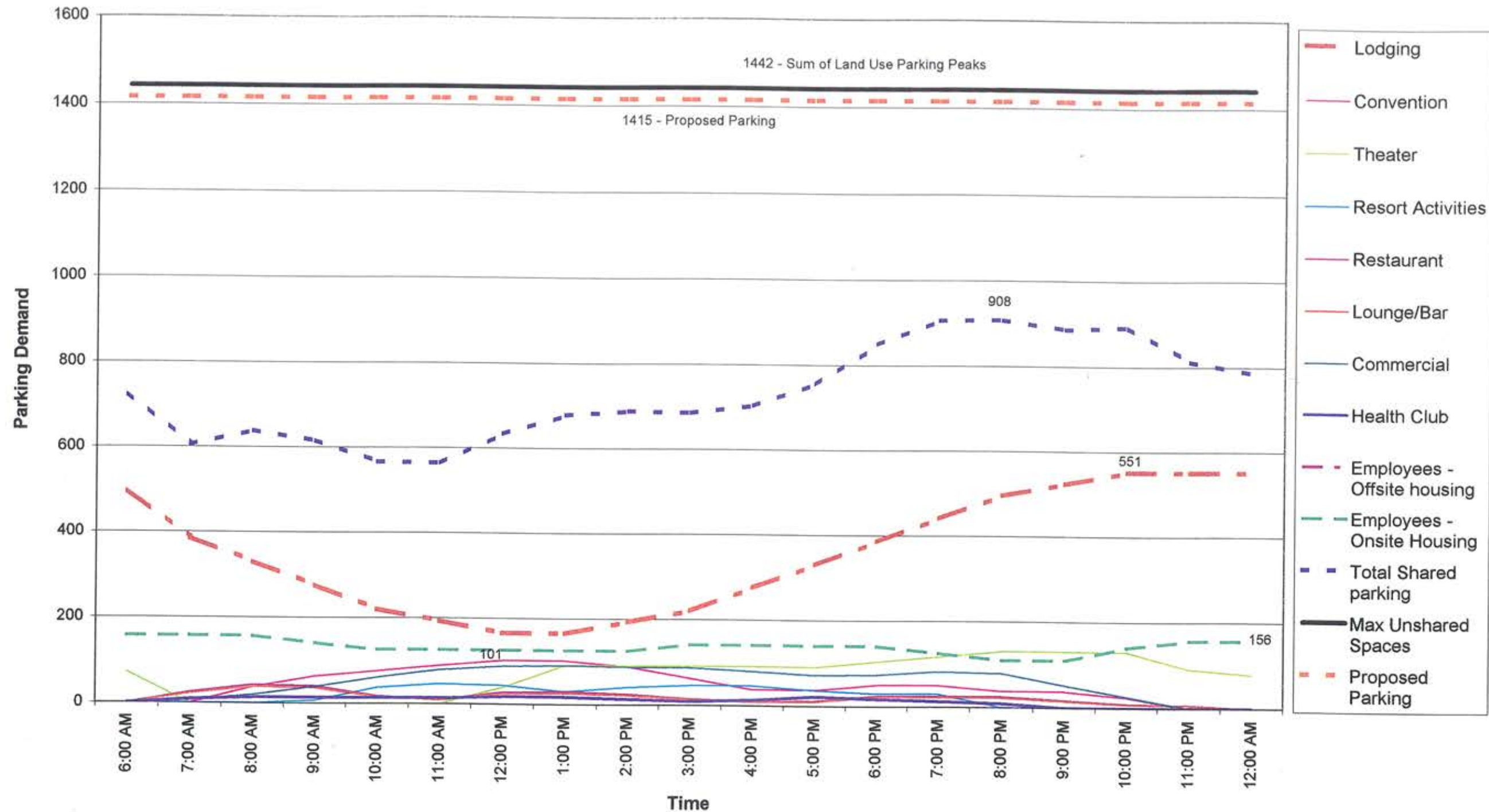
This number represents a reduction in required parking after the TMF and the OUF are applied. This number is a more accurate estimate of the required parking since it avoids counting users more than once and considers users who use alternative transportation. This number does not yet include any sharing of parking spaces





Winter - Weekend
Hourly Parking Demand on
Snow King Resort Parking
Graph P-2





Summer - Weekend
Hourly Parking Demand on
Snow King Resort Parking
Graph P-4

IX. CAPITAL IMPROVEMENTS PLAN

A. Introduction and Summary

The Snow King Water Supply, Wastewater Management and Storm Water Discharge Systems are designed and developed to meet the critical requirements associated with the function of such a vital gathering center. The Snow King Resort Comprehensive Master Plan represents urban planning that incorporates both destination vacationers and local commerce. Due to the difficulty of consistently servicing such a varying utility demand, peak design considerations were used in the design.

In establishing flow characteristics for the Resort, quantities of water consumption and wastewater production were calculated utilizing historical prediction charts for each service type and then applying this rate to the square footage of the service area. The square footage and water volume values have been summarized in the enclosed "Water and Waste Water Usage Table." It is necessary to keep in mind that this table reflects both the amount of water usage and the amount of water discharged, and has no allocation for water consumption use. The additional consumption use refers to the volume of water lost, evaporated, transpired, or otherwise utilized through leakage, washing, lawn irrigation or utility use. This quantity has been accounted for in the water service design considerations.

Total water usage is based on domestic needs, fire sprinkler suppression, (fire sprinkler suppression and fire hydrant demands are based upon minimum regulatory fire flow and flow duration requirements per Uniform Fire Code [UFC]), irrigation needs and fire hydrant flow requirements. The domestic water demand takes into account both the existing probable peak usage in addition to the proposed Master Plan peak flow rate of 223 gpm. Total peak demand is then calculated by uses expected from such resort facilities. This peak demand is 2,300 gpm. It is essential to understand that a flow of 2,300 gpm includes fire suppression of 1750 gpm, which is not a normal daily system demand. Thus, when removing the fire suppression, normal peak-operating demand is found. The resulting normal peak operating demand is approximately 550 gpm.

The existing and future water usage predictions previously noted do not consider water required for snow making. The Town of Jackson has been concerned about utilizing potable supplies for snowmaking. Snow King has additionally been concerned that the Town of Jackson water is warmer than ideal for snowmaking. To address these concerns, snowmaking water capacity will be expanded this summer (2000) in a joint project with the Town of Jackson to bring cooler water from Flat Creek to the Summit Lift pump house.

The wastewater sanitary system considers the existing Town of Jackson infrastructure capacity, potential wastewater produced by the current land use plan, and the potential flow created by this Snow King Master Plan. The current peak flow is 106 gpm. The proposed Master plan creates an additional 305 gpm. Existing upstream land use has the potential to produce an additional peak flow of 35 gpm. These peak flows are calculated from average day flows that are increased based on a peak flow multiplier. This peak flow multiplier has been produced from previous Town of Jackson maximum day vs. average day wastewater studies. The result is a total potential peak wastewater flow of 796 gpm. Maximum development of the Master Plan exceeds the existing Town of Jackson West Karns Avenue infrastructure by 245 gpm. The additional peak hour flows require the existing 8-inch diameter line located on West Karns, north of the rodeo grounds be increased to a 10-inch diameter line. The capacity of the existing 8-inch diameter interceptor is 593 gpm. This Town of

Jackson interceptor should be upgraded when the percentage of wastewater produced by the Master Plan exceeds eighty percent of the 593 gpm, or 475 gpm. Planning for these costs should be a consideration in the Master plan phases of construction. (See supporting water and sewerage design consideration calculations.)

Storm water runoff considerations are calculated in a similar manner. Design considerations give respect to existing Resort usage and Master Plan development.

Runoff calculations are based on the Jackson Rainfall Intensity Duration data for 10-year and 100-year event frequencies. Detention basins of natural appearance have been designed and designated to accommodate the 10-year storm event. Discharge leaving detention areas will not exceed the predevelopment rate for a 10-year storm. Storm water runoff generated from 1-year to 10-year events release the highest concentration of pollutants and settleable solids. These storms will pass through treatment facilities located at the catch basin receptacles. These storm water catch basins will remove the pollutants without possible re-suspension by future runoff events.

The Storm Water Runoff from the developed site will proceed directly to a Town of Jackson collection facility, but shall not discharge at a rate greater than the 10-year and 100-year predevelopment rate. Storm water runoff from the Forest Service property will be naturally diverted around the Resort. The 100-year storm event will bypass the detention areas and be handled by the proposed storm water facilities that connect to the Town of Jackson system.

Consideration has also been given to other utilities. Electricity, gas, cable TV and telephone are all available at the site and will be expanded as needed. Private in-resort telephone and broadband capabilities will also be expanded as needed. Two-way radio, telephone and internet capabilities at our mountain-top (Snow King West) site is also used by the Resort to provide broadband connectivity.

B. Water Supply System Plan

The Snow King Resort Water Supply System Plan was developed to meet the critical requirements associated with public water distribution. The first requirement was to determine the quantity of water need for domestic supply to accommodate the proposed facilities. The second objective is to provide fire flow suppression through fire sprinkler and fire hydrant supply.

Design Consideration - Water Service

1) Potential Flow Required by Master Plan

The practice for predicting water consumption was to develop a system capable of meeting maximum day demand

Existing and Master Plan Combined

$$\begin{array}{rcl} \text{Max Daily Flow} & = & 319,800 \text{ gpd} \\ (\text{See Waste Water Calcs.}) & = & 223 \text{ gpm} * \end{array}$$

* Total pre and post development Max. Day Waste Water Flow

Total peak demand is based upon the demand required for domestic flow, fire sprinkler flow, lawn sprinkler flow, and fire hydrant flow. Fire flow shall provide 1,500 gpm for a minimum to w-hour duration. Fire hydrant flow shall provide a minimum 250 gpm flow.

$$Q_T = Q_{\text{Domestic}} + Q_{\text{Fire Sprinkler}} + Q_L \text{ Sprinkler} + Q_{\text{Fire Hydrant}}$$

$$Q_{\text{Domestic}} = 450 \text{ gpm} *$$

$$Q_{\text{Fire Sprinkler}} = \text{Fire Sprinkler Flow} = Q_{\text{FS}}$$

$$Q_L \text{ Sprinkler} = \text{Lawn Sprinkler Flow} = Q_{\text{LS}}$$

$$Q_{\text{Fire Hydrant}} = \text{Fire Hydrant Flow} = Q_{\text{FH}}$$

* Use Multiplier factor of 2 x Max Day Waste Water flow. Accounts for additional water usage not recorded as Waste Water flow.

UNIFORM FIRE CODE

Classification Group A Occupancy

Division I (UFC-91, Sect. 9117)

Group R Occupancy

Division I & 3

Minimum Reg. Fire Flow & Flow Duration

Table No. A-111 - A-I UFC-91 pg. 496

Type 111 One-hr@ 6,000 gpm

75% Fire Flow Reduction

Assuming FS Installation = 1,500 gpm
For 2-hr duration

QL Sprinkler = QLS 100 gpm (Assumed)

QFire Hydrant = **QF.H.** 250 gpm

QT = 2,300 gpm = Peak Hour Demand

QT = QFS - QFH = 548 gpm = Normal Max Operating Demand

2) Existing Infrastructure Capacity

The fact that maximum day water demand may occur several days consecutively led us to consider checking for a water supply that would provide the maximum day demands, 548 gpm, and a source that could provide the peak hour demand, 2,300 gpm.

The expanded Snow King system will tie into the existing Town of Jackson 6-inch diameter high pressure line that parallels the Resort's northern property boundary. The new Snow King water main would complete a high-pressure water main loop creating a system more efficient than the existing dead-end main. The existing source is a system comprised of six-inch diameter service nourished from a twelve-inch diameter line located in East Kelly Avenue.

The Town of Jackson water system has sufficient water supply and storage to meet the maximum day demands, 548 gpm, and the peak fire and domestic demand of 2,300 gpm. Snow King will need to provide the additional water mains to complete the high-pressure zone and deliver the water to proposed Resort facilities.

C. Sanitary Sewer

Design Consideration

The Snow King Resort Sanitary Sewer Management Plan was developed to meet two crucial objectives. The first, to determine the infrastructure required on-site to handle the capacity of the proposed facilities. The second, to convey sanitary sewer flows away from the Resort and distribute these discharges into the Town of Jackson sanitary system. The following design considerations are incorporated into the design and shall be considered during construction phases of the Master Plan

- 1) Existing Town of Jackson Collector Capacity - Upstream of MH CI 0-16
 - Alley parallel and between E. Kelly and E. Karns MH CI0-30 to MH CI0-16
 - Existing 10" PE pipe / minimum slope downstream = 1.47%
 - Land use currently designated: residential
 - Existing 10" will handle 1,550 gpm maximum
- 2) Existing Collector System and Land Use Flow Potential - Upstream of Resort

The Snow King Collector sewer objective is to collect wastewater from various Resort service lines and carry it by gravity to the Town of Jackson Interceptor Sewers.

Current Snow King Resort Flow Potential

204 Hotel Units at 225 gpd/room	45,900 gpd
40 Condominium Units at 2 Units Each at 225 gpd/unit	18,000 gpd
Motel Restaurant Services - 200 seats at 80 gpd	16,000 gpd
Pitchfork Townhomes - 19 units at 450 gpm	13,500 gpd
Clark's Knoll Townhomes - 19 units at 450 gpd	<u>8,550 gpd</u>
Existing Max. Day Waste Water Flow Total (I)	101,950 gpd
Total (I)	71 gpm
Existing Peak Hour Flow	106 gpm

3) Dwelling Units Representing Potential Upstream Flows:

Zone	Area	Max Density	No. of Units	Flow Max Day (gpd)
AR	34.7 Acre	4.6/Acre	160	70,400
NC-2	25 Lots	2/Lot	50	22,000
NC/SF	144 Lots	1/Lot	144	63,360
SR	139.1 Acre	2.9/Acre	403	77,320
R	80 Acre	1/Acre	80	35,200
PRD	Pitchfork	30 Units	30	13,200
PRD	Snow King	See Table		<u>88,450</u>
			867	470,230

Average Day Flow (Max Day/2)	=	235,115 gpd
Max Day Flow	=	470,230
		328 gpm
Peak Hour Flow (Avg Day *3)	=	490 gpm
Potential Upstream Max Day		
Flow Minus Snow King Resort	=	368,280 gpd
Potential Upstream Avg. Day		
Flow minus Snow King Resort	=	184,140 gpd
Potential Upstream Peak Hour		
Flow Minus Snow King Resort	=	552,420 gpd
	=	385 gpm

Existing 10" P.E./n = 0.010/S = 1.47%

$$Q = 1.49 AR^{2/3} S^{1/2} / n$$

$$Q = 1,550 \text{ gpm}; \quad \text{Capacity of Existing Collector}$$

Storm water runoff generated by the 1 -year to 10-year storm events on roads.

4) Potential Flows for Snow King Master Plan

The collector sewers have been designed for peak flows that include a factor applied at four times the expected average daily flow. The collector sewers were then sized using the peak flows and Manning's equation. Manning's equation is utilized to predict the adequate pipe diameter required for full flow design based on pipe diameter, pipe slope and peak flow, a minimum slope of 0.75 percent was used to represent a minimum pipe slope scenario. The pipe is then checked for a minimum scouring velocity of 2.5 ft/s applied with a lower average daily flow rate.

Proposed Master Plan Flow Potential-2000

494 Hotel Units at 225 gpd/room	=	111,150 gpd
120 Hotel Units at 225 gpd/room		27,000 gpd
100 Hotel Units at 225 gpd/room		22,500 gpd

Commercial Space and Assembly at 146,000 SF		
Assume .05 gpd / ft ² (5000 SF at 225 gpd per)		7,300 gpd

Commercial Theaters/Health Club/Daycare/		
Pool at 37,000 SF. Assume 0.11 gpd/ft ²		
(2000 SF at 225 gpd per)		4,200 gpd

Restaurant/Services - 200 seats at		
80 gpd each		16,000 gpd

Employee Housing at 18 units at 450 gpd each	=	8,100 gpd
Condominiums at Love Ridge at 40 units at 450 gpd each	=	18,000 gpd
Cottages at 8 units at 450 gpd each	=	3,600 gpd
Proposed Max. Day Flow Total (2)	=	217,850gpd
Proposed Max. Waste Water Flow (2)	=	152 gpm
(See Water and Waste Predicted Usage Table for additional breakdown)	=	223 gpm
Max Daily Waste Water Flow (1 & 2)	=	319,800 gpd
Avg Day Flow (Day/2)	=	108,925 gpd 76 gpm
Peak Hour Flow (Avg Day* 4)	=	305 gpm

5) Total Flow - Existing and Proposed

Existing Peak Hour Flow (Reflects potential flow upstream from Resort)	385 gpm
Proposed Peak Hour Flow (Reflects 2000 Snow King Master Plan)	305 gpm
Existing Max. Day Waste Water Flow (1)	106 gpm
Total Flow (QT= 385+305+71)	= <u>796 gpm</u>

6) Existing Collector Capacity at the Resort Discharge

10" PE / n = 0.010 / S = 1.47%
 $Q = 1.49 \text{ AR}^{2/3} \text{ S}^{1/2} \text{ n}$ Full Flow = Manning's Equation
 QE.C. = 1,550 gpm Capacity of Existing Pipe = QE.C.
 QT= 796 gpm
 QE.C. = 1,500 fpm > QT = 796 gpm

7) Existing Town of Jackson Collector Capacity - Downstream of Resort

- Line parallel with West Karns Avenue between Mateosky Park and Flat Creek Drive MH C10-10
- Existing 8" clay / minimum slope downstream = 1.2 %
- Current land use designated: residential

The existing Town of Jackson Interceptor Sewers were checked for the capacity of three times the future maximum expected average daily flow, the maximum future flows are representative of the maximum possible build-out potential of all upstream sewers in accordance with the current land use plan.

Dwelling Units Representing Potential Downstream Flows Influencing Existing Collector Capacity on West Karns Avenue.

<u>Zone</u>	<u>Area</u>	<u>Max Density</u>	<u>No. of Units</u>	<u>Flow- May Day (gpd)</u>
AR	12 Acre	4.6/Acre	55	24,200
NC /MHP	6 Lots	2 / Lot	12	5,280
PI SP	24 Acre			<u>10,560</u>
Existing Downstream Max Day Flow Potential				40,040
Existing Downstream Max. Day Flow Potential				= 30 gpm
Existing Downstream Peak Hour Flow				42 gpm
* (Reflects max build-out of existing land use upstream of Park and Snow King Resort)				385 gpm
Proposed Peak Hour Flow (Reflects 2000 Snow King Master Plan)				305 gpm
Existing Peak Hour Flow (1)				106 gpm
Potential Total Peak Hour Flow at MH CI 0-10				838 gpm

Existing Collector Capacity

$$8" \text{ Clay } / n = 0.013 \quad I S = 1.2 \%$$

Manning's equation for Full Flow

$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2} = 593 \text{ gpm}$$

$$593 \text{ gpm} < 830 \text{ gpm}$$

Therefore, 8" existing TOJ sewer main must be replaced with new 10" main, approximately 1,200 LF

The peak hour flows for maximum build-out and the proposed Snow King facilities exceed the downstream Town of Jackson 8-inch diameter collector by 245 gpm. Expansion in accordance with the Snow King Master Plan beyond a potential flow of 593 gpm will require approximately 1 200 linear feet of existing Town of Jackson interceptor to be replaced with a 10-inch diameter interceptor. The interceptor could be replaced upon reaching 80 percent of the 593 gpm that exceeds the 8-inch h interceptor's capacity. This would allow the Town of Jackson and Snow King Resort to plan and acquire the funding required to replace this line. The Town may be interested in creating a joint investment account that both parties could contribute to annually, raising and sharing the cost. of the infrastructure replacement. It would be of great benefit for the Master Plan to indicate rate of development, so that a proper fund could be established that would accrue at a rate equal to the anticipated replacement occurrence.

Note :

Town of Jackson WWTF Flows Indicate

- $\text{Max day} = 2 * \text{Avg day}$
- $\text{Max hour} = 2.7 * \text{Avg day}$

Snow King Master Plans Calculations Utilize

- $\text{Max day} = 2 * \text{Avg day}$
- $\text{Max hour} = 4 * \text{Avg hour}$

TOJ Line Capacity Calculations Utilize

- $\text{Max day} = 2 * \text{Avg day}$
- $\text{Max hour} = 3 * \text{Avg day}$

D. Storm water Management Plan

A complete storm water management program contains many elements including on-site infiltration and detention, collection, and transport systems. The Snow King Resort Storm water Management Plan was developed to meet several major objectives associated with post-development storm water runoff. The most critical is to convey storm water away from developments, thus diminishing the water buildup from minor storms and damage that can be associated with major storms.

Storm water Runoff Design Conditions

The methodology for calculating peak rate of runoff from undeveloped and developed areas and runoff storage is "Rational Method." Runoff calculations are based on the Jackson Intensity Duration Frequency data CIA "RATIONAL METHOD"

Find: Rainfall intensities for 10-year and 100-year events.

Find: Max allowable pre-development release for 100-year storm event.

The rational method assumes that the maximum flow will occur at the time when all of the runoff flows from the contributing watersheds reach the outlet.

Existing Site Conditions (In Acres)

<u>Sub- Area</u>	<u>Total Area</u>	<u>Pervious Area</u>	<u>Impervious Area</u>
1	4.51	13.50	1.03 (Roof & Asphalt)
2	4.96	4.52	0.044 (Dirt)
3	5.28	5.28	0.00
4	13.09	12.09	1.00
5	13.55	10.27	3.28 (Roof & Asphalt)
6	17.70	16.70	1.00 (Dirt)

Pre-Development Runoff Summary

<u>Sub-Area</u>	<u>Time of Concentration (min)</u>	<u>10-Year Event (CFS)</u>	<u>100-Year Event (CFS)</u>
1	20.3	3.88	6.09
2	24.9	1.23	1.93
3	22.2	1.08	1.69
4	28.4	2.82	4.51
5	22.3	5.11	8.02
6	29.8	3.48	5.52

Pre-Development Runoff and Conditions

Assume 100% pervious surface conditions
C= 0.3 for undeveloped with sparse grass

Time of concentration

$$T_c = \frac{1.8 (1.1-C) V_L}{(S)^{1/3}} = \frac{1.8 (1.1-0.3) V_{2200}}{(15)^{1/3}} = 27.4 \text{ min}$$

Rainfall Intensity:	10-Year	0.89 in / hr
	100-Year	1.40 in / hr

QIO = 0.3 (0.89) 69	18.45 CFS
QIOO = 0.3 (1.40) 69	<u>28.98 CFS</u>

Post-Development Runoff and Conditions

No development shall cause adjacent landowners, water courses or conduits to receive storm water runoff from the proposed development at a higher peak flow rate than would result from the same storm event occurring over the site if the land was in its undeveloped condition. The storm events considered will be for a 10-year and 100-year event.

Post-Development Site Conditions

<u>Sub-Area</u>	<u>Total Area</u>	<u>Pervious Area</u>	<u>Impervious Area</u>
1	14.51	6.22	8.29
2	4.96	1.06	3.90
3	5.28	2.72	2.56
4	13.09	9.29	3.80
5	13.55	11.13	2.42
6	17.70	16.07	1.63

Post-Development Runoff Summary

<u>Sub-Area</u>	<u>Total Area</u>	<u>Pervious Area</u>	<u>Impervious Area</u>
1	20.31	9.32	14.63
2	31.71	2.98	4.72
3	28.1	2.45	3.92
4	13.09	9.29	3.80
5	13.55	11.13	2.42
6	17.70	16.07	1.63

Storm water Runoff Summary

<u>Sub-Area</u>	<u>Acres</u>	<u>Post-Dev. Runoff (CFS)</u>	<u>Minimum Diameter Storm Pipe (3 CFS)</u>	<u>Design Release</u>	<u>(CFS)</u>
1	14.51	14.63	24"	9.67	6.09
2	4.96	4.72	15 "	3.12	1.93
3	5.28	3.92	15"	2.59	1.69
4	13.09	7.23	18"	4.78	4.51
5	13.55	7.15	18"	4.71	8.02
6	29.80	<u>5.99</u>	<u>15 "</u>	<u>4.10</u>	5.52
		43.65	Mass Calc. -	28.98	
				Ind. Calc.	27.76

27.76 Max allowable release- 100-year event base

Storm water subsurface facilities are required to carry the runoff from a 25-year storm event as minimum design criterion. Storm water surface facilities shall be sized to handle additional runoff from the 100-year storm event as a minimum.

Non-contaminated storm water from roofs and landscaped areas shall be designed to flow into natural detention areas. These designed detention areas shall be sized to accommodate the 100-year storm event. The rate of flow leaving these detention areas shall not exceed the pre-development rate for the 10-year to 100-year storm.

Sub-Area Release and Storage Summary - 100-Year event

<u>Sub-Area</u>	<u>Acres</u>	<u>Release (CFP)</u>	<u>Storage Volume (CF)</u>
1	14.51	6.09	5,987
2	4.96	1.93	3,135
3	5.28	1.69	2,085
4	13.09	4.51	1,545
5	13.55	4.71	966
6	29.80	5.52	50

Previous calculations show that a 36" pipe in a 4' x 5' percolation trench provides 10.05 CF/LF storage. 24" provides 7.43 CF/F: storage.

<u>Sub-Area</u>	Volume	Length	
		<u>36"</u>	24"
1	5,987 CF	596 LF	806
2	3,135	312	422
3	2,085	208	281
4	1,545	153	208
5	966	96	130

Storm water runoff generated by the 1 -year to 10-year storm events on roads and parking areas shall pass through treatment facilities to remove and trap settleable solids and floating petroleum products from the storm water as practical without resuspension of contaminants by runoff from subsequent storm events. Storm water runoff generated by the 10-year to 100-year storm events shall bypass the treatment facilities and proceed directly to the Town of Jackson collection facilities, but shall not discharge at a rate greater than the pre-development rate for the 10-year to 100-year storm event.

Storm water runoff from the Forest service property shall be naturally diverted around Snow King Resort utilizing resort facilities to handle mountain runoff for the 100-year storm event.

The Resort Master Plan should incorporate detention basins of volume as shown in the 100-year storage summary table. Additional infrastructure will then carry overland flow not detained on site. The Storm Water infrastructure shall be sized to accommodate 100-year event storms and be incorporated with the existing Town of Jackson Storm Water Infrastructure.

E. Other Utilities

The Site is supplied with sufficient capacity of electrical, gas, telephone and cable television lines. Expansion of these utilities will be available as expansion occurs. Within the site, the Snow King Resort Master Association will administer private telephone, internet, broadband satellite /cable TV lines and construct additions as needed. In cooperation with the Town of Jackson, the Applicant is undertaking an expansion of the snowmaking water capabilities during the summer of 2000. The mountaintop west electronic site was expanded during the 1999 summer to allow for additional wireless telephone and high-speed internet equipment. Additional room is available at this site for future expansion to serve the Resort and the community at large.

F. Additional Conditions

At the time of approval of this Master Plan, the following conditions were included as part of the approval:

Prior to the submittal of the first Snow King Resort Final Development Plan, additional analysis and information shall be submitted for the storm water collection and discharge systems to be installed at the resort. The additional storm water analysis shall include but not be limited to: the preliminary design layout of all onsite collection and discharge systems, a preliminary grading plan, a capacity analysis of the existing Kelly Avenue storm drainage system, a review of the impacts which may be created to adjacent offsite areas and a plan layout which indicates the sub-basin areas and the impervious surfaces to be installed in each. This additional analysis shall be completed to comply with all existing Town standards.

The applicant shall be responsible to complete offsite storm drainage improvements necessary to convey storm water flows from the site to the Kelly Avenue drainage system and, if warranted based on the provided engineering analysis, complete improvements to the Kelly Avenue drainage system that are a consequence of the development within the Snow King Master Plan.

To facilitate the conveyance of storm water flows between the Kelly Avenue storm drainage system and Snow King Estates, the applicant shall provide the Town with a storm drainage easement in the easterly area of the site. The easement location and language shall be mutually agreed to by the Town and the applicant.

An additional water system analysis and information shall be provided and approved by the Town Engineer. The additional information shall be provided with and without the Town's system supplying snow making water and shall include but not be limited to: a comprehensive Town water system hydraulic model which indicates the adequacy of the existing Town system at the estimated build out date of the development, a review of available fire flow capacities in the area of the resort at build out, a review of the water velocities produced in transmission pipes which are 8 inches in diameter and less, an analysis of the existing Town storage capacity, a summary of the installation of the proposed high pressure zone, calculations indicating the size of the proposed storage tank preliminary pump sizing calculations and an implementation plan for onsite systems.

The applicant shall be responsible to ensure that under, the additional water demands created from the developments build out, the Town's system shall remain in compliance with DEQ water system regulations and Town ordinances.

The applicant shall insure that the Town's right to inspect onsite water systems is maintained.

Prior to occupancy of the first Final Development Plan building, the applicant shall be required to complete the installation of an 8" inch (minimum) watermain from the development to Kelly Avenue. The new watermain shall be completed per Town standards and shall be installed in the Cache Creek Drive and Redmond Street Right-of-ways.

A sanitary sewer system report shall be provided to and approved by the Town. The sanitary sewer plan shall include a preliminary onsite sanitary system design.

Sanitary sewer systems completed shall be constructed, tested and maintained in accordance with DEQ and Town standards.

The applicant shall insure that the Town's right to inspect onsite sewer systems is maintained

The applicant shall be required to provide the Town with financial mitigation fees for the completion of the Cache and Willow Street corridors (from Snow King Avenue to Broadway Avenue) and the intersection of Snow King/Willow.

The amount collected shall be based on the calculated increased levels of traffic and pedestrian impacts created from the development together with the estimated project completion costs for roadway, curb, pedestrian and landscaping improvements. The improvements required shall be based on the preliminary design as completed in the year 2000 charrette process. The mitigation fee to be provided to the Town shall be based on the estimated project costs required to complete the corridor work at the time the fee is due. Any improvements to the Willow Street corridor that are completed by others prior to reaching the levels of new development described below are not to be included in the calculations of mitigation fees. The mitigation fees shall be provided to the Town in cash at the time the levels of development are reached and prior to issuance of building permit.

The total new square footage allowed under the proposed resort master plan is estimated to be approximately 700,000 SF. This new square footage does not include the existing hotel building or the Love Ridge development. As such the mitigation fees shall be forwarded to the Town as follows:

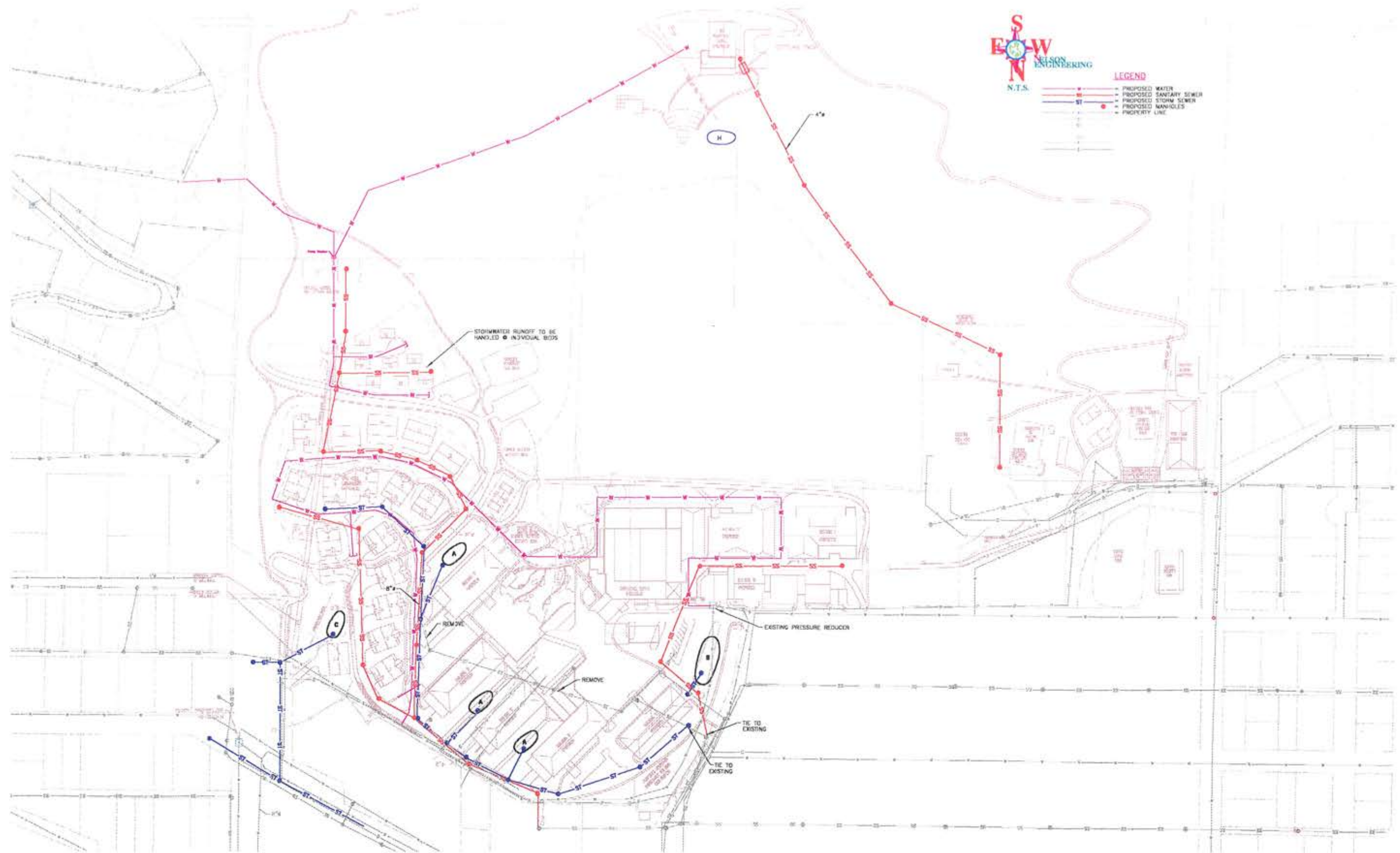
At 200,000 SF of new development: The applicant shall be required to provide 100% of the project costs associated with the completion of improvements to the Snow King/Willow Street intersection. Improvements shall be completed to satisfy the Town standard Level of Service (LOS) requirements for the traffic anticipated at the build out of the development.

The applicant shall also provide a mitigation fee in the amount of 15 % of the total estimated project cost required to complete the Willow and Cache Street corridors.

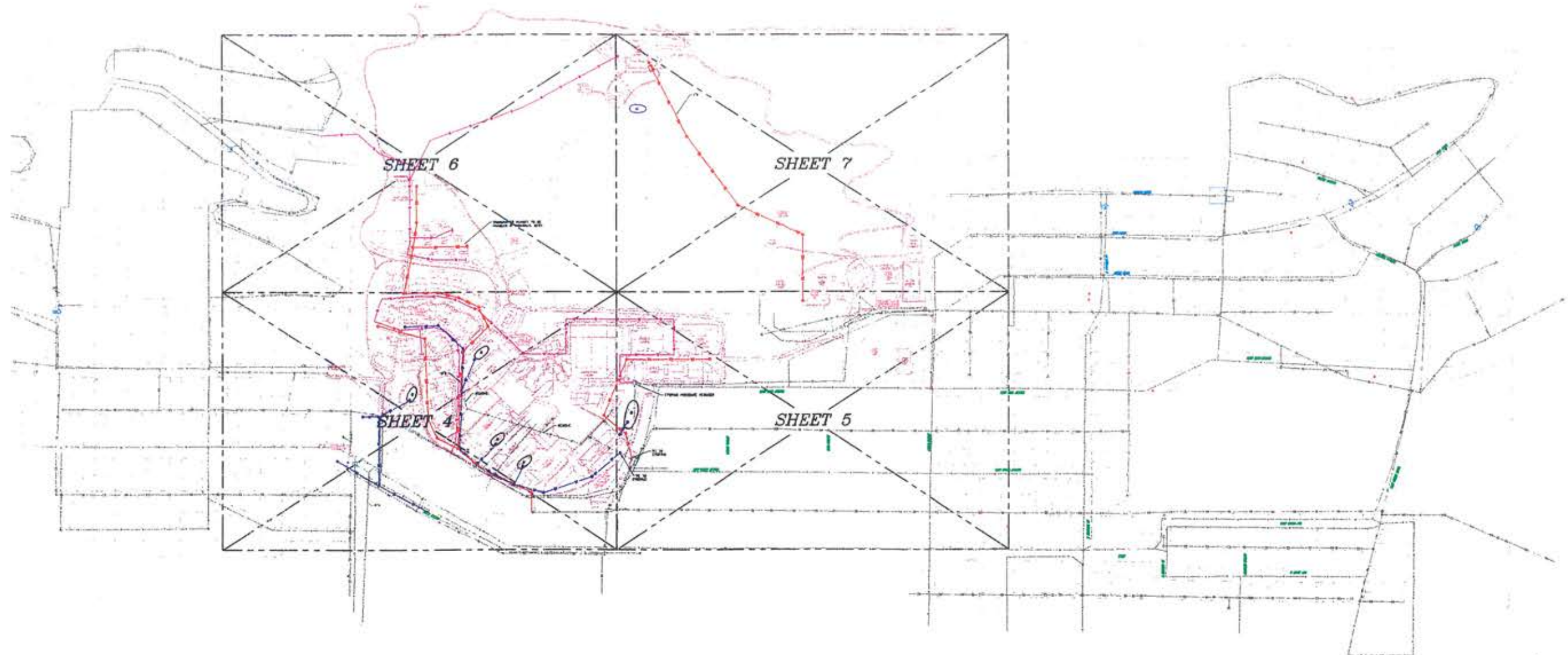
At 400,000 SF of new development: The applicant shall provide an additional mitigation fee in the amount of 15% of the total estimated project cost required to complete the Willow and Cache Street corridors.

At 600,000 SF of new development: The applicant shall provide an additional mitigation fee in the amount of 15% of the total estimated project cost required to complete the Willow and Cache Street corridors.

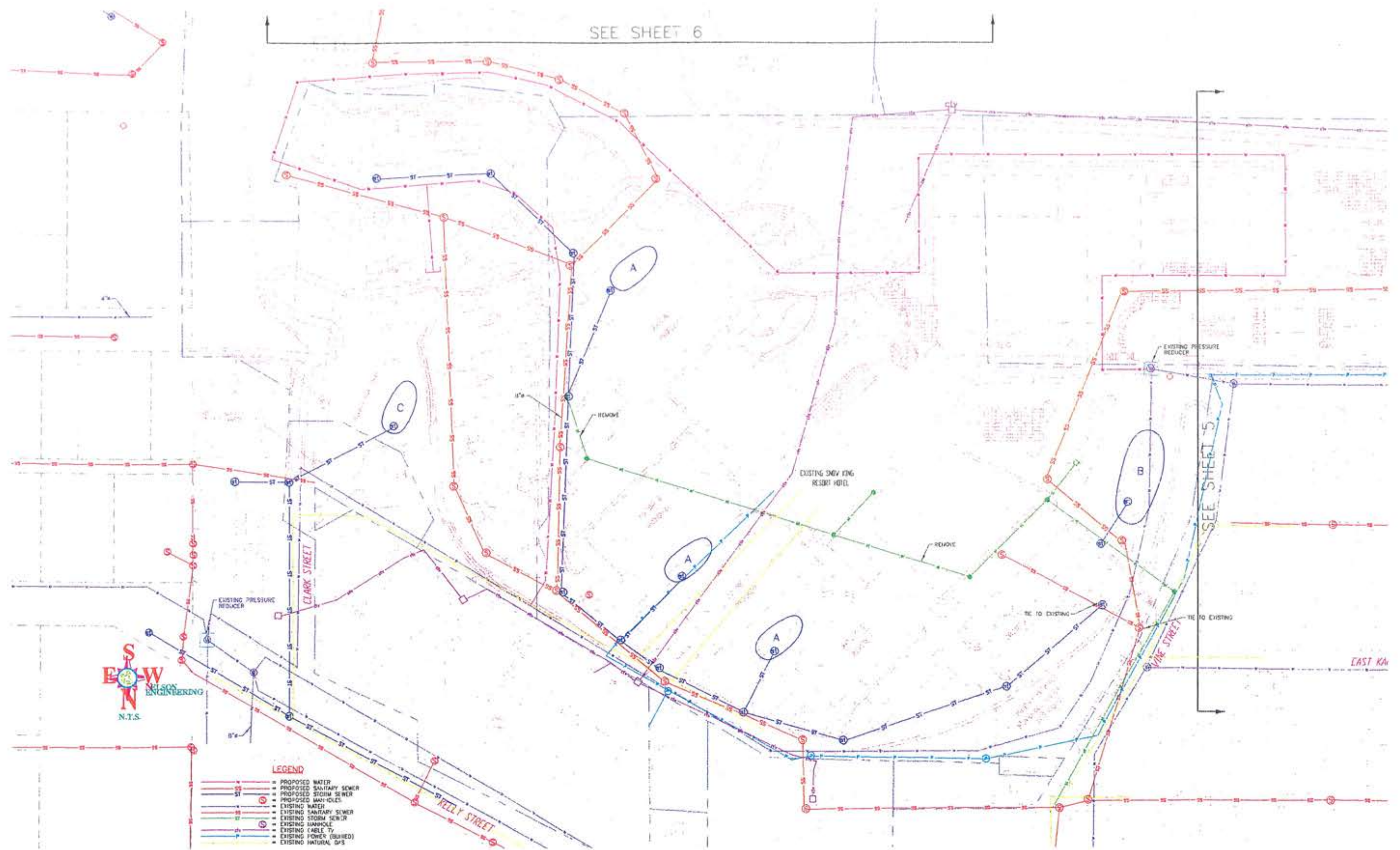
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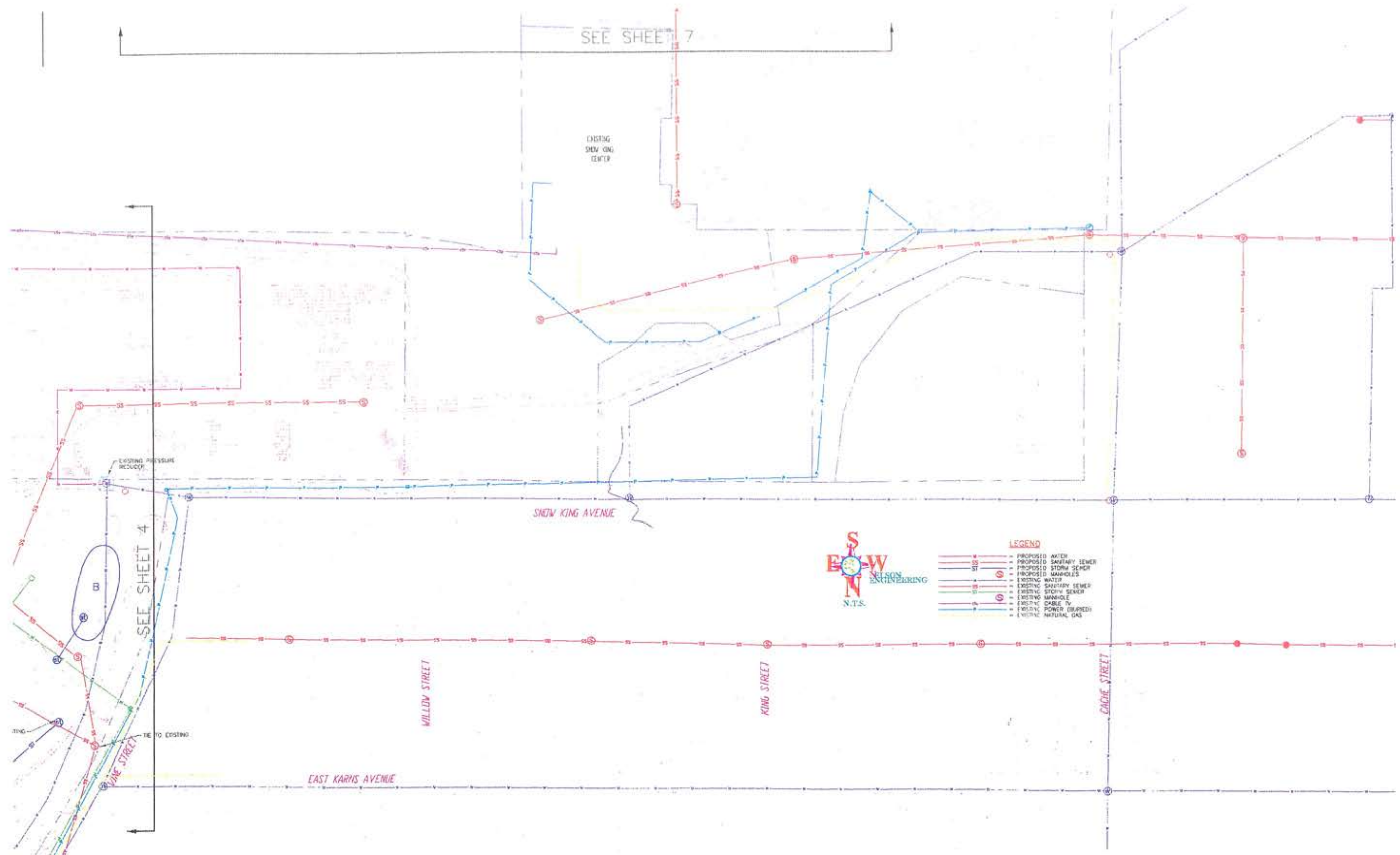


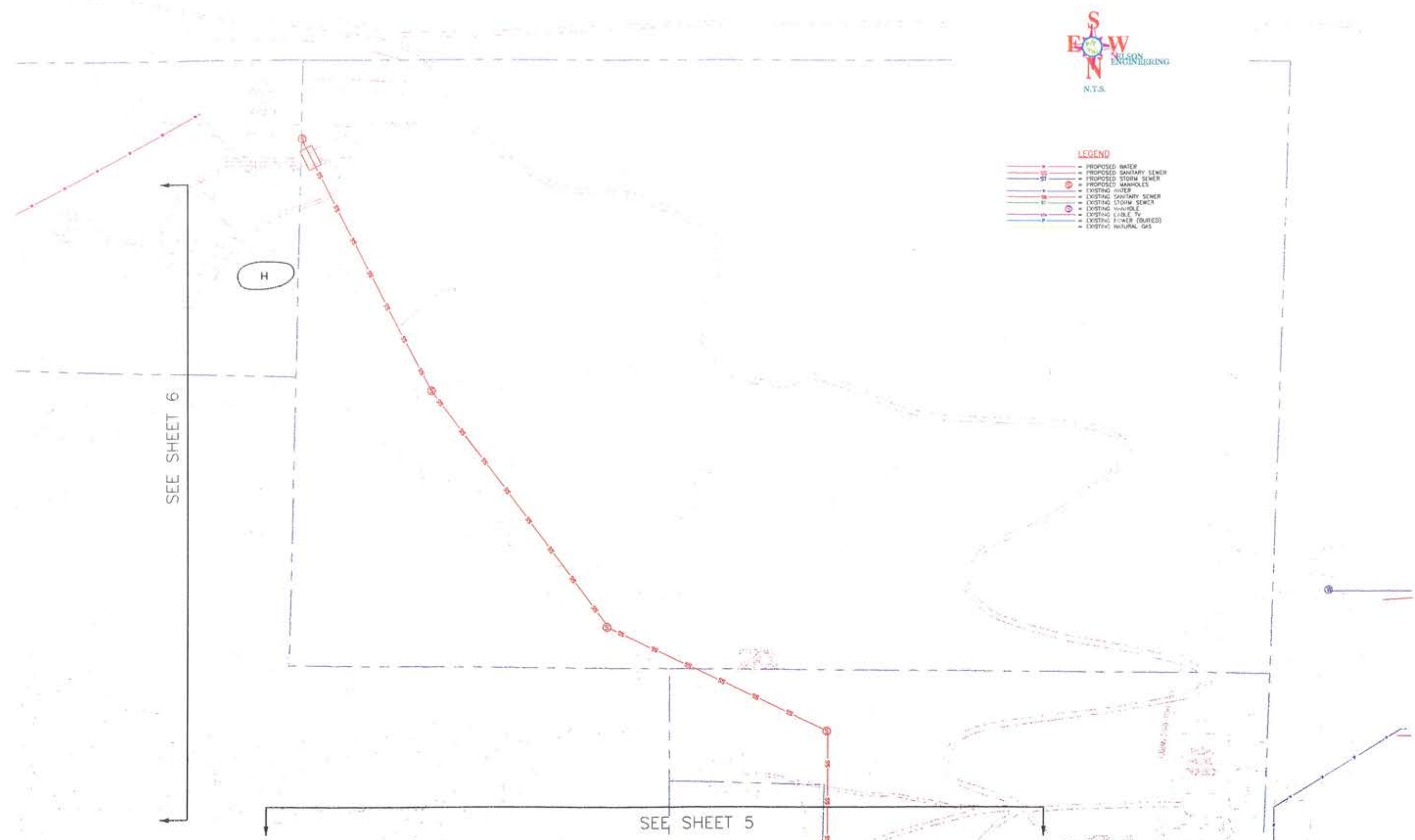
PROPOSED UTILITY PLAN



ENLARGED PLAN INDEX







ENLARGED PLAN - SHEET 7

XI. PHASING AND THE SNOW KING RESORT MASTER ASSOCIATION

The PRO regulations require a phasing plan and an explanation of relevant management policies and procedures that will guide the implementation of the master plan. The phasing plan must include performance objectives and must be sufficient to assure that development will take place in a logical sequence and that an adequate monitoring program is in place to determine the accomplishment of proposed remedies and mitigation measures for projected impacts.

Snow King will develop the property in phases and in a well-balanced manner. While there is no specific timeline and individual phases will be constructed according to market demand, Snow King will insure that all facilities required for the convenience of guests, public safety and mitigation of any negative impacts are constructed in a timely and concurrent fashion and follow a logical sequence. As additions are completed, the entire infrastructure and other required performance components for each phase will be in place and performance standards will be adhered to. These components include utilities, parking, housing and transportation elements that will be developed in increments in tune with commercial, lodging and other development. When any of these components are built in excess of the required needs of a particular phase, and in excess of the cumulative needs to date, this excess will be credited towards the requirements of future phases. Final Development Plans for each building or phase will address the specific impacts and required mitigation associated with it.

As a first phase, Snow King plans to improve the periphery road (Snow King Loop) concurrent with the construction of infrastructure associated with the Love Ridge development. When this road is built, utilities will be oversized to accommodate future needs envisioned in this Master Plan.

The Snow King Resort Master Association (SKRMA) will oversee the proper phasing and administration of all development within the resort district. The intent of this organization is to have one voice represent the resort district and to ensure that adequate monitoring programs are established for development within the district.

SKRMA will be controlled by the landowners in the District and will ensure that development occurs in groups, or bundles, that ensure a well-balanced development. SKRMA will be managed by a Board of Directors consisting of up to seven members elected by the District property owners, with voting based on assessed valuation. SKRMA will assign responsibilities and cost sharing among entities other than the applicants.

The responsibilities of SKRMA include serving as the conduit for all major development applications within the resort district, and assessing dues and fees for landscaping, snowplowing, and common area road repairs within the district. SKRMA is tasked with the responsibility of carrying out the Transportation Demand Monitoring plan associated with this master plan and submitting results as required to the Town of Jackson. The organization will have one primary point of contact for all inquiries, billing, and organizational requests. SKRMA will exist in perpetuity to oversee the administration and development plans of the resort district and to ensure that resort commitments within this Master Plan are transferable to all new future owners of property within the district. SKRMA members will pay dues on an annual basis to cover costs associated with the management and operation of the organization.

All areas and developments within the resort district will be required to participate as members of SKRMA.

SKRMA's involvement on the Existing Condominiums area will be mostly limited to controlling any future redevelopment to conform to this Planned Resort District Plan. In addition, SKRMA will partition fees associated with the maintenance of common roads, sidewalks, and areas to existing condominiums.

The Snow King Resort Master Association will be:

- Implementing and monitoring the Transportation Demand Management Plan, Housing Mitigation Plan, adherence to Design and Dimensional Limitation Plans and will act as the Architectural Review Board for the Snow King Planned Resort District. The Snow King Resort Master Association will be responsible for building or providing all required improvements or services as needed according to the phased development commensurate and coincidental with phases of the resort's development.
- Empowered to either own or have others build and own, as well as to maintain, employee housing, parking areas and structures and other infrastructure. All roads, pathways and utilities within the extent of this Master Plan will remain private.
- Act as a Master Association for all the property owners within Sub-Areas 1,2,3,4, and 5 and coordinate the activities within Sub-Area 3 and the Existing Condominiums area that may affect common utilities, safety, transportation, employee housing and parking within the Snow King PRD district.
- Responsible for snow removal, lighting, signing, construction and maintenance of common roads. SKRMA will ensure that it's members continue operation of airport, Teton Village and Town Square shuttles, as required for TDM strategies.
- Be the vehicle for pre-screening any final development applications prior to presentation to the Town of Jackson for final development approval. All Final Development plans submitted for review by the Town shall be first reviewed and approved by the Snow King Resort Master Association.

Ultimately, SKRMA will act as a pseudo improvement district and be entitled to assess and collect dues and assessments from all property owners, renters, resort guests and from any entities performing management functions, owning property or obtaining revenues within this Planned Resort District. These dues are intended to cover all of SKRMA 's costs including various mitigation plans, constructing and maintaining any improvements that are its responsibility including landscaping, roads, utilities, employee housing, parking, pathways, recreation, common signage, transportation, and any other aspects associated with the proper and successful implementation of this Master Plan and its goals and objectives.

IX. COMMUNITY SERVICES ELEMENT

Introduction

The PRD regulations include an optional Community Services element to describe the interrelationship between the resort and the community. It is recognized that community services are an important part of maintaining the balance between visitors and residents and can contribute significantly to the quality of life of the community.

Community involvement is of paramount interest to Snow King. Community service attributes are woven throughout this Master Plan presentation and are an integral and foremost part of Snow King's vision and philosophy. Since 1939 Snow King has been a proud community partner. Being a "Community Resort" is in fact part of Snow King's Mission Statement. For over 60 years Snow King and the Jackson Hole community have had a very close and symbiotic relationship. Snow King's services to the community are well known and indisputable. Snow King hosts, assists and supports practically all of the local non-profit organizations and service clubs. Our doors are always open and our record of community assistance, involvement, dedication and good will is impeccable. Snow King is very proud of its continuous contributions to this community as a partner. This Master Plan is one more step in continuing and expanding upon this tradition.

Snow King as a Community Partner

A stated purpose and intent of the resort district is to provide recreational opportunities that rely on indigenous natural attributes of the area. These opportunities are provided to both the community and the visitor through the development of resort facilities. The unique in-town nature of these recreational amenities makes them a very important asset to town residents and visitors.

The Snow King Mountain provides a venue for the junior ski racing programs, adult ski racing as well as recreational skiing and snowboarding, both day and night. In addition, the ski area contributes to community integration through supporting efforts of the Doug Coombs Foundation to give low-income students and families the opportunity to learn to ski. On the mountain, improved snowmaking provides early season training opportunities for foreign, regional and local ski racing programs as well as for recreational skiers. The tubing park has become an extremely popular winter outdoor family activity for both locals and visitors. The ski area also accommodates many other special events such as the Town Downhill, regional and national races, and snowmobile events such as the annual World Championship Hill Climb.. As a very unique and special service, Snow King presently provides after school ski programs with access via the activity bus to Town and Wilson schools in cooperation with the Teton County School District. Snow King has embraced the spectacular growth of uphill skiing in the wintertime through progressive policies to allow this activity and ultimately charge affordable season long and day ticket prices. This activity will continue to be permitted into the future and where possible distinct trails and routes will be further improved for this user group.

Snow King Mountain supports Parks and Recreation programs such as the annual Snow King Hill Climb Run, as well as offers reduced rates for community events and non-profit organizations such as the Teton County School District Winter Sports Program, the Doug Coombs Foundation ski programs, the Jackson Hole Ski and Snowboard Club, and Teton Youth and Family Service programs.

As part of the 2018 update to this master plan, Snow King Mountain has proposed to build a mountain sports center adjacent to the Snow King Center as an additional community benefit. This sports center is envisioned to including indoor rock climbing and athletic training facilities available to the public. The Jackson Hole Ski and Snowboard club will use the space for athlete training in addition to other groups in the community. Snow King will also work with and support the Jackson Hole Ski and

Snowboard Club to expand and improve the existing lodge room and administrative facilities above. As part of proposed improvements at the summit of the mountain Snow King Mountain seeks to build a planetarium and observatory that can be used for educational and scientific purposes as well as making the world of astronomy more accessible to the community. In conjunction with improvements to the base of the mountain for the addition of a gondola located in the existing parking lot loop, Snow King has proposed increasing the grass turf fields to maximize the green-space at the base of the mountain. As part of this base area improvement Snow King Mountain seeks to work with local artists to create a welcoming gateway to the resort at the corner of Cache St. and Snow King Ave. and improve Phil Baux Park via additional landscaping and potentially a concert pavilion. These multi-million-dollar investments into infrastructure that directly benefits the community are another direct way of demonstrating Snow King's commitment to Jackson Hole. In addition, Snow King will support the addition of a second sheet of ice on Town of Jackson property to serve the growing hockey and skating community.

Both summer and winter, Snow King Mountain hosts a wide variety of athletic events and competitions for the community including uphill ski races, obstacle course races, bike races, running races, scavenger hunts, snowmobile races, and downhill ski racing.

The Hagen trail connection to Cache Creek, the tubing hill and snowboard terrain park diversify and improve the winter activities while annual events such as the Hill Climb continue to draw large numbers of visitors. The figure skating and hockey programs have blossomed since the opening of the Snow King Center. An excellent example of public-private partnership, the Snow King Center has been successfully providing recreation and many other services to the community for over 6 years.

During the summer, Snow King provides a trail system that has become a much-used hiking, running, biking and horseback riding area for residents and visitors alike. Summer mountain improvements envision trail upgrades, pathways, outdoor pools, climbing walls, a planetarium and observatory, on mountain dining, and additional outdoor activities. . Unlike winter uphill travel where there are high costs associated with snowmaking, grooming, and ski patrol, summer use of the trail system for hiking on Snow King will be free to the public in perpetuity. Ultimately, the resort desires to serve as the primary jumping off point for access to USFS trails in the greater Snow King trail system with improved trails for hikers, bikers, uphill skiers, and outdoor recreationalists of all kinds.

It must be noted that many of our community partnership activities mentioned above often come at a high cost to Snow King Resort and operation of lodging, conference, and on mountain activities provide the financial and operational platform and the resources to support these and other community-oriented activities.

Snow King Resort has provided the largest year-round meeting and conference facilities in the county since 1976. These facilities are regularly used by virtually every community organization in Jackson Hole. In many cases, Snow King has provided the only appropriate facilities available for community events and programs.

Within the larger Wyoming community, Snow King has, over the years, hosted practically all of Wyoming's professional and trade associations as well as many statewide events, political conventions and innumerable meetings. Larger facilities will attract other Wyoming and regional gatherings that have outgrown our facilities.

Snow King has, for many years, been one of the largest employers in Teton County. Among the large employers, we pride ourselves in maintaining a very high rate of year-round, stable and level employment. This is a valuable contribution to the stability of our local workforce.

Since the hotel opened in 1976, we have always had our doors open to a great variety of community meetings and events. We have also pioneered innovative relationships with the U.S. Forest Service, with the Town of Jackson and with many community organizations, such as the Jackson Hole Ski Club. Virtually every non-profit organization in Teton County uses Snow King facilities to bring people together.

Although it would frankly be tedious to list all the community groups that Snow King has assisted and cooperated with over the years, we would like to highlight some specific examples. Snow King provides discounted and sometimes complimentary rates for meeting and lodging rooms to a wide variety of governmental and non-profit organizations. Snow King assists Arts organizations, the Jackson Hole Ski and Snowboard Club, the Doug Coombs Foundation, St. John's Hospital, the school district and many others with programs offering complimentary or discounted benefits to their employees, incentives and other discounts. Providing rooms for visiting speakers or artists and nameless other acts of community involvement are the norm for Snow King. Each year Snow King donates over fifty thousand dollars in complementary rooms, activities, and services to community non-profits and will continue to support these organizations into the future. Community Service is an integral part of the Snow King culture.

Every season for the past 5 years Snow King Mountain has offered locals appreciation days with free or discounted activities that are affordable to the permanent population and will continue this practice into the future as a means of supporting our community.

Since its construction, Snow King Resort has contributed to the community a lively, multi-purpose facility. Summer and winter, the Resort's facilities have encouraged visitors to step out of their rooms and into the mountains. Indoors and outdoors, the Resort has enhanced the daily life of the community. From youth skiing and skating to Rotary lunches and Chamber of Commerce banquets. From catering to the desires of visitors to fulfilling community needs, Snow King's dual roles exemplify the "town as heart of the region" and our own "community resort" goals. This Master Plan intends to improve upon this dual function in the future and presents a next generation vision of Snow King's partnership with the Jackson Hole community.

PARCEL 1-A

That part of the SW ¼ NW ¼ and SE ¼ NW ¼ of Section 34, Township 41 North, Range 116 West, Teton County, Wyoming, lying within the incorporated limits of the Town of Jackson, describe as follows: Beginning at a point on the south line of said SE ¼ NW ¼ identical with the southeast corner of that tract of record in the Office of the Clerk of Teton County in Book 5 of Deeds on Page 507, and N 89 degrees 54 minutes E, 1582.70 feet from the west one-quarter corner of said Section 34 described on the Certified Land Corner Recordation Certificate of record in the said Office; thence N 01 degrees 36 minutes W, 340.35 feet along the east line of said tract to a point identical with the Northeast corner; thence N 89 degrees 44 minutes W, 307.10 feet along the North line of said tract to a point identical with the southeast corner of the Meadowland Addition to the Town of Jackson; thence N 08 degrees 15 minutes E, 211.10 feet along the east line of said Addition to a point; thence N 26 degrees 03 minutes E, 235.80 feet along the east line of said Addition to a point; thence N 27 degrees 46 minutes E, 135.70 feet along the east line of said Addition to a point; thence N 89 degrees 51 minutes E, 91.64 feet to a point; thence N 00 degrees 32 minutes W, 9.95 feet to a point; thence S 88 degrees 28 minutes E, 316.33 feet to a point; thence S 59 degrees 03 minutes E, 379.47 feet to a point identical with the northwest corner of that tract of record in said Office in Book 14 of Deeds on Page 42; thence S 00 degrees 22 minutes E, 687.83 feet along the west line of said tract to a point on the south line of said SE ¼ NW ¼ identical with the southwest corner of said tract; thence S 89 degrees 54 minutes W, 618.10 feet along the said south line to the point of beginning; EXCEPTING THEREFROM that portion of said property conveyed by instrument dated October 20, 1998, recorded October 26, 1998 in book 363 of Photo page 1068 to 1073, said parcel being more particularly described as follows:

A Tract of Land in the NE ¼ SW ¼ and the SE ¼ NW ¼ of Section 34, T41N, R116W, 6th, P.M., Town of Jackson, Teton County, Wyoming, being described as:

Beginning at the Southwest Corner of Tract B as shown on Map T-71-C as recorded in Said Office of the Teton county Clerk;

Thence along the southerly line of Said Tract B, S89°54'07"E, 297.93 feet to the southeast corner of Said Tract, the southwest corner of Tract BB as shown on Map T-71-C as recorded in Said Office;

Thence along the southerly line of Said Tract BB, N89°56'17"E, 15.37 feet to a point;

Thence S18°38'21"W, 36.32 feet to a point;

Thence N71°21'39"W, 53.64 feet to a point;

Thence N88°42'59"W, 121.72 feet to a point;

Thence S5°55'38"W, 22.04 feet to a point;

Thence N84°04'22"W, 125.61 feet to a point;

Thence N54°19'44"W, 79.57 feet to a point;

Thence N47°04'07"E, 51.10 feet to a point;

Thence N0°16'09"W, 485.63 feet to a point;

Thence N58°37'40"E, 29.20 feet to a point on the westerly boundary line of Said Tract B, Map T-71-D;

Thence along said westerly boundary line, Tract B, S0°16'09"E, 558.05 feet to the Corner of Beginning.

PARCEL 1-B

The south twenty-five (25) feet of the following described tract of land:

Commencing at a point on the west line of Section 34, which is 2325 feet from the NW corner of said Section 34 T. 41 N. R. 116 W. 6th P.M., Teton County, Wyoming; thence North 89°46'E. 1264 feet, thence N. 7°16' E. a distance of 213.2 feet, thence N 24° 23' E. a distance of 234.5 feet, thence N. 27° 43' E. a distance of 214.5 to Corner No. 1 and place of beginning, on old fence line and alley line of the Meadowland Addition to the Town of Jackson, County of Teton, State of Wyoming; thence N. 88° 57'E. a distance of 55 feet to Corner No. 2; thence south 70 feet to corner No. 3, thence west to east line of the Meadowland Addition, which is the street line, thence N 27° 43' E. to corner No. 1 and place of beginning.

Parcels 1-A and 1-B contain approximately 14.54 Acres.

XIII. A.1

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PARCEL 2-A

A parcel of land situated in the SE ¼ NW ¼ of Section 34, T41N, R116W, the P.M., Teton county, Wyoming, being part of that parcel described in Warranty Deed recorded in Book 10 Deeds, page 544, more particularly described as follows:

BEGINNING at the southeast corner of Lot 16, Block 2 of Harold Clark Subdivision, Town of Jackson and running thence west 140 feet more or less to the northeast corner of that tract of land described in Warranty Deed recorded in Book 12 Deeds, page 233, thence south along the east line of said tract described in Book 12 Deeds, page 233, 60 feet more or less, thence east 140 feet more or less to the southwest corner of that tract described in Warranty Deed recorded in Book 276 Photo, page 946-947 and thence north 60 feet more or less along the west line of said tract described in Book 276, page 946-947 to the point of beginning;

And,

The North forty-five (45) feet of the following described tract of land:

Commencing at a point on the west line of Section 34, which is 2325 from the NW corner of said Section 34 T. 41 N. R. 116 W. 6th P.M., Teton county, Wyoming; thence North 89°46'E. 1264 feet, thence N. 7°16'E. a distance of 213.2 feet, thence N 24°23'E. a distance of 234.5 feet, thence N 27°43'E. a distance of 214.5 to Corner No. 1 and place of beginning, on old fence line and alley line of the Meadowland Addition to the Town of Jackson, County of Teton, State of Wyoming; thence N 88°57'E. a distance of 55 feet to Corner No. 2; thence south 70 feet to Corner No. 3, thence west to east line of the Meadowland Addition, which is the street line, thence N 27°43'E. to Corner No. 1 and place of beginning,.

Parcel 2-A contains approximately 0.27 Acre.

PARCEL 2-B

Parcel 2-B is comprised of the 5 separate Clark's Knoll plats, aggregating to approximately 1.3 Acres:

Plat #785:

That part of the SE ¼ NW ¼ of Section 34, T41N, R116W, within the incorporated limits of the Town of Jackson, Teton county, Wyoming, including a part of Lots 12, 13 and 14 of the Harold Clark Plat of the Town of Jackson of record in the Office of the Clerk of Teton county as Plat No 136, described as follows: BEGINNING at the southeast corner of said Lot 12:

Thence S00° 04'41" E, 70.21 feet, along the east line of that tract of record in said Office of Book 10 of Photo on pages 404 to 405 as it is shown on said Map No. D-46 to the point on the northeast line of the Snow King Resort tract of record in said Office in Book 12 of Deeds on page 630 found as shown on that map of record in said Office as Map No. T-71-A titled "MAP TO ACCOMPANY LOT DIVISION PERMIT AMERICANA SNOW KING RESORT...", dated 1982-83;

Thence N59° 02'27"W, 94.21 feet, along said Northeast line to an angle point marked by a 2" galvanized steel pipe, 28" long, with a brass cap inscribed: PAUL N. SCHERBEL RLS 164 BIG PINEY WYOMING", and appropriate details;

Thence N88° 31'18"W, 8.03 feet, along the north line of said Snow King Resort tract to a point;

Thence N59° 21'46"W, 9.21 feet, to a point;

Thence N88° 31'18"W, 44.20 feet, to a point;

Thence N00° 07'49" E., 32.76 feet, to a point;

Thence N30° 30'53"E, 90.49 feet, to a point;

Thence S59 °-16'-11"E, 110.21 feet, to a point on the east line of said Lot 12;

Thence S00° 06'28"E, 38.69 feet, along said east line to the Point of Beginning;

ENCOMPASSING and area of 0.32 Acre, more or less;

PARCEL 2-B (Continued)

Plat #801:

That part of lots 12 and 13 of the Harold Clark Plat to the Town of Jackson of record in the Office of the Clerk of Teton County as Plat no. 136, within the SE ¼ NW ¼ of Section 34, T41N, R116W, described as follows:
BEGINNING at the northeast corner of CLARKS KNOLL FIRST ADDITION to the Town of Jackson of record in said Office as Plat No. 136, N00° 06'28"W, 38.69 feet of the southeast corner of said Lot 12;
Thence N00°06'28"W, 143.156 feet along the east line of Lot 12 of said HAROLD CLARK PLAT, to the northeast corner thereof;
Thence N64°34'56"W, 44.50 feet, along the north line of said Lot 12 to an angle point;
Thence S89°48'19"W, 9.03 feet, along the north line of said Lot 12 to the northeast corner of Lot 13 of said HAROLD CLARK PLAT;
Thence continuing S89°48'19"W, 45.44 feet, along the north line of said Lot 13 to a point N89°48'19"E, 5.33 feet, of the northwest corner of said Lot 13;
Thence S00° 06'28"E, 105.76 feet, to the northerly corner of said CLARKS KNOLL FIRST ADDITION; Thence S59°16'11"E, 110.21 feet, along the northeast line of said ADDITION to the POINT OF BEGINNING;

ENCOMPASSING an area of **0.28** Acre, more or less;

Plat #810

That part of Lots 13, 14 and 15 of Block 2 of the Harold Clark Plat to the Town of Jackson of record in the Office of the Clerk of Teton County as Plat No. 136, within the SE ¼ NW ¼ of Section 34, T41N, R116W, described as follows:
BEGINNING at the northwest corner of CLARKS KNOLL SECOND ADDITION to the Town of Jackson of record in said Office as Plat No. 801, N89°48'19"E, 5.33 feet FROM THE NORTHEAST CORNER OF SAID Lot 14;
Thence S00°06'28"E, 105.76 feet, along the west line of said CLARKS KNOLL SECOND ADDITION to the southwest corner of said CLARKS KNOLL SECOND ADDITION;
Thence S30°30'53"W, 29.87 feet, along the northwest line of CLARKS KNOLL FIRST ADDITION, of record in said Office as Plat No 785 to a point;
Thence N70°09'40"W, 77.79 feet, to a point;
Thence N00°07'49"E, 104.57 feet, to a point on the north line of said Lot 15;
Thence N89°25'38"E, 32.57 feet, to the northeast corner of said Lot 15;
Thence N89°48'19"E, 55.33 feet along said north line of said Lot 14 and Lot 15 at CORNER OF BEGINNING;

ENCOMPASSING an area of **0.24** Acre more or less;

Plat #829

That part of Lots 15 and 16 of Block 2 of the Harold Clark Plat to the Town of Jackson of record in the Office of the Clerk of Teton County as Plat No. 136, within the SE ¼ NW ¼ of Section 34, T41N, R116W, described as follows:

BEGINNING at the northwest corn of CLARKS KNOLL THIRD ADDITION to the Town of Jackson of record in said Office as Plat No. 810, S89° 25'38"W, 17.63 feet of the northwest corner of said Lot 15:
Thence S00° 07'49"W, 104.57 feet, along the west line of said CLARKS KNOLL THIRD ADDITION;
Thence S70° 09'40"E, 44.34 feet, along the southwest line of said CLARKS KNOLL THIRD ADDITION;
Thence S89° 53'31"W, 109.56 feet, to a point on the west line of said Lot 16;
Thence N00°07'46"E, 119.15 feet, along said west line of the northwest corner of said Lot 16;
Thence N89° 25'38"E, 67.83 feet, along the north line of said Lots 15 and 16 to the CORNER OF BEGINNING;

ENCOMPASSING an area of **0.19** Acre, more or less;

Parcel 2-B (Continued)
Plat #844

That part of the SE ¼ NW ¼ of Section 34, T41N, R116W, within the incorporated limits of the Town of Jackson, Teton County, Wyoming, including a part of Lots 14, 15 and 16 of Block 2 of the Harold Clark Plat to the Town of Jackson of record in the Office of the Clerk of Teton County Plat No. 136, described as follows:
BEGINNING at the southwest corner of Clarks Knoll Fourth Addition to the Town of Jackson of record in said Office as Plat No. 829, on the west line of said Lot 16;
Thence N89° 53'31"E, 109.56 feet, along the south line of said Addition to a point on the southwesterly line of Clarks Knoll Third Addition to the Town of Jackson of record in said Office as Plat No. 810;
Thence S70° 09'40"E, 33.45 feet, along said southwesterly line to a point on the northwesterly line of Clarks Knoll First Addition to the Town of Jackson of record in said office as Plat No. 785;
Thence S30° 30'53"W, 60.62 feet, along said northwesterly line to a point;
Thence S00° 07'49"W, 32.76 feet, along the west line of said First Addition, to a point;
Thence N88° 31'18"W, 10.00 feet, to a point;
Thence S00° 07'49"W, 4.49 feet, to a point on the north line of the Snow King Resort tract of record in said Office in book 12 of Deeds on page 630;
Thence N88° 31'18"W, 100.42 feet, along said north line to a point at the intersection of said north line with the southerly extension of the west line of said Lot 16;
Thence N00° 07'46"E, 97.77 feet, along said extension and the west line of said Lot 16 to the POINT OF BEGINNING

ENCOMPASSING an area of **0.27** Acre, more or less;

PARCEL 2-C

A parcel of land in the SE ¼ NW ¼ of Section 34, T41N, R116W, 6th P.M. Town of Jackson, Teton County, Wyoming, being a portion of Lot 11 and a portion of the west ½ of Lot 10 of Block 2 of the Harold Clark Addition, Plat No. 136, as recorded in the Office of the Clerk of Teton County, also being a portion of that record parcel in Book 248 of Photos, pages 751-752 as recorded in said Office and being more particularly described as follows:

Beginning at the northwest corner of Lot 11 of said record Plat 136:

Thence along the north boundary line of said Lot 11 and said west one-half of Lot 10 S63° 49'41"E, 86.65 feet to a point, the northwest corner of Pitchfork Townhomes Addition to the Town of Jackson, Plat No. 717 as recorded in said Office:
Thence along the east line of said west one-half of Lot 10, S00 29'31"E, 96.47 feet to a point;
Thence N85° 38'49"W, 78.64 feet to a point on the west line of said Lot 11;
Thence along said west line of Lot 11, N00° 05'00"W, 128.72 feet to the Corner of Beginning.

Said parcel contains **0.20** acres, more or less.

PARCEL 2-D

A parcel of land in the SE ¼ NW ¼ of Section 34, T41N, R116W, 6th P.M. Town of Jackson, Teton County, Wyoming, being a portion of Lot 11 and a portion of the west ½ of Lot 10 of Block 2 of the Harold Clark Addition, Plat No. 136, as recorded in the Office of the Clerk of Teton County, also being a portion of that record parcel in Book 248 of Photos, pages 751-752 as recorded in said Office and being more particularly described as follows:

Beginning at the southwest corner of Lot 11 of said record Plat 136;

Thence along the west boundary line of said Lot 11, N00°05'00"W, 52.94 feet to a point;
Thence S85° 38'49"E, 78.64 feet to a point on the east line of the west one-half of said Lot 10:
Thence along the said east line, S00° 29'31"E, 94.61 feet to the southeast corner of said west one-half of Lot 10;
Thence along the south boundary of said west one-half of Lot 10 and the south boundary of said Lot 11, N58° 57'38"W, 92.37 feet to the Corner of Beginning.

Said Parcel contains **0.28** acres, more or less.

PARCEL 2-E

Said tract is located within the Incorporated Limits of the Town of Jackson, Wyoming and is identical with Lots 2,3,4,5,6,7,8,9 and the E ½ of Lot 10 of Block 2 of the Harold Clark Plat, of record in said Office as Plat No. 136, which is located in the SSE 1/4 NW 1/4 of Section 34, T41N, R116W, 6th P.M., Teton County, Wyoming. TOGETHER WITH an additional portion of said SE ¼ NW ¼ of Section 34:

Said tract is more particularly described as follows:

BEGINNING at the northwest corner of Lot 1, Block 2 of said Harold Clark Plat, which lies on the southerly line of Kelly Street, and is monumented by a 5/8 inch diameter steel reinforcing bar with aluminum Surv-Kap inscribed "NELSON ENGR PE & LS 578";
Thence along the west line of said Lot 1, S01° 38'23"E, 56.55 feet to the southwest corner of said Lot 1, which is monumented by the same type monument described in the paragraph above;
Thence along south line of said Lot 1, S65° 32'56"E, 154.12 feet to the northeast corner of said Lot 2 which lies on the wet line of Clark Street; coincident with the east line of said Block 2;
Thence along the west line of said Clark Street and said east line of Block 2, S00° 00'00"E, 185.68 feet to a corner on the north boundary of a parcel of record in said Office in Book 70 of Photo on page 504;
Thence along the boundary of said record parcel in Book 70 of Photo, S00° 10'34"W, 70.21 feet to an angle point monumented by a car axle;
Thence continuing along said boundary N58° 49'00"W, 341.24 feet to the northwest corner of said record parcel in Book 70 of Photo; identical with the northeast corner of that parcel of record in said Office in Book 12 of Deeds on page 630;
Thence along the north line of said parcel in Book 12 of Deeds, N59° 0'00"W, 192.03 feet to the south corner of that parcel of record in said Office in Book 14 of Deeds on page 494, where is found a 5/8 inch diameter steel reinforcing bar with aluminum Surv-Kap inscribed "NELSON ENGR PE & LS 578";
Thence along the east line of said parcel of record in Book 14 of Deeds, N00° 23'28"W, 71.02 feet to the southeast corner of the W ½ of Lot 10, Block 2 of said Harold Clark Plat, which is part of said parcel of record in Book 14 of Deeds; said corner being monumented by a 5/8 inch diameter steel reinforcing bar with aluminum Surv-Kap inscribed "NELSON ENGR PE & LS 578";
Thence continuing along the east line of said parcel in Book 14 of Deeds and the east line of said W ½ of Lot 10, N00° 23'28"W, 191.04 feet to the northeast corner of said parcel in Book 14 of Deeds, identical with the northeast corner of said W1/2 of Lot 10, and which lies on the north line of said Block 2, coincident with the south line of Kelly Street;
Thence along the north line of said Block 2 and the south line of Kelly Street, S62° 59'21"E, 355.47 feet to the CORNER OF BEGINNING;

All corners called for above, but not previously described herein, are monumented by a 5/8 inch diameter steel reinforcing bar with aluminum cap inscribe "P.M. JORGENSEN PE & LS 2612";

ENCOMPASSING an area of **2.80** acres, more or less;

PARCEL #3

A tract of land in the SE1/4NW1/4 of Section 34, Township 41 North, Range 116 West, 6th P.M., in the Town of Jackson, Teton County, Wyoming, being part of the tract described in the warranty deed recorded in Book 14 of Deeds, Page 42, in the office of the Clerk of Teton County, and described as follows:

Beginning at 5/8" diameter rebar with cap inscribed PLS 3831" on the North line of said record parcel, from which a 5/8" diameter rebar with cap inscribed "PE&LS 2612" marking the Northwest corner of said record parcel is North 58 degrees 57 minutes 57 seconds West 156.26 feet; thence South 58 degrees 57 minutes 57 seconds East 185.00 feet along said North line which is common with the South line of the Pitchfork Townhomes Addition to the Town of Jackson (Plat No. 713) to the Southeast corner of said plat; thence North 00 degrees 10 minutes 08 seconds East 70.44 feet along the East line of said plat to the North Northwest corner of said record tract marked by a 5/8" diameter rebar with cap inscribed "PE&LS 2612; thence South 58 degrees 46 minutes 43 seconds East 50.79 feet to 5/8" diameter rebar with cap inscribed "PLS 3831" marking the Northeast corner of said record tract; thence South 03 degrees 32 minutes 37 seconds West 140.46 feet along the East line of said record tract to a 5/8" diameter rebar with cap inscribe "PLS 3831"; thence South 89 degrees 53 minutes 59 seconds West 69.04 feet to a 5/8" diameter rebar with cap inscribed "PLS 3831"; thence North 58 degrees 57 minutes 57 seconds West 108.81 feet to a 5/8" diameter rebar cap inscribed "PLS 3831"; thence North 25 degrees 00 minutes 58 seconds West 116.39 feet to a 5/8" diameter rebar with cap inscribed "PLS 3831"; thence North 31 degrees 02 minutes 03 seconds East 35.00 feet to the Point of Beginning.

Encompassing an area of **0.553** acres, more or less.

PARCELS 4-A AND 4-B

A parcel of land located in the SE ¼ NW ¼ and the NE ¼ SW ¼, Section 34, T41N, R116W, 6th P.M., Town of Jackson, Teton County, Wyoming, being all of Tract B as shown on Map T-71D and a portion of Tract BB as shown on Map T-71C as recorded in the Office of the Teton County Clerk and a portion of that parcel of record described in Said Office in Book 255 of Photos pages 12-14 as "Parcel No. 4", all being more particularly described as follows:

Beginning at a point on the east line of Said SE ¼ NW ¼ which lies N 0° 4' 39" W 156.30 feet from the southeast corner of Said SE ¼ NW ¼, the center ¼ corner of Said Section 34,
Thence S89°55'38"W, a distance of 159.06 feet to a point on the east boundary line of Said Tract B;
Thence along said east boundary line S03°35'36"W, a distance of 50.85 feet to a point;
Thence S71°21'39"E, a distance of 42.01 feet to a point;
Thence S18°38'21"W, a distance of 133.50 feet to a point;
Thence N71°21'39"W, a distance of 53.64 feet to a point;
Thence N88°42'59"W, a distance of 121.72 feet to a point;
Thence S05°55'38"W, a distance of 22.04 feet to a point;
Thence N84°04'22"W, a distance of 125.61 feet to a point;
Thence N54°19'44"W, a distance of 79.57 feet to a point;
Thence N47°04'07"E, a distance of 51.10 feet to a point;
Thence N00°16'09"W, a distance of 485.63 feet to a point;
Thence N58°37'40"E, a distance of 29.20 feet to a point on the west boundary line of Said Tract B;
Thence along said west boundary line, N 0°16'09" W, a distance of 129.02 feet to the northwest corner of Said Tract B, a point on the southerly boundary line of Pitchfork Townhomes Addition to the Town of Jackson, a subdivision of record in Said Office as Plat no. 713;
Thence along the northerly line of Said Tract B and the southerly line of Said Pitchfork Townhomes Addition, S58°54'59"E, a distance of 156.35 feet to a corner of Said Tract B, the northwest corner of Tract A as shown on Said Map T-71D;
Thence along the line between said tracts A and B thorough the following courses and distances:
S31°08'57"W, a distance of 34.90 feet to a point;
S24°57'35"E, a distance of 116.33 feet to a point;
S58°54'43"E, a distance of 108.85 feet to a point;
N89°56'21"E, a distance of 69.09 feet to the northeast corner of Said Tract B and the southeast corner of Said Tract A, which corner lies on the west boundary line of Tract AA as shown on Said Map T-71C;
Thence departing the line between Said Tracts A and B and proceeding along the east boundary line of Said Tract B and the west boundary line of Said Tract AA, S03°36'11"W, a distance of 40.26 feet to a point;
Thence along the line between Said Tracts AA and BB through the following courses and distances:
S58°54'02"E, a distance of 88.98 feet to a point;
N89°51'02"E, a distance of 69.00 feet to the northeast corner of Said Tract BB and the southeast corner of Said Tract AA;
Thence departing the line between Said Tracts AA and BB and proceeding along the east line of Said Tract BB, S00°02'30"E, a distance of 51.50 feet to a point;
Thence continuing along said east line, Tract BB, S00°04'39"E, 121.44 feet to the Point of Beginning.

Containing 5.037 Acres, more or less.

PARCEL 5
(5A & 5B Combined)

That part of the NE ¼ SW ¼ of Section 34, T41N, R116W, within the incorporated limits of the Town of Jackson, Teton County, Wyoming described as follows:

BEGINNING at the northeast corner of said NE ¼ SW ¼; thence 01°-56.5'W, 1253.65 feet along the east line of said NE ¼ SW ¼ to the southeast corner thereof; thence S89°-54' W, 1332.41 feet along the south line of Said NE ¼ SW ¼ to the southwest corner thereof; thence N01°-55'E, 424.85 feet along the west line of said NE ¼ SW ¼ to the southwest corner of that tract of record in the office of the Clerk of Teton County in Book 11 of Deeds on page 312; thence S89°-58.5'E, 427.64 feet (East, 400 feet rec.) along the south line of said Tract in Book 11 of Deeds on page 312 to the southeast corner thereof; thence N00°-01.5'W, 830.17 feet (North, 830 feet rec.) along the east line of said Tract in Book 11 of Deeds on page 312 to the northeast corner thereof on the north line of said NE ¼ SW ¼; thence 89°-57'E, 933.34 feet along said north line of the CORNER OF BEGINNING;

And that parcel of land conveyed to Snow King Resort, Inc. a Wyoming corporation by instrument dated October 14, 1998, recorded October 26, 1998 in book 363 of Photo, page 1074 to 1076, more particularly described as follows:

A tract of land in the SE ¼ NW ¼ of Section 34, T41N, R116W, 6th P.M., Town of Jackson, Teton County, Wyoming, being a portion of Tract BGB as shown on Map T-71-C as recorded in the Office of Teton County Clerk, and being more particularly described as follows:

Beginning at the Southeast Corner of Said Tract BB, the center one-quarter corner of Said Section 34;

Thence along the southerly boundary line of Said Tract BB, S89°56'17"W, 153.71 feet to a point;

Thence N18°38'21"E, 97.18 feet to a point;

Thence N71°21'39"W, 42.01 feet to a point on the westerly boundary line of Said Tract BB;

Thence along said westerly boundary line, N3°35'36"E, 50.85 feet to a point;

Thence departing said westerly boundary line and proceeding N89°55'38"E, 159.06 feet to a point on the easterly boundary line of Said Tract BB;

Thence along said easterly boundary line S0°04'39"E, 156.30 feet to the Corner of Beginning.

Excepting therefrom: Conveyance to SK Land Limited Liability Company dated October 20, 1998, recorded October 26, 1998 in Book 363 of Photo, page 1068 to 1073, said parcel being more particularly described as follows:

Beginning at the Southwest Corner of Tract B as shown on Map T-71-D as recorded in the Office of the Teton County Clerk:

Thence along the southerly line of Said Tract B, S89°54'07"E, 15.37 feet to a point;

Thence N71°21'39"W, 53.64 feet to a point;

Thence N88°42'59"W, 121.72 feet to a point;

Thence S5°55'38"W, 22.04 feet to a point;

Thence N84°04'22"W, 125.61 feet to a point;

Thence N54°19'44"W, 79.57 feet to a point;

Thence N47°04'07"E, 51.10 feet to a point;

Thence N0°16'09"W, 485.63 feet to a point;

Thence N58°37'40"E, 29.20 feet to a point on the westerly boundary line of Said Tract B, Map T-71-D;

Thence along said westerly boundary line, Tract B S0°16'09"E, 558.05 feet to the Corner of Beginning.

The total area of Parcels 5 is approximately 30.82 Acres

PARCEL #6
KM6 LLC

Property described by a metes and bounds survey as follows:

Beginning at Corner No. 1, the northwest corner of the tract hereby conveyed, the said Corner No. 1 being 344 feet north of the East-West Quarter Section line through Section 34, T41N, R116W, (6th P.M.) and 950 feet east of the west line of said Section 34, thence easterly and parallel to the aforesaid Quarter Section line for 633.14 feet to Corner No. 2, thence southerly and parallel to the aforesaid west line of Section 34 for 344 feet to the aforesaid Quarter-Section line and to Corner No. 3, thence westerly along said Quarter Section line for 633.14 feet to Corner No. 4, thence northerly and parallel to the aforesaid west line of Section 34 for 344 feet, more or less, to Corner No. 1, the point of the beginning. All bearings being true bearings and the tract thus enclosed containing five (5.0) acres more or less, lying wholly within the S ½ NW ¼, Section 34, T41N, R116W, (6th P.M.) together with all improvements situated thereon and all rights and privileges pertaining thereto.

The area of this parcel is approximately 4.92 Acres.

PARCELS 7-A, 7-B, 7-C & 7-D

These parcels are owned by the Town of Jackson and leased to Snow King Resort, Inc. under lease agreements dated April 22, 1994 extending through May 1, 2033. These parcels are described in Exhibits H-1, H-2, I and J to the Ski Shelter, Ski Lift and Mountain Tract lease and Exhibit A to the Ice Rink Tract lease.

These parcels aggregate to approximately **34.196 Acres**.

PARCEL 8

That part of the NW ¼SW¼ of Section 34, T41N, R116W, within the incorporated limits of the Town of Jackson, Teton County, Wyoming it being the intent to redescribe Tract No. 1 of the record in the Office of the Clerk of Teton County in book 11 of Deeds on page 313 as follows:

BEGINNING at the west one-quarter corner of the said Section 34; thence N89°-54.5'E, 792.36 feet (N89°-46'E, 793 feet rec.) along the north line of said NW ¼ SW ¼ to a corner; thence S00°18'E, 425.85 feet (South, 429 feet rec.) to a corner; thence N89°-49.5'W, 807.92 feet (West, 793 feet rec.) to an intersection with the west line of said NW ¼ SW ¼; thence N01°-48.5'E, 422.32 feet (North, 429 feet rec.) along said west line to the CORNER OF BEGINNING; EXCEPTING THEREFROM conveyance to the Town of Jackson for the Ice Rink Tract as contained in instrument dated April 24, 1992, recorded July 17, 1992 in Book 255 of Photo, page 15 to 17, more particularly described as follows:

A tract of land in the NW ¼ SW ¼ of Section 34, T41N, R116W, in the Town of Jackson, Teton County, Wyoming described as follows:

Beginning on the north line of said NW ¼ SW ¼ at a 3" diameter brass cap on an iron pipe marking a corner of Aspen Hill Cemetery, and from which the Northwest corner of said NW ¼ SW ¼ is S 89°54'00"W, 792.23 feet, the Base Bearing for this description,

Thence S 00° 18'26"E, 277.90 feet along the west line of the Aspen Hill Cemetery to a point;

Thence S 00° 02'00"W, 206.99 feet to a point;

Thence N 00° 58'00"E, 120.00 feet to a point;

Thence S 89° 02'00"E, 14.00 feet to a point;

Thence N 00° 58'00"E, 90.00 feet to a point;

Thence N 89° 02'00"W, 16.00 feet to a point;

Thence N 00° 58'00"E, 26.00 feet to a point;

Thence N 89° 02'00"W, 35.00 feet to a point;

Thence N 00° 58'00"E, 37.41 feet to a point; on the north line of said NW ¼ SW ¼;

Thence N 89° 54'00"E, 237.85 feet along said north line to the Point of Beginning;

Encompassing an area of 1.296 acres, more or less.

The total area of Parcel 8 is approximately **6.494 Acres**.

LEASE PARCEL

Exhibit H-1

That part of Blocks 7,8 and 9, Aspen Drive, Laural Drive, King Street and the area designated Parking in the Meadowland Addition to the Town of Jackson, recorded as plat number 127 in the Office of the Clerk of Teton County, Wyoming described as follows:

Beginning at the Northeast corner of said Parking area on the south line of Snow King Avenue (Norwood Ave.) the northwest corner of the "Murie Tract," THENCE South 00 degrees 12 minutes 53 seconds West for a distance of 136.08 feet along the east line of said Addition to a point;
 THENCE North 88 degrees 18 minutes 02 seconds West for a distance of 24.36 feet to a point;
 THENCE North 80 degrees 31 minutes 02 seconds West for a distance of 74.35 feet to a point;
 THENCE North 74 degrees 23 minutes 12 seconds West for a distance of 54.84 feet to a point;
 THENCE South 16 degrees 21 minutes 46 seconds West for a distance of 28.35 feet to a point;
 THENCE South 06 degrees 29 minutes 47 seconds East for a distance of 7.85 feet to an intersection with the east west mid-section line of section 34, T41N, R116W;
 THENCE South 89 degrees 54 minutes 00 seconds West for a distance of 282.13 feet along said mid-section line to a point;
 THENCE South 89 degrees 53 minutes 50 seconds West for a distance of 49.85 feet continuing along said line to a point;
 THENCE North 07 degrees 54 minutes 12 seconds West for a distance of 127.80 feet to a point;
 THENCE North 72 degrees 02 minutes 48 seconds East for a distance of 70.00 feet to a point;
 THENCE South 54 degrees 19 minutes 35 seconds East for a distance of 38.41 feet to a point;
 THENCE North 89 degrees 54 minutes 15 seconds East for a distance of 69.70 feet to a point;
 THENCE North 47 degrees 28 minutes 01 seconds East for a distance of 45.91 feet to a point;
 THENCE North 59 degrees 23 minutes 01 seconds East for a distance of 50.07 feet to a point;
 THENCE East for a distance of 5.25 feet to a point;
 THENCE North 00 degrees 02 minutes 30 seconds West for a distance of 161.45 feet to an intersection with the north line of said block;
 THENCE South 89 degrees 59 minutes 45 seconds East for a distance of 258.81 feet along the north line to the POINT of BEGINNING.

Together with and subject to covenants, easements, and restrictions of record.

Said property contains 2.75 acres more or less.

MOUNTAIN TRACT

Exhibit J

NW1/4SW1/4 of Section 34, T41N, R116W, Teton County, Wyoming, excepting therefrom the North 429 feet.

LEGAL DESCRIPTION
FOR A
PARKING AREA

Exhibit H-2

That part of Blocks 7,8 and 9, Aspen Drive, Laural Drive, King Street and the area designated Parking in the Meadowland Addition to the Town of Jackson, recorded as plat number 127 in the Office of the Clerk of Teton County, Wyoming described as follows:

Beginning at a point on the east-west mid-section line of Section 34, which is S 89° 54' 00"E, 35.00 feet from the west 1/4 corner of said Section, Thence N 00° 13' 00"E, 66.00 feet parallel with the west line of said subdivision to a point,
 Thence N 89° 56' 59"E, 150.81 feet to a point,
 Thence N 79° 16' 02"E, 35.73 feet to a point,
 Thence N 60° 43' 41"E, 58.86 feet to a point,
 Thence N 47° 13' 04"E, 48.28 feet to a point,
 Thence N 33° 54' 07"E, 51.74 feet to a point,
 Thence N 24° 27' 24"E, 29.55 feet to a point,
 Thence N 88° 25' 34"E, 16.55 feet to a point,
 Thence N 01° 45' 13"W, 139.37 feet to an intersection with the south line of Snow King Avenue (Norwood Ave.),
 Thence S 89° 59' 45"E, 41.99 feet along said south line to the northwest corner of Phil Box Park Parcel,
 Thence S 89° 59' 45"E, 551.88 feet along the west line of said park parcel to a point,
 Thence S 63° 44' 48"W, 778.37 feet along the west line of said park parcel to a point on said east-west mid-section line,
 Thence N 89° 54' 00"W, 222.09 feet to the POINT OF BEGINNING.

Together with and subject to any covenants, easements, and restrictions of record.

Said property contains 2.63 acres more or less.

SNOW KING ICE RINK TRACT

Exhibit A

A tract of land in the NW $\frac{1}{4}$ SW $\frac{1}{4}$ of Section 34, T41N, R116W, in the Town of Jackson, Teton County, Wyoming, described as follows:

Beginning on the north line of said NW $\frac{1}{4}$ SW $\frac{1}{4}$ at a brass cap on a 2" diameter steel pipe marking a corner of Aspen Hill Cemetery, from which the northwest corner of said NW $\frac{1}{4}$ SW $\frac{1}{4}$ is S 89°54'00"W, 792.23 feet, the Base Bearing for this description,

THENCE S 00°18'26"E, 202.00 feet along the west line of the Aspen Hill Cemetery to a point;

THENCE S 89°54'00"W, 195.35 feet parallel with the north line of said NW $\frac{1}{4}$ SW $\frac{1}{4}$ to a point;

THENCE N 00°06'00"W, 242.00 feet perpendicular to said north line to a point;

THENCE S 89°54'00"W, 37.50 feet parallel with said north line to a point;

THENCE N 00°06'00"W, 40.00 feet perpendicular to said north line, to the intersection with said north line to a point;

THENCE N 89°54'00"E, 231.83 feet along said north line to the Point of Beginning;

Encompassing an area of 1.296 acres, more or less.

SKI LIFT LEGAL DESCRIPTION
TRACK OF
 A SKIER EASEMENT

Exhibit I

An easement for skiers and associated people moving lift operations across that part of Blocks 7, 8 and 9, Aspen Drive, Laurel Drive, King Street and the area designated parking in the Meadowland Addition to the Town of Jackson, recorded as plat number 127 in the Office of the Clerk of Teton County, Wyoming described as follows:

Commencing at the northeast corner of said parking area on the south line of Snow King Avenue (Norwood Ave.) the northwest corner of the "Murie Tract," THENCE North 89 degrees 59 minutes 45 seconds West for a distance of 258.81 feet along the south line of said Snow King Avenue to a point;
THENCE South 00 degrees 02 minutes 30 seconds East for a distance of 87.44 to the POINT OF BEGINNING of this easement;
THENCE continuing South 00 degrees 02 minutes 30 seconds East for a distance of 74.02 feet to a point;
THENCE West for a distance of 5.25 feet to a point;
THENCE South 59 degrees 23 minutes 01 seconds West for a distance of 50.07 feet to a point;
THENCE South 47 degrees 28 minutes 01 seconds West for a distance of 45.91 feet to a point;
THENCE South 89 degrees 54 minutes 35 seconds West for a distance of 69.70 feet to a point;
THENCE North 54 degrees 29 minutes 35 seconds West for a distance of 38.41 feet to a point;
THENCE South 72 degrees 02 minutes 48 seconds West for a distance of 70.00 feet to a point;
THENCE North 07 degrees 54 minutes 12 seconds West for a distance of 20.00 feet to a point;
THENCE North 69 degrees 57 minutes 17 seconds East for a distance of 176.76 feet to a point;
THENCE North 71 degrees 30 minutes 44 seconds East for a distance of 30.25 feet to a point;
THENCE North 45 degrees 22 minutes 41 seconds East for a distance of 56.89 feet to a point;
THENCE East for a distance of 17.19 feet to the POINT OF BEGINNING.

Together with and subject to covenants, easements, and restrictions of record.

Said property contains 0.32 acres more or less.

DIVISION 2500. PLANNED RESORT (PR) DISTRICT**SECTION 2510. PURPOSE AND INTENT**

The purpose of the Planned Resort District standards are to provide for and guide the creation or continuation of a planned development configured around a major recreational activity. The intent of this District is to:

- A. Encourage recreational activities that rely on indigenous natural attributes of the area, contribute to the community's character and economy and have had a long-standing, beneficial role in the community; and
- B. Provide flexibility for planning and developing recreational resort facilities in a creative, efficient and coordinated manner in order to provide quality visitor experiences; and
- C. Create a process in which applicants, Teton County and the Town of Jackson collaborate with landowners in planning and designing resort master plans that meet community goals and respond to the unique circumstances of the resort area; and
- D. Permit resort development that contributes to expanding the winter and shoulder economic seasons; and
- E. Ensure that resort plans incorporate a mix of land uses, promote alternative modes of transportation, and provide a pedestrian-oriented community in order to alleviate traffic-related impacts; and
- F. Ensure resort plans are consistent with the Comprehensive Plan, and therefore, are beneficial to the community; and
- G. Enable long-range planning for infrastructure, capital facilities, and community land use patterns by establishing a level of predictability in the maximum potential size and character of each resort area; and
- H. Ensure a balance is maintained between tourism and community that promotes social diversity but does not cause undesired shifts away from rural, western community character; and
- I. Produce resort plans that make significant contributions toward protecting attributes of the community that are considered critical to the community's long-term health, welfare, and well-being.

SECTION 2520. APPLICABILITY

- A. **PR District.** Only those lands described below shall be eligible for PR District (hereinafter Planned Resort) zoning. The intent is that a limited number of PR Districts be created and only in locations that are consistent with the Jackson/Teton County Comprehensive Plan.

- I. **Snow King Ski and Summer Resort.** For the purposes of this Division, this area shall be known as "Snow King" and shall encompass the property mapped in Section 2550.M.3.g, Area description.

SECTION 2530. PROCEDURE

This procedure is intended to promote collaboration among landowners, the County, and the Town of Jackson in designing land development standards specific for each resort area. While one or more landowners may propose a Planned Resort master plan, and maintain the role of the applicant as identified herein, all landowners within a resort area are encouraged to participate in the design of the Master Plan. Participation of all landowners within the PRD, however, is not required for the Town to adopt a Master Plan for the Planned Resort.

- A. **Master plan review and approval.** Public review and approval for Planned Resort master plans follows the procedures set forth for Sketch Plans and serves as a Sketch Plan pursuant to Section 51200, Development Plan. The standards for review of the master plan, however, are the standards set forth in this Division, in order to allow for flexibility and creativity in the master plan and discretionary review thereof.
 1. **Purpose and intent of master plan.** The purpose of a Planned Resort master plan is to establish the development standards and serve as a guide to all future development within the Planned Resort. The Planned Resort master plan is intended to be of sufficient detail to describe the amount, type, size, location, and impact of the proposed resort, but technical specifications of the proposed development, such as fully engineered plans or fully detailed architectural drawings, are not required.
 2. **Submittal components.** A Planned Resort master plan application shall include all lands in a given resort area, as listed in Section 2520, Applicability. The minimum requirements for a master plan application shall be established by the Planning Director and shall include, but not be limited to:
 - (a) Statement of Purpose
 - (b) Master Site Plan
 - (c) Dimensional Limitation Plan
 - (d) Design Guidelines
 - (e) Transportation Demand Management Plan
 - (f) Housing Mitigation Plan
 - (g) Capital Improvements Plan
 - (h) Land Use Plan
 - (i) Phasing Plan
 - (j) Community Services Element (optional)
 3. **Recordation.** Upon approval, the Planned Resort Master Site Plan and a Certificate of Standards and Conditions, and any amendments thereto, shall be recorded in- the Teton County, Wyoming Clerk's Office. The Certificate shall be in the form of an affidavit and

shall detail the Planned Resort master plan conditions of approval and the development standards to be applied within the Planned Resort, as well as any other standards, conditions, or agreements pertaining to future development or responsibilities of landowners within the Planned Resort. The Planning Director shall prepare the affidavit in a form acceptable to the Town Attorney.

4. **Joint review by Town and County.** In addition to the review procedure set forth in Section 51200, Development Plan, the Town Planning Commission and Town Council shall make recommendations to the County Planning Commission and Board of County Commissioners regarding any Planned Resort master plan application within unincorporated portions of Teton County. For the same purpose, the Town Planning Commission and the Town Council shall receive and consider recommendations from the County Planning Commission and Board of County Commissioners regarding any Planned Resort master plan application in the Town of Jackson.

- a. **Purpose.** The purpose of the County's and Town's review of any Planned Resort in the other jurisdiction is to recognize the impact of resorts on neighboring jurisdictions and to provide an opportunity for cooperation in planning and mitigation of potential impacts.
- b. **Intent.** The intent of review is for the County Planning Commission and Board of County Commissioners to have an opportunity for review and comment on a proposed Master Plan. The role of Teton County is advisory only and does not include a voting participation in review of the Planned Resort master plan.

- B. Final Development Plan review and approval.** After approval of a Planned Resort master plan, Final Development Plan and building permit approvals are required prior to commencement of any construction or operation of any new land use within the Planned Resort.

1. **Final Development Plan application.** Final Development Plan applications shall be in accordance with the Planned Resort master plan and shall be reviewed and approved pursuant to Section 51200, Development Plan. No Sketch Plan review is required. No Final Development Plan shall be approved unless the proposal is consistent with the Planned Resort master plan.
2. **Phasing.** A Final Development Plan application may encompass only an increment of the total resort development in accordance with an approved phasing plan.

- C. Other development options.** The purpose of this subsection is to provide development options for properties within the Planned Resort District prior to adoption of a Planned Resort master plan, for individual properties which comprise a minor component of a Planned Resort District, and for properties which are not included in an approved Planned Resort master plan.

1. **Prior to master plan approval.** Until such time as a Planned Resort master plan is approved, development shall only be permitted in accordance with dimensional standards

and limitations listed for Auto-Urban Commercial/Lodging Overlay (AC/LO) and Auto-Urban Residential (AR) in Table 2400, Schedule of Dimensional Limitations, except that for non-residential development, the Floor Area Ratio (FAR) shall be limited to .25. Uses allowed shall be those listed for AC/LO and AR in Table 2200, Use Schedule.

2. **Prior to master plan approval - waiver for individual properties.** Upon written request of the applicant, the Town Council may for individual properties waive the limitations set forth in this subsection if the Council finds that the property constitutes a minor component of the total Planned Resort District, and development of the property prior to adoption of a master plan will not compromise the purpose or intent of the Planned Resort District or these Land Development Regulations. In the event Council waives the limitations as described herein, the applicant may submit a Sketch Plan or Final Development Plan, as appropriate, pursuant to Section 51200, Development Plan. Standards for review and approval shall be those applicable standards set forth in Section 51200, Development Plan and in Section 2550.M, Character element.
3. **Standards for properties not part of an approved master plan.** Immediately upon approval of a Planned Resort master plan any parcels not included in the master plan may be developed in accordance with the dimensional standards and limitations listed for Auto-Urban Residential (AR) in Table 2400, Schedule of Dimensional Limitations. Uses allowed shall be those listed for the AR in Table 2200, Use Schedule. Approval of any development shall be in accordance with Section 51200, Development Plan.

SECTION 2540. STANDING, AMENDMENTS, EXPIRATION, EXTENSION AND RECONSIDERATION

- A. **Standing of Planned Resort master plan.** An approved Planned Resort master plan shall specify the development standards for the Planned Resort. Upon approval of a Planned Resort master plan, any amendments to these Land Development Regulations shall not affect the approval of the Planned Resort master plan, or the conditions of approval, provided development within the Planned Resort proceeds **in** accordance with an approved phasing plan and provided none of the conditions occur that prescribe expiration of the Planned Resort master plan, pursuant to Section 2540.C, Expiration.
- B. **Amendment of master plan.** Any amendment to the Planned Resort master plan shall be reviewed and acted upon pursuant to the procedures set forth in this Division for review and action on the original master plan. The amendment shall be subject to all applicable standards of this Division and these Land Development Regulations that are in effect at the time of review of the amendment. Notwithstanding, minor deviations from a Planned Resort master plan may be approved by the Planning Director, pursuant to Section 51200.J, Minor deviations.
- C. **Expiration.**
 1. **Time-frame.** A Planned Resort master plan shall expire three (3) years from the date of its approval unless a sufficient application for Final Development Plan, in accordance with the approved phasing plan, is filed with the Planning Department A Planned Resort master

plan shall expire five (5) years from the date of its approval unless there is commencement of construction or operation of land uses or activities in accordance with the approved phasing plan. Notwithstanding, alternate time frames for expiration of a Planned Resort master plan may be established in an approved phasing plan.

2. **Effect.** Upon expiration, approval of a Planned Resort master plan shall become null and void, and all rights that are established by the master plan shall expire.

D. Extension. A Planned Resort master plan approval may be extended by the Town Council provided a written request for extension is received at least thirty (30) calendar days prior to expiration of the Planned Resort master plan.

1. **Procedure.** The request for extension shall be reviewed by the Town Council at a regularly scheduled meeting, by which time a public hearing notice shall be advertised and any necessary information pertinent to the extension request can be made available. The Planned Resort master plan shall be deemed extended until the Town Council acts upon the request for extension.
2. **Grounds for extension.** The grounds for extending a Planned Resort master plan approval shall be specified by the Town Council and shall include, but not be limited to, the following:
 - a. **No change in conditions.** Conditions in the community have not substantially changed since the original Planned Resort master plan approval. No extension shall be granted if the Town Council finds that changes in the community result in the resort plan being consistent with the community's land use patterns, these LDRs, or the community's ability to provide infrastructure and services to accommodate the resort.
 - b. **Good faith efforts.** Activities and investments on the part of landowners within the Planned Resort demonstrate good faith efforts in pursuing the development permitted by the Planned Resort master plan.

E. Reconsideration. If development within a Planned Resort fails to proceed in general accordance with the approved phasing plan, the Town Council may require reconsideration of the Planned Resort master plan and either amend the phasing plan or revoke the master plan, as appropriate.

1. **Amendment.** Amendment of the phasing plan shall be appropriate if either an acceptable alternative phasing plan that meets the standards of this Division or a development schedule acceptable to the Town Council for regaining compliance with the original phasing plan is presented.
2. **Revocation.** Revocation of the master plan shall have the effect of forfeiting all rights within the Planned Resort to any further development according to the Planned Resort master plan and shall be appropriate if:

- a. No material progress has been made in development of the resort for ten (10) consecutive years, or
 - b. There is substantial noncompliance with the performance objectives specified in the conditions of approval, or the monitoring program, and no agreement can be reached between representatives of the landowners within the Planned Resort or applicant of record and the Town Council for bringing the resort development into compliance with the standards of this Division.
3. **Procedure.** The Town Council shall hold a public hearing, in accordance with Section 5120.E, Notice of public hearings, and Section 5120.F, Public hearing procedure, for the purpose of examining the development that has occurred within the Planned Resort and its consistency with the Planned Resort master plan. The Town Council shall issue a determination as to whether amendment or revocation of the master plan is appropriate, in accordance with the above specified standards. Amendments to the master plan shall be accomplished pursuant to Section 2540.B, Amendment of master plan.

SECTION 2550. STANDARDS APPLYING TO ALL PLANNED RESORTS

- A. **Consistency with Comprehensive Plan.** Planned Resort master plans shall be consistent with the goals and objectives of the Jackson/Teton County Comprehensive Plan.
- B. **Compliance with Land Development Regulations.** A Planned Resort master plan shall comply with the standards of these LDRs. Notwithstanding, the applicant for a Planned Resort master plan may propose, and the Town Council may approve, alternative standards for development that are consistent with the purpose and intent of this Division. It is fully consistent with this Division that Planned Records may have dimensional, design, and other development standards different from those described in other sections of these LDRs due to the unique circumstances of, and community objectives for, resort development.
- C. **Statement of purpose.** The Planned Resort master plan shall have a Statement of Purpose which describes the applicant's rationale for resort expansion and the design theme of the resort development. The Statement also shall describe how the resort master plan fulfills the intents of this Division, as specified in Section 2510, Purpose and Intent.
- D. **Master Site Plan.** The Planned Resort master plan shall have a Master Site Plan that clearly illustrates the proposed development and the site to the satisfaction of the Planning Director.
- E. **Dimensional Limitation Plan.** The Planned Resort master plan shall have a Dimensional Limitation Plan which specifies dimensional limitations necessary to achieve the design theme identified by the applicant. The plan shall include floor areas and floor area ratios, densities landscape ratios, height, setbacks, building envelopes, etcetera, or other lines delineating areas on which restrictions of development are to be imposed and areas in square feet for each lot or building.

Any dimensional limitations unspecified by the Planned Resort master plan shall be established by the standards set forth in Section 2530.C, Other development options.

F. **Housing element.** The Planned Resort master plan shall have a housing element is to ensure a supply of affordable and employee housing that is commensurate to the demand for housing created by development within the Planned Resort.

1. **Affordable housing.** Affordable housing shall be provided in conjunction with residential development pursuant to Division 49400, Residential Affordable Housing Standards, of these LDRs.
2. **Employee housing.** Employee housing shall be provided in conjunction with nonresidential development pursuant to Division 49500, Employee Housing Standards, of these LDRs.
 - a. **Employee housing calculations.** Since development of a Planned Resort may span time periods over which numbers of employees and their salaries may fluctuate, the calculations performed in developing a Housing Mitigation Plan shall use data current for the most recent full year prior to application for Planned Resort master plan.
 - b. **Master plan estimate.** The number of employees required to be housed and the locations where they will be housed, as presented in the Planned Resort master plan, shall be treated as an estimate/concept, and shall be finalized by the Planning Director as Final Development Plans within the Planned Resort are reviewed and acted upon. Each approved Final Development Plan shall establish the actual number of employees required to be housed and the locations in which they will be housed for that portion of the Planned Resort master plan.

G. **Design element.** The Planned Resort master plan shall include design guidelines, and a mechanism for their implementation, that establish design parameters for both buildings and spaces in the Planned Resort. The design theme of the resort shall be defined by the applicant and be consistent with the standards of this Division. This subsection establishes concepts that the design guidelines shall address; the design guidelines shall be evaluated as to whether or not they address these concepts, as well as character objectives for specific resorts set forth in Section 2550M, Character element. The design guidelines shall be prepared by an architect or landscape architect licensed in the State of Wyoming; preparation by a person or persons of similar expertise may be permitted by the Planning Director.

1. **General.** The design theme of the Planned Resort shall have an emphasis on outdoor recreational activities and create a sense of place. A sense of place is created when site planning and architecture:
 - a. Concentrate activities and human interaction into identifiable spaces, such as a plaza or mall;

- b. Assemble a built environment that connects buildings, spaces and structures through common scale, design, and materials;
- c. Incorporate into the built environment the natural features and cultural heritage of the area, and;
- d. Produce an identifiable image that is associated with the planned resort and with Jackson Hole.

There shall be visual continuity among the resort structures and design elements without unduly limiting variety in design. Development shall be compatible with the surrounding built and natural environment in both scale and character.

2. **Architecture.** Building design guidelines shall reflect:

- a. The community's architectural character and themes
- b. A human scale, pedestrian-orientation, which are created when:
 - (1) The height of buildings does not overwhelm people walking beside the buildings; and
 - (2) The ground level doors, windows and design features of buildings create an interesting diversity for people walking past the buildings.
- c. A built environment in keeping with the cultural and aesthetic values of the community
- d. Natural attributes of the immediate vicinity
- e. Building materials and colors compatible with the surrounding natural and built environment.

3. **Bulk and scale.** The design guidelines shall ensure the bulk and scale of individual buildings within the Planned Resort achieve compatibility with:

- a. Other structures within the Planned Resort when the resort development is completed, and
- b. Neighboring structures that are not a part of the resort, and
- c. The natural environment.

4. **Signs.** The design guidelines shall include a sign component that sets forth the sign theme for the Planned Resort and specifies criteria for determining permitted sign sizes, types, and

locations. The guidelines shall contain prototypical examples of all types of signs, including wall, canopy, freestanding, directional, and informational signs. The flexibility extended to Planned Resorts via this Division, to propose standards for signs different from those specified in Chapter 15.28, Signs, of the Jackson Municipal Code, is encouraged with the purpose of having sign guidelines in keeping with the unique character and needs of the resort.

5. **Lighting.** The design guides shall include an analysis of proposed project lighting. Areas to be illuminated (parking areas, walkways, entries, etc.) shall be identified, and general standards should be set forth. Identification of models and types of standards and fixtures is encouraged, but specific illumination plans and photometric footprints are not required. Generally, lighting shall be low-intensity, low profile, and shielded to avoid "light pollution" and glare to off-site areas. General illumination standards are set forth in Section 49370, Exterior Lighting and Glare.
6. **Site planning.**
 - a. **Orientation and aspect.** Structures and public spaces within the Planned Resort, generally, shall be arranged with views of, and access to, the principal resort recreational amenity.
 - b. **Entrance features.** Entrances to the Planned Resort shall create a sense of arrival. A sense of arrival is created when the entrance into the Planned Resort is easily identifiable and is consistent with the design theme of the resort.
 - c. **Natural resources.** The site design shall highlight the natural resources within the Planned Resort and integrate them into the layout of the resort in order to promote a connection to the natural environment. Consequently, natural features of the site, such as significant vegetation, rock outcroppings, water bodies, etc., shall be preserved and incorporated into the project design to the extent practicable.
 - d. **Pathways and pedestrian facilities.** Pathways and pedestrian facilities, including access for the disabled, shall be integral components of the site design. The site shall provide an attractive, outdoor atmosphere that encourages use and reliance upon pathways and walkways.
 - (1) **Safe, convenient, and direct access.** Pathway and pedestrian systems shall provide safe, convenient, and direct access throughout the resort, to public lands, transit facilities and the existing or planned community pathway system, when adjacent to the resort.
 - (2) **Pathways.** Pathways shall be provided for non-motorized transportation, except motorized wheelchairs for the disabled shall be permitted. Bicycle racks, ski racks, etc., shall be provided at various destination points within the resort.

- e. **Transportation facilities.** Site design shall integrate safe, convenient, and direct access to transportation services and facilities (i.e., bus shelters, information kiosks) and shall incorporate the facilities necessary for the proper functioning of the Transportation Demand Management Plan (see subsection H.2, below.)
 - f. **Circulation.** The layout of local streets, alleyways, and parking lots shall be sensitive to the natural terrain and landscape. Cut and fill areas shall be minimized, and natural features of the site such as wooded areas, rock outcroppings, and water bodies, shall be preserved to the maximum extent practical.
 - g. **Access.** Safe vehicular access appropriate for refuse removal, recycling, emergency services, and delivery shall be provided. Service access shall not create unsafe conflicts with automobile and pedestrian access to primary destinations within the resort.
 - h. **Landscaping.** Project landscaping, including hardscape areas, shall be consistent with the overall design theme of the resort. Use of indigenous plant materials is encouraged. Existing vegetation shall be preserved and incorporated into the design of the project to the extent practical, especially wooded areas and other significant vegetation, which provides shelter or habitat for wildlife.
7. **Character objectives.** Section 2550.M, Character element, contains character and size objectives specific to each resort area that shall be incorporated into the design guidelines.
- H. **Transportation element.** The Planned Resort master plan shall have a transportation element to ensure that resort development does not produce an amount of vehicular traffic that undermines the community's character, and endangers the public health, safety and welfare (i.e., noise, air quality and traffic impacts.) The Planned Resort master plan shall provide an optimum mix of automobile, transit, and pathway facilities within the resort, encourage coordination of all resort transportation facilities with the County-wide transportation system, promote design and management which encourages shifts from single-occupancy vehicle trips to multi-occupancy trips, or other transportation modes, and provide equitable cost sharing for facilities and services.
1. **Traffic impact analysis.** A traffic impact and access analysis is required. At a minimum, this analysis shall contain:
- a. Projections of external vehicle trips generated by the Planned Resort.
 - b. Analysis of levels of service (LOS) impacts on roadway system segments and intersections serving the Planned Resort.
 - c. Specification of any improvements needed to roadway system segments and intersections as a result of increased traffic from the Planned Resort.

2. **Transportation Demand Management Plan.** The Planned Resort master plan shall include a Transportation Demand Management (TDM) Plan that demonstrates how the travel behavior of resort visitors and employees will be managed to minimize the number of vehicle trips on the roadway network resulting from the resort development. The Transportation Chapter of the Jackson Teton County Comprehensive Plan will allocate a number of vehicle trips to various roadway segments, based upon the projected traffic demand and the planned character of the roadway segments. A goal of the applicant's **TDM** Plan shall be to manage the transportation demands of the resort so that it is consistent **with** the allocation of vehicle trips to the various roadway segments that serve the Planned Resort. Potential mechanisms for managing travel behavior may include, but are not limited to:
 - a. Increasing average vehicle occupancy
 - b. Shifting vehicular trips (resident and visitor) to public transit
 - c. Shifting vehicular trips (resident and visitor) to walking, bicycling and other non-motorized means
 - d. Reducing vehicular trips through internal capture associated with mixed land use patterns.
 3. **Parking and loading.** The Planned Resort master plan shall provide parking and loading areas of sufficient amount and type to accommodate the resort's projected demand including parking for visitors and lodging guests, waiting and loading areas for transit vehicles and their passengers, and loading areas for delivery vehicles. Parking shall be designed to encourage non-motorized transportation, transit and high occupancy vehicle use and discourage single-occupancy vehicle use.
- I. **Capital improvements element.** The Planned Resort master plan shall have a capital improvements element to ensure that infrastructure and essential services will be provided in an efficient and timely manner to accommodate projected resort demands. Planned Resort master plans shall include a capital improvements element that identifies service providers, analyzes impacts and proposes a capital improvements plan for facilities and services needed by the resort. Such facilities and services may include, but are not limited to: transportation (including transit, parking and pathways;) potable water and wastewater treatment services; waste management (hazardous and solid;) utilities; storm water management and snow storage facilities.
1. **Identification and acknowledgment of service providers.** The applicant shall identify the provider of all infrastructure facilities and services included in the plan. Where services are to be provided by an entity other than the applicant, documents from the service provider shall demonstrate the commitment and ability to provide such service according to the Planned Resort master plan.
 2. **Impact analysis.** An impact analysis shall be performed for all facilities and services, unless waived by the Planning Director. Each impact analysis shall identify the following:

- a. The maximum daily peak capacity of existing facilities.
 - b. The current daily peak demand on existing capacity.
 - c. The daily peak capacity available for new development.
 - d. The projected daily peak demand generated by new development in the Planned Resort.
 - e. When development outside of a resort is reasonably anticipated to utilize the same infrastructure system as the resort, the Town of Jackson shall provide the applicant with estimated peak demand.
 - f. Any planned improvements by other entities, such as the Town of Jackson or the Teton Village Water and Sewer District, and the timing of such improvements.
 - g. Any deficits in daily peak capacity potentially resulting from development within the Planned Resort--either from a strict demand standpoint or from a timing standpoint--taking into account other potential new development outside the Planned Resort.
3. **Capital improvements program.** The capital improvements plan shall be consistent with the impact analysis and specify how any deficiencies in infrastructure will be remedied or mitigated, including descriptions of the infrastructure improvements, the responsibility and sources of funding for the improvements, and the timing for completion of improvements. Concept plans for improvements shall be included in the capital improvements plan; engineered plans shall be provided in the final development plan application for subsequent development.
- J. **Land use element.** The Planned Resort development shall have a land use element that identifies the land uses within a proposed Planned Resort. The land uses shall be consistent with both the applicant's design theme and the character objectives for the resort, as specified in Section 2550. **M, Character element**.
- I. **Permitted uses.** The type of development permitted within a Planned Resort shall be set forth in the Planned Resort master plan and shall be consistent with the following:
- a. Residential uses shall be permitted.
 - b. Uses necessary for operation of the resort's primary recreational activity (ski area, hot springs) shall be permitted.
 - c. Nonresidential uses that provide for the basic needs of the resort's lodging guests, day visitors, employees and vicinity residents shall be permitted.

- d. Regional-serving commercial uses which rely upon vehicle trips from a community-wide market area rather than the Planned Resort vicinity shall be prohibited, unless they are determined by the Town Council to be resort-related amenities.
- e. Commercial amusement activities that are detrimental to the outdoor, natural resource character of Teton County shall be prohibited.
- f. Special events such as music and dance festivals, art and craft shows, concerts, live theater, and similar events, which are compatible with the resort and its facilities, shall be permitted.

2. **Amount and type of development.** The amount and type of development in a Planned Resort master plan shall be consistent with:

- a. The applicant's rationale for resort expansion and the character objectives for the resort area pursuant to Section 2550.M, Character element.
- b. The overall amount of development that can be permitted while preserving community character, as reflected in the Jackson Teton County Comprehensive Plan and the Town and County's LDRs.
- c. The amount of infrastructure capacity that can be provided while maintaining consistency with community character goals.
- d. Providing a level of self-sufficiency within the resort, such that vehicle trips ending outside the resort are minimized.

K. **Phasing element.** The Planned Resort development shall have a phasing element to ensure that development within a Planned Resort occurs in logical sequence within the Planned Resort, including amenities and necessary public service expansions. Planned Resort master plans shall contain a phasing plan that identifies the sequence of resort structures, uses and amenities, installation of infrastructure, implementation of the Transportation Demand Management Plan, Housing Mitigation Plan, and implementation of Planned Resort master plan conditions of approval.

- 1. **Description.** All structures, land use activities, mitigation strategies and infrastructure expansions proposed, including such activities and improvements on public lands, shall be included in the phasing plan.
- 2. **Functional phases.** Each phase shall be self-sufficient, in conjunction with existing elements of the Planned Resort, i.e., transportation and parking needs, as well as amenities, for each phase shall be satisfied within each phase and shall not be dependent upon a future phase. Each phase shall represent a logical and compact extension of infrastructure and public services. In order to develop certain improvements in logical increments that provide for economies of scale, the phasing plan may propose that improvements required for an earlier phase be provided in a later phase only if:

- a. The delayed construction of the improvement does not create a negative impact or exacerbate an existing problematic condition, and
 - b. Financial assurance, in a form acceptable to the Town Council, is provided, i.e., letter of credit, that the, improvement required for the earlier phase will be developed within a certain time-frame, even if later phases remain undeveloped.
3. **Coordinated with public services.** Phasing shall be coordinated with the improvements schedule or capital improvements program of public or semipublic service providers, as identified in the Capital Improvements Element.
4. **Relationship of phasing to overall resort plan.** Phasing shall implement the stated purpose of the Planned Resort master plan, i.e., if a destination ski area is the basis for the resort plan, the ski area facilities should not be the last increment of development. Similarly, open space dedications, amenities, and required performances that mitigate the impacts of the resort shall be developed or provided in proportion to the type and amount of development in each phase.
5. **Performance objectives.** The Town shall establish performance objectives as part of the Planned Resort master plan approval that ensure that development within the Planned Resort achieves the required mitigation of projected impacts on the community. The resort developers shall be responsible for ensuring that proposed mitigation measures are effective. For example, the resort approval may require vehicle trip reduction techniques in order to avoid undesired vehicle trips; performance objectives shall be identified and incorporated into a monitoring program, pursuant to subsection K.6, Monitoring program, below.
6. **Monitoring program.** A program for monitoring compliance with performance objectives for each phase of development shall be designed in a collaborative effort between the applicant(s) and the Town, and shall be set forth in the Planned Resort master plan approval. The monitoring program shall be implemented by the applicant, or an entity that equitably represents all landowners within the Planned Resort, and will include monitoring of DM components, employee housing developments, and other such elements as identified by the Town Council.
 - a. **Program contents.** The monitoring program shall specify data collection needs, responsibility for data collection, techniques to be used in analyzing data, how the data shall be used to determine achievement of performance objectives, and the schedule for reporting to the Town the results of the monitoring effort
 - b. **Program results.** Representatives of the landowners within the Planned Resort shall have three (3) reporting opportunities to demonstrate achievement of performance objectives. If, by the third scheduled report, the resort has been unable to meet any specified performance objective, the Planned Resort master plan may be subject to reconsideration pursuant to Section 2540.E, Reconsideration.

7. Achievement of performance objectives. Approval of future final development plans may be delayed until the performance objectives of the previous phases are met or a strategy for achieving them has been approved by the Town Council.
- L. Community services element (optional). Resorts function as integral parts of the community by participating in civic initiatives and implementing the goals of the community. The optional community services element is intended to be a component of the Planned Resort master plan in which the benefits that the resort area provides to the community are acknowledged. Landowners within Planned Resorts are encouraged to continue with, and expand upon, programs designed to retain local access to the resort's main recreational activity and facilities. Community service programs help to maintain a balance at the resort between out-of-town visitors and the community, and contribute to the quality of life in the community. Examples of community services currently provided are:
1. Hosting activities for local disabled persons
 2. Hosting Parks & Recreation Department activities
 3. Providing trail head access to public forest land
 4. Hosting local nonprofit events, including free recreational activities and transportation
 5. Offering reduced facility rates for community events and nonprofit organizations
 6. Offering local appreciation and promotional reduction in activity fees
 7. Offering activity fees that are affordable to the permanent population
- M. **Character element.** The Planned Resort master plan shall have a character element to ensure that resort development is in keeping with the community's character and the planned character for the vicinity in which the resort development is located as described in this subsection. The standards set forth in this subsection are unique to each resort area in order to recognize the differences between the individual resorts, the planned character of their neighborhoods, and the community's expectation of resort development in that vicinity.
1. **General.** The standards specified in this Section are the minimum required, or maximum permitted, as indicated by a "no less than" or "no more than" statement. Minimum requirements may be increased in order to avoid or mitigate impacts of a specific Planned Resort master plan proposal, better achieve the character objectives for the resort, or better implement the goals and objectives of the Comprehensive Plan. Similarly, an applicant's ability to achieve the maximums permitted is dependent upon the Planned Resort master plan's avoidance or mitigation of negative impacts on the community, its achievement of the character objectives for the resort, or its contribution toward achievement of the goals and objectives of the Comprehensive Plan.

2. Definitions.

- a. **Guest.** A guest is a person who is accommodated in overnight lodging facilities within the Planned Resort. The number of guests is calculated by the "average peak occupancy" of the lodging accommodations.
- b. **Average peak occupancy.** For the purposes of this Section, the following average peak occupancies (APOs) shall be used in calculating the capacity of guest accommodations:
 - (1) **Hotel, motel, or similar lodging unit.** A hotel, motel, or similar lodging unit that exists as sleeping quarters only, and does not contain other types of living spaces such as a living room or kitchen, shall be assigned an APO of two (2.)
 - (2) **Dwelling unit.** A dwelling unit, used for short term rental, shall be assigned an APO of four (4.)
 - (3) **Other.** Other lodging facilities that do not meet the definitions above shall have an APO assigned that is the sum of the number of bedrooms the lodging facility contains multiplied by two (2.)

3. Snow King

- a. **Character and design.** As indicated on the Community Issues **Map** of the Jackson/Teton County Comprehensive Plan, Snow King Resort will continue its role as a unique, resort-oriented urban commercial node serving both visitors and residents. Improvements and expansions at Snow King will solidify its role as the main convention and conference facility in the community. Factors and resort characteristics important in Snow King's future development include:
 - (1) Capitalization on the location at the terminus of Snow King Avenue.
 - (2) Creation of a sense of arrival.
 - (3) Creation of an active, attractive, pedestrian streetscape along the eastern end of Snow King Avenue.
 - (4) An attractive, safe, and direct pedestrian streetscape connection to the Town Square.
 - (5) A layout that blends the edges of the resort into neighboring developments, creating a porous edge to the resort that encourages pedestrian travel into and through the area.

- (6) Structure sizes and layout that draw people into the resort area.
- (7) A continuity of architecture and activities within the resort, creating a multi-use sense of place.
- (8) Pathways throughout the resort and connections to the Jackson Hole pathways system.
- (9) Continued provision of the amenities of "town hill" skiing.

b. Capacity.

- (1) **Lodging.** Lodging capacity shall be for no more than 2,460 guests shall be provided within the Planned Resort.
- (2) **Buildings.** There shall be no more than a total of 1,080,000 square feet of gross floor area for all facilities and all uses located within both the Building Envelopes and the Recreation Land Use Zones within Sub-Areas 1-6 as defined in the Snow King Master Plan, as well as, all development within Sub-Area 7 located within the Planned Resort District, but not part of the Snow King Master Plan (Pitchfork, Clark's Knoll, Grand Vista, Stevens, Remington). For purposes of allocating square footage 915,000 square feet shall be allocated to Sub-Areas 1-6 and 165,000 square feet to Sub-Area 7. The 1,080,000 square feet of gross floor area shall include all structures, both new, existing and all additions and/or redevelopment of structures. All floor area devoted to employee housing shall be exempt from the gross floor area calculation. With the exception of floor area devoted to employee housing, the total gross floor area shall include all floor area as defined by the Town's Land Development Regulations and as defined in the Planned Resort Master Plan for Snow King. (Ord. 668, § 1, 1/2001)

- c. **Land use.** Convention center facilities shall be provided necessary to serve a year-round convention market, including community needs for convention space. Commercial services provided, in addition to convention facilities, shall be essential services to on-site guests and supplemental neighborhood services. The commercial space shall be sized and designed for serving the needs of on-site guests of the resort and nearby residents.
- d. **Landscape surface area.** Within areas of the Planned Resort to be developed as lodging, conference, commercial and related facilities, the minimum landscape surface ratio shall be .25, exclusive of the already permitted residential development that exists upon the enactment of this Division (Clark's Knoll, Pitchfork Townhomes, Love Ridge, and Love Ridge Addition.) Notwithstanding, the Town Council may reduce the minimum landscape surface area to no less than twenty (20)

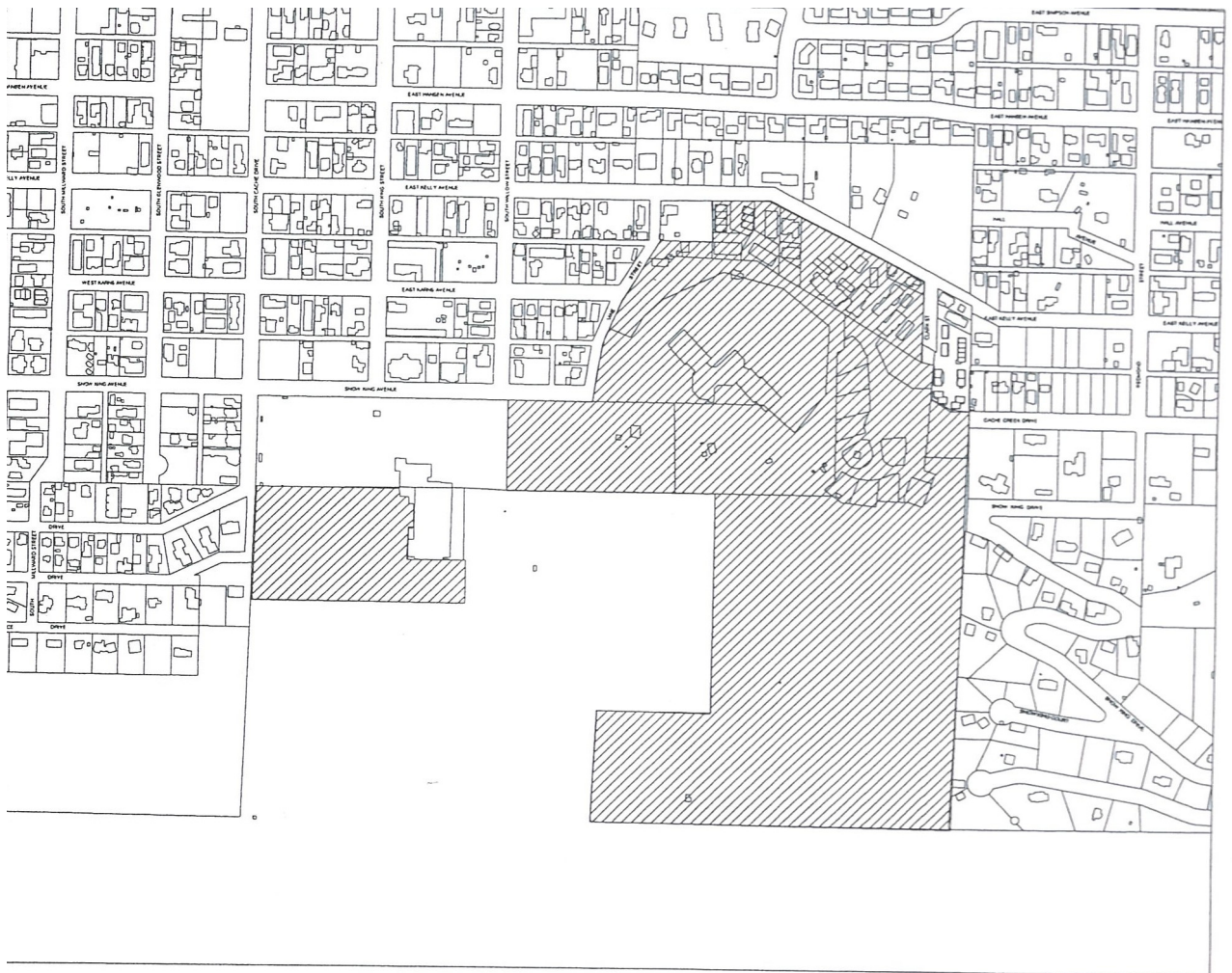
percent upon demonstration by the applicant that the following objectives are achieved with a reduced landscape surface area. The primary purposes of the landscaped areas within Snow King are to:

- (1) Create visually strong and attractive streetscapes.
 - (2) Create a porous edge to the Planned Resort such that residents and visitors in the surrounding areas are invited to enter the resort through attractive pedestrian ways.
 - (3) Support high quality urban design, including integral public spaces for interaction and public events.
- e. **Environmental analysis.** An EA with a visual component dealing with the potential visual impacts of development shall be performed pursuant to the procedures and standards of Division 3300, Scenic Resources Overlay (SRO) District. An EA shall be performed which recommends any action necessary to mitigate impacts to wildlife, migration corridors and crucial winter range.
- f. **Relationship to Town Square.** Programs and facilities shall be established that encourage non-motorized access and public transit access to the Town Square and other Town tourist environs, in conjunction with Town of Jackson planning efforts and goals.

A Planned Resort master plan shall be approved only if all of the following findings are made.

- A. **Consistency with Comprehensive Plan.** The Planned Resort master plan is consistent with the goals and objectives of the Jackson Teton County Comprehensive Plan.
- B. **Consistency with purpose and intent.** The Planned Resort master plan is substantially consistent with the purpose and intent of this Division, as set forth in Section 2510, Purpose and Intent
- C. **Affordable and employee housing.** The Planned Resort master plan ensures a supply of affordable and employee housing that is in accordance with the requirements for housing created by development within the Planned Resort.
- D. **Design guidelines.** The Planned Resort master plan contains design guidelines that
 - 1. Establish standards for buildings, spaces, signs, and lighting within the Planned Resort;
 - 2. Promote the design concepts set forth in Section 2550.G, Design element; and
 - 3. Establish a method for consistent implementation of the guidelines.
- E. **Transportation element.** The Planned Resort master plan contains a traffic impact analysis and transportation demand management plan that:
 - 1. Promote multimodal forms of transportation that are consistent with the transportation goals of the Jackson/Teton County Comprehensive Plan;
 - 2. Manage the generation of resort related traffic to avoid undermining community character and endangering the public health, safety, and welfare; and
 - 3. Identify an equitable cost sharing plan for transportation facilities and services.
- F. **Capital improvements plan.** The Planned Resort master plan contains a capital improvements plan that ensures infrastructure and essential services will be provided in an efficient and timely manner to accommodate projected resort demands.
- G. **Land use element.** The Planned Resort master plan promotes land uses that support and maintain the character of the resort as specified in Section 2550.M, Character element.
- H. **Phasing plan.** The Planned Resort master plan contains a phasing plan that ensures:
 - 1. Development of the resort, its amenities, and public facilities necessary to serve the resort, occur in logical sequence and

- g. **Area description.** The following map depicts the Snow King area that is within the Planned Resort District.



Planned Resort District

CALCULATION OF HOUSING NEEDS AT BUILDOUT

TABLE 3

Section Break (Continuous)

Land Use	Requirement	or Numbers	#Required
Column Break			
Section Break (Continuous)			
Office	0.03/1,000 SF	74,200 SF	85.85
Commercial Retail	0.41/1,000 SF	85,000 SF	
Restaurant/Bar	1.01/1,000 SF		
Commercial, Lodging, Hotel, Motel & Other		1,800 *	117.00
Short Term Rentals	0.065/guest		7.14
Conference/Meeting Rooms	0.06/1,000 SF	119,000 SF	Section Break (Continuous)
Indoor/Outdoor Recreational Facilities (to be determined in the future)	-----	3 1 . 1 6	
Column Break			
Total Required			241.51

1,800 = 2,208 less 408 guests (APO) in the existing hotel (204 rooms)

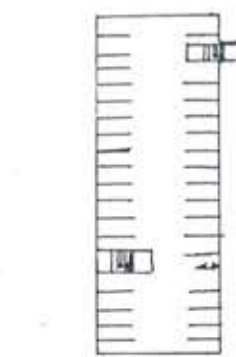
EMPLOYEE HOUSING DISTRIBUTION SUMMARY

TABLE 4

Section Break (Continuous)

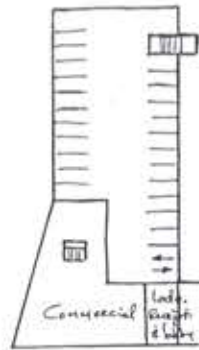
Required Employees at	Build dout	Snow King
	Column Break	Column Break
		Other Locations in Town
242	73	169

These calculations of required housing needed at buildout are only preliminary estimates. The final numbers will be determined by applying the required factors and formulas described in this section to the square footage or number of units actually built. As development occurs, the required employee housing shall be periodically updated as final development permits are obtained. Any changes in the formulas used for computing required employee housing that result in needs beyond the above described, shall be allowed to be met offsite.



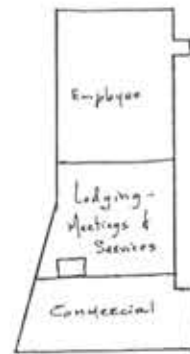
BMT PARKING
Elev. 6222

37 PARKING SPACES
16,000 SF PARKING & CIRCULATION



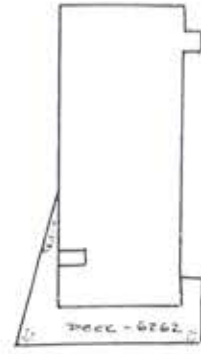
Lower Level
Elev. 6234

25 PARKING SPACES
5,000 SF Commercial
1,000 SF Lodging Reception & lobby



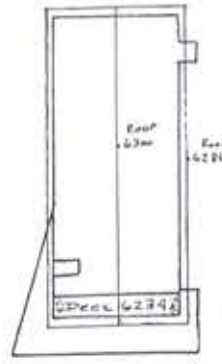
FIRST FLOOR
Elev. 6248

Commercial: 5,000 SF
Employee: 6,000 SF
Services: 2,000 SF
Meeting: 2,000 SF



Second Floor
Elev. 6262

Lodging: 14,000 SF
32 Rooms
64 Guests



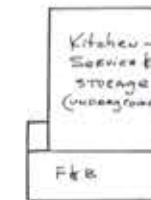
Third Floor
Elev. 6274

Lodging: 13,000 SF
28 Rooms
56 Guests

SUMMARY:

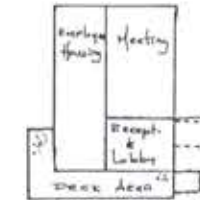
Parking: 62 spaces
Underground parking & circ.: 28,000 SF
Commercial: 10,000 SF
Lodging lobby & reception: 1,000 SF
Employee: 6,000 SF
Services: 2,000 SF
Meeting: 2,000 SF
Lodging: 27,000 SF
Lodging: 60 Rooms, 120 guests
Total Above ground SF: 42,000 SF plus 6,000 SF employee
Grass Coverage: 19,000 SF

PINE Lodge



Lower Level - Elev. 0'

F&B: 3,000 SF
Underground: circular, service & storage: 7,000 SF



First Floor: Elev. 14'

Employee Housing: 3,000 SF
Lobby/Reception: 2,000 SF
Meeting: 3,000 SF



Second Floor: Elev. 28'

Lodging: 7,000 SF
14 Rooms
28 guests



Third Floor: Elev. 40'

Lodging: 7,000 SF
14 Rooms
28 guests

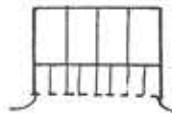
MID-MOUNTAIN Lodge

Lodging: 14,000 SF - 28 Rooms - 56 guests
Lobby/Reception: 2,000 SF
Meeting: 3,000 SF
Employee housing: 3,000 SF
Commercial: F&B: 3,000 SF
Underground: Kitchen, storage, services: 7,000 SF
Parking - SURFACE (summer only): 12
Ground coverage - building: 11,000 SF



TYPICAL UPPER LOVE RIDGE AREA Building

1 OF 4



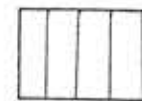
Lower Level:

8 PARKING SPACES
4 employee units @ 625 SF/EA
2,500 SF



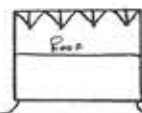
Middle Level:

Lodging/condos: 4,000 SF



Upper Level:

Lodging/condos: 4,000 SF



TOTALS: PER BUILDING

8 PARKING SPACES - covered
4 employee units - 2,500 SF
4 condominium units
16 guests
8,000 SF lodging
5,000 SF ground coverage

Lower Love Ridge Addition Building



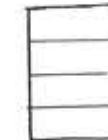
Lower Level:

8 PARKING SPACES
2 employee units @ 1,000 SF each = 2,000 SF



Middle Level:

5 SURFACE PARKING SPACES
Lodging/condos: 4,000 SF

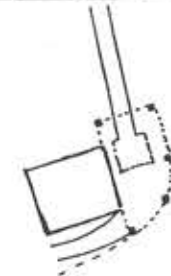


Upper Level:

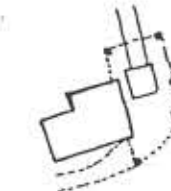
Lodging/condos: 4,000 SF

TOTALS:

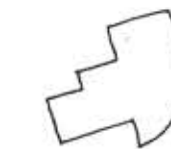
PARKING: COVERED: 8
SURFACE: 5
2 employee units: 2,000 SF
4 condominium units
16 guests
8,000 SF lodging
5,000 SF bldg. ground coverage



BASEMENT: 2,000 SF STORAGE

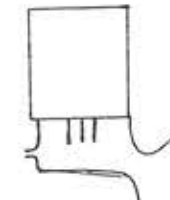


FIRST FLOOR:
Commercial & F&B: 2,000 SF

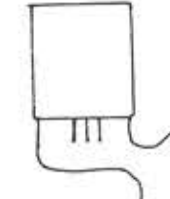


SECOND FLOOR:
Employee Housing: 4,000 SF

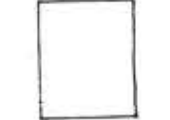
PROPERTY LIFT BASE Bldg.
Underground Storage: 2,000 SF
Commercial: 2,000 SF
Employee Housing: 4,000 SF



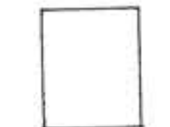
Lower BMT:
PARKING: 4,000 SF
12 CARS



Upper BMT:
PARKING: 4,000 SF
12 CARS



FIRST FLOOR:
Employee Housing: 4,000 SF



SECOND FLOOR:
Employee Housing: 4,000 SF

Employee Housing Bldg. behind Pine Lodge.

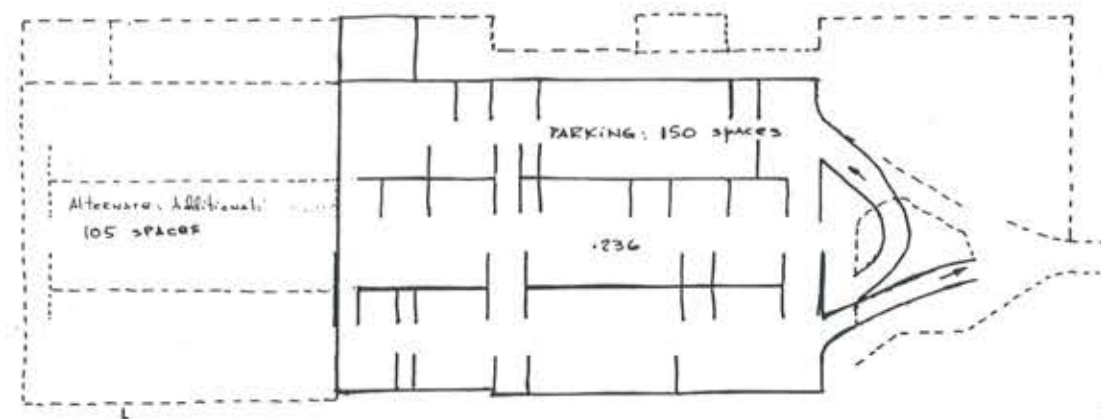
Underground Parking: 8,000 SF, 24 CARS
Employee Housing: 8,000 SF



UNDERGROUND STORAGE: 2,000 SF

Basement Storage Bldg.
behind S.K. Center:
Underground Storage: 2,000 SF

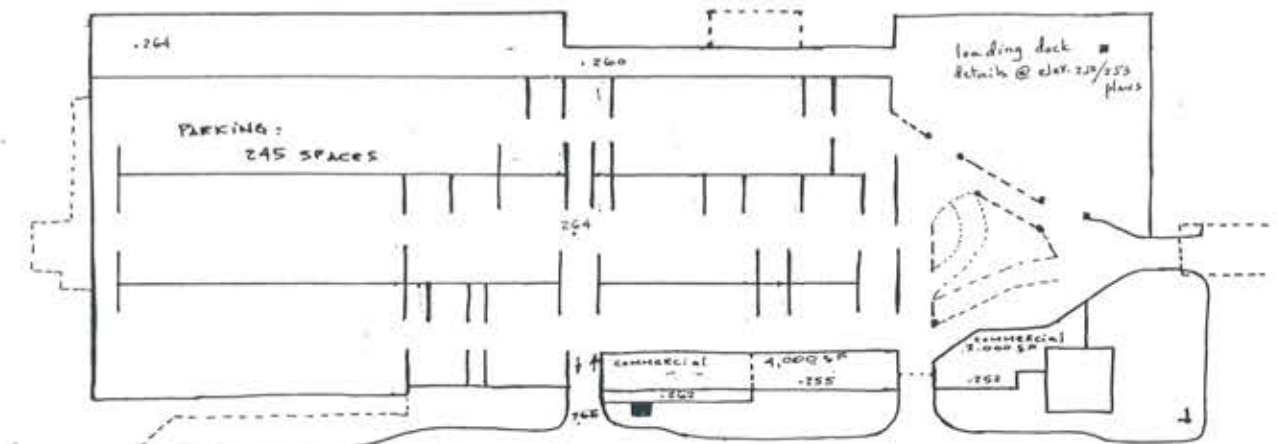
CONCEPTUAL BUILDING DESIGNS. VARIOUS SUB-AREAS



ALTERNATE - A20

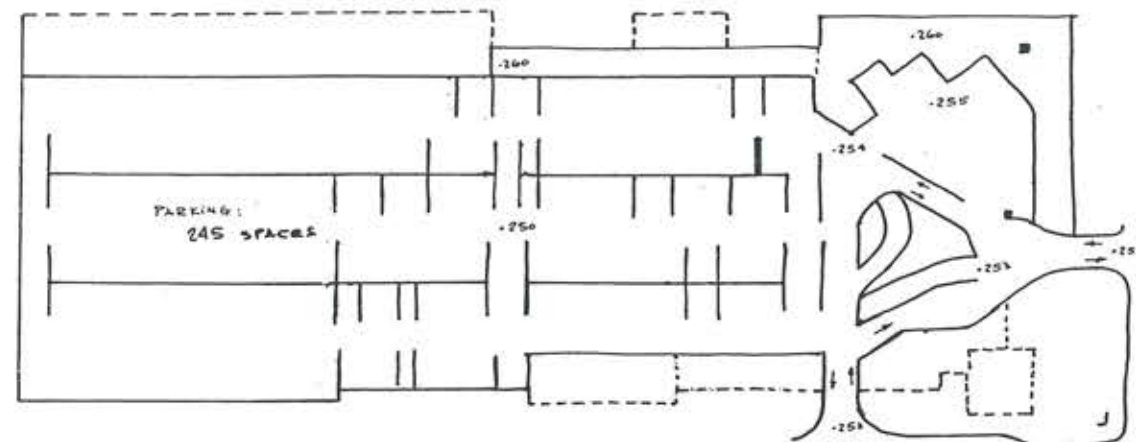
	Snow King	KMG	TOTALS
PARKING SPACES	28	77	105 BA
PARKING & CIRCULATION SF	14,000	28,000	42,000 SF
Mech. & Support	2,000	2,000	4,000 SF

BASE BUILDING
 KMG: 150 parking spaces
 64,000 SF PARKING & CIRCUL.
 4,000 SF Mechanical & Support (underg.)
 Elev. 236



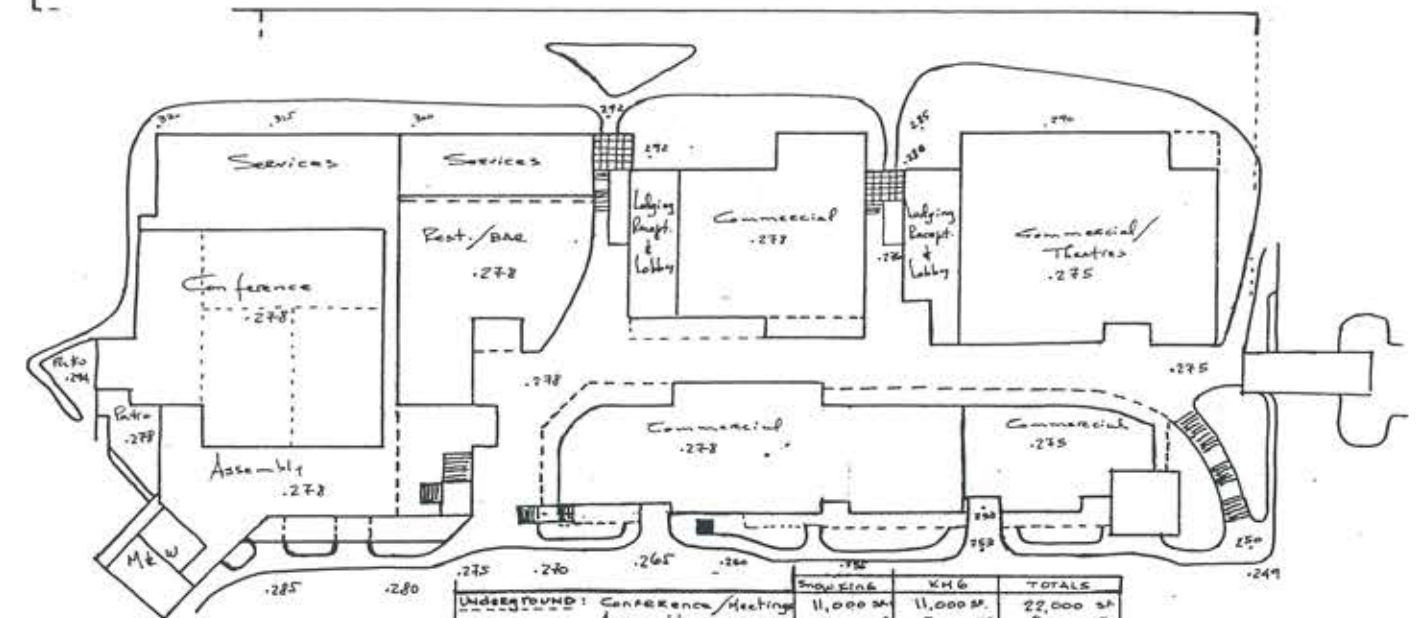
	Snow King	KMG	TOTALS
Parking Spaces	25	220	245
Parking & Circ. SF	13,000 SF	89,000 SF	102,000 SF
Underg. Support & Mech	3,000 SF	13,000 SF	16,000 SF
Commercial	-	6,000 SF	6,000 SF

Elev. 260/264



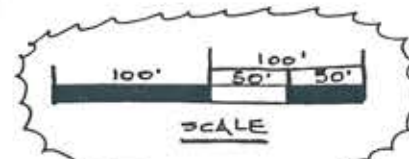
	Snow King	KMG	TOTALS
Parking Spaces	25	220	245
Parking & Circ. SF	13,000 SF	89,000 SF	102,000 SF
Underg. Support & Mech	3,000 SF	6,000 SF	9,000 SF
Underg. Loading Dock	-	22,000 SF	22,000 SF

Elev. 250/253

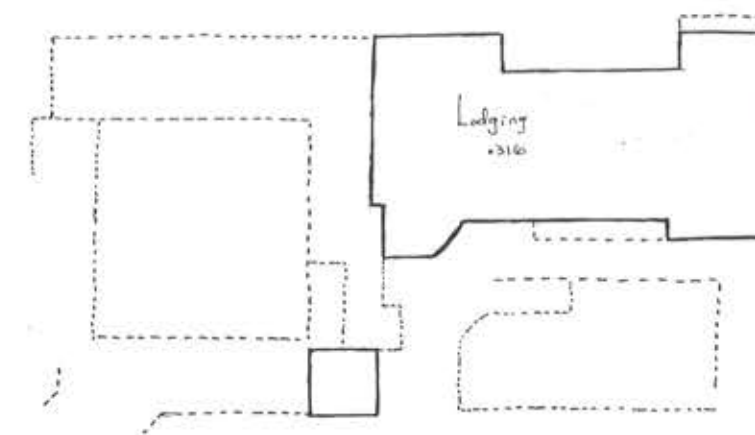
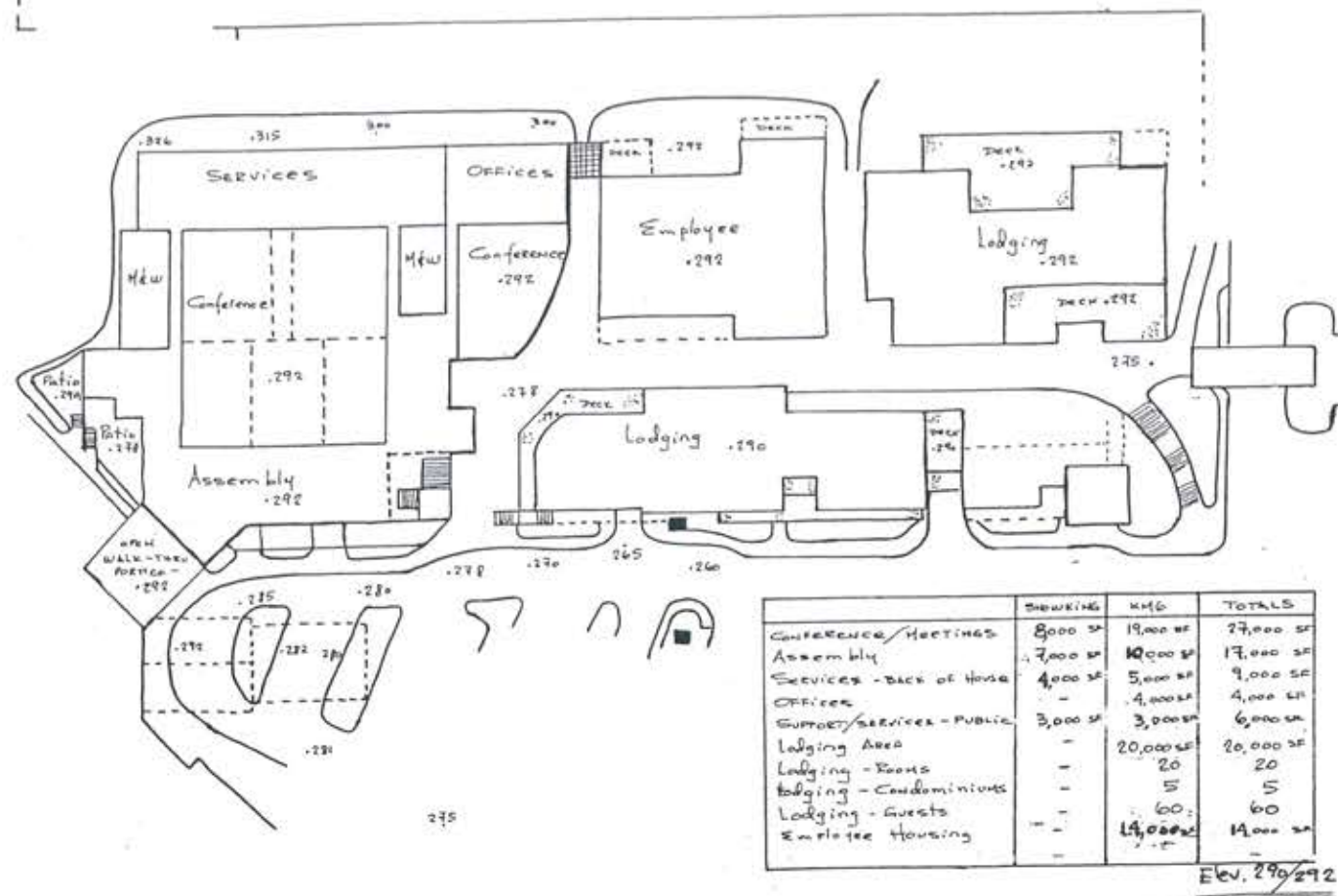


	Snow King	KMG	TOTALS
UNDERGROUND: Conference/Heating	11,000 SF	11,000 SF	22,000 SF
Assembly	4,000 SF	5,000 SF	9,000 SF
Service 2nd level Plaza	5,000 SF	13,000 SF	18,000 SF
Support & Services - full	2,000 SF	-	2,000 SF
Above Ground: Commercial (F&B)	-	11,000 SF	11,000 SF
Commercial (unassg)	-	34,000 SF	34,000 SF
Assembly	-	3,000 SF	3,000 SF
Lodging lobby & Receipt	-	6,000 SF	6,000 SF
Theatres or Commercial	-	9,000 SF	9,000 SF
GROUND COVERAGE: Buildings	22,000 SF	111,000 SF	133,000 SF
Landscaped Plaza	-	37,000 SF	37,000 SF
Pathways, Sidewalks	2,000 SF	15,000 SF	17,000 SF

Elev. 275/278

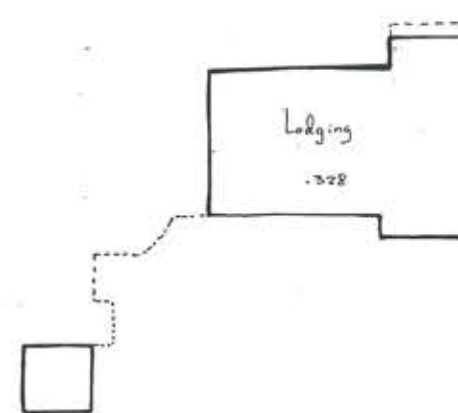
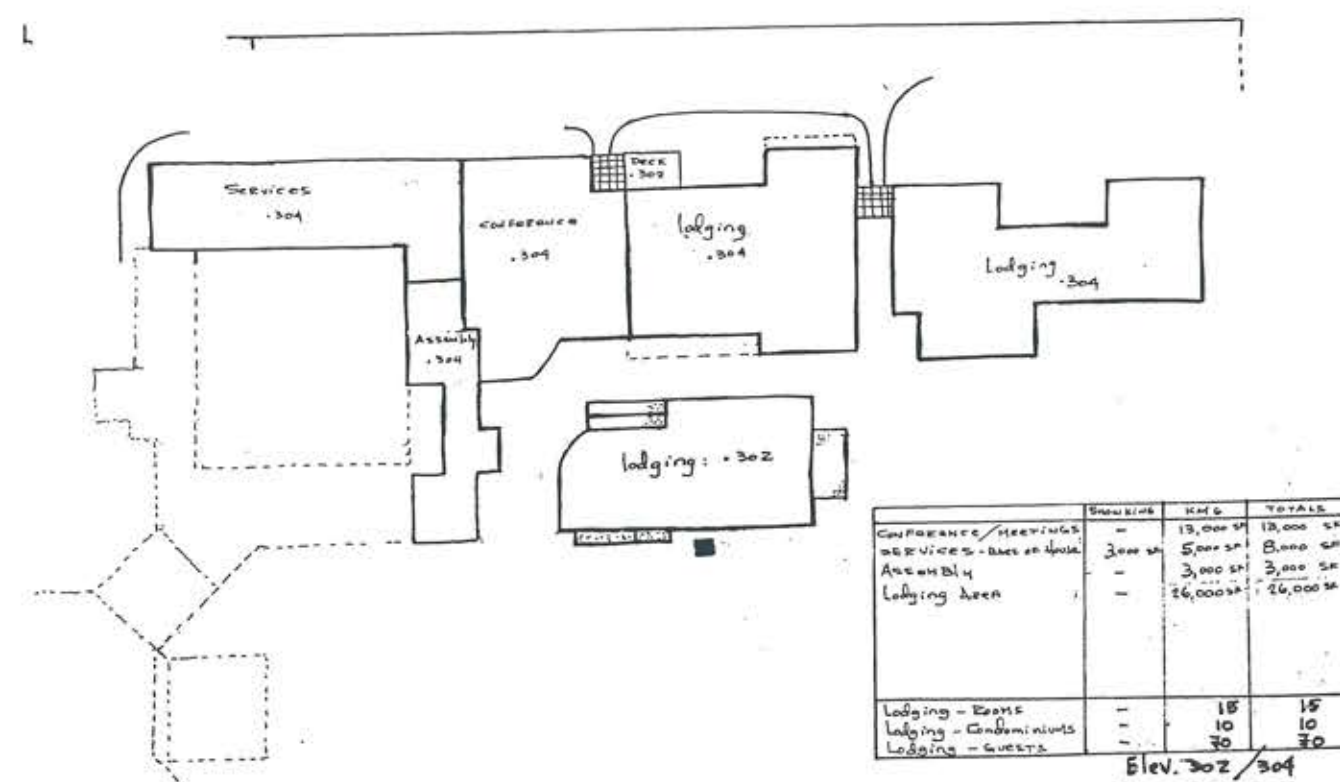


CONCEPTUAL BUILDING DESIGNS - SUB AREA 2



	KMG	TOTALS
Lodging Area	16,000 SF	16,000 SF
Lodging - Rooms	30	30
Lodging - Guests	60	60

Elev. 316



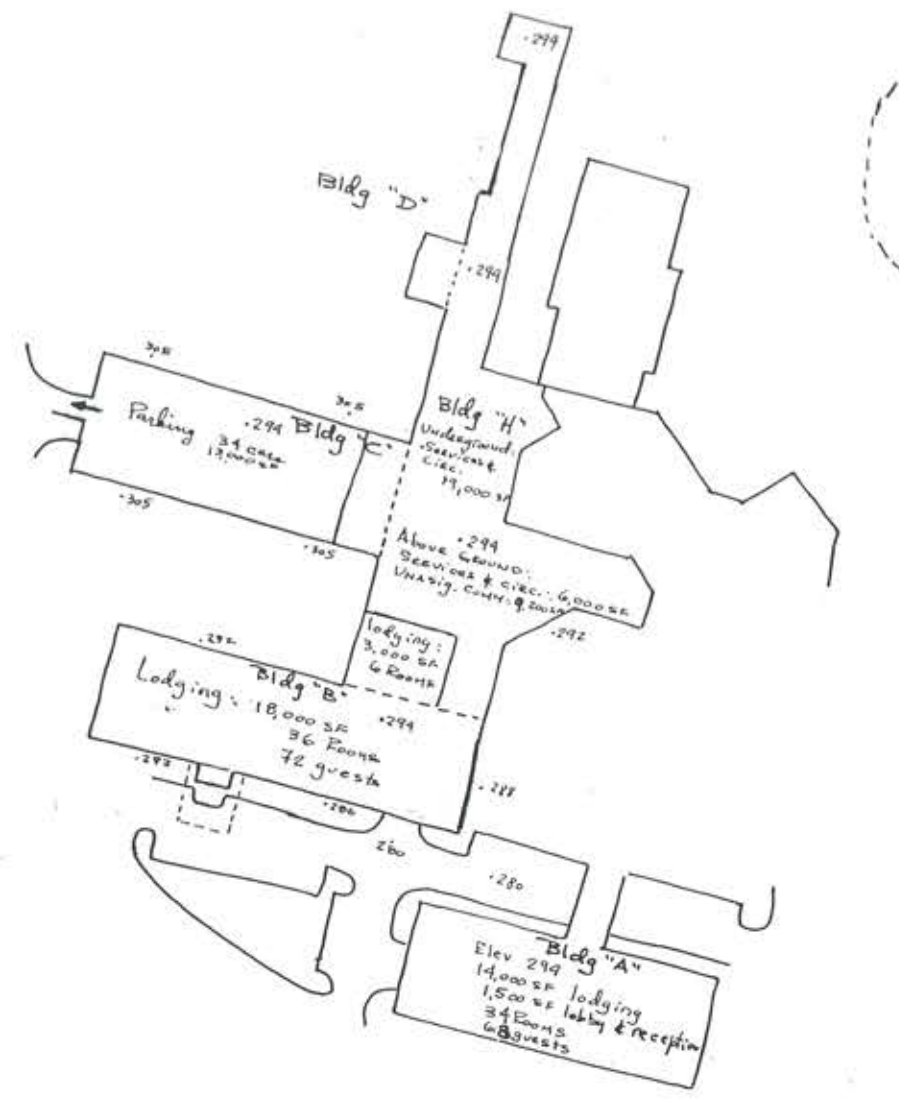
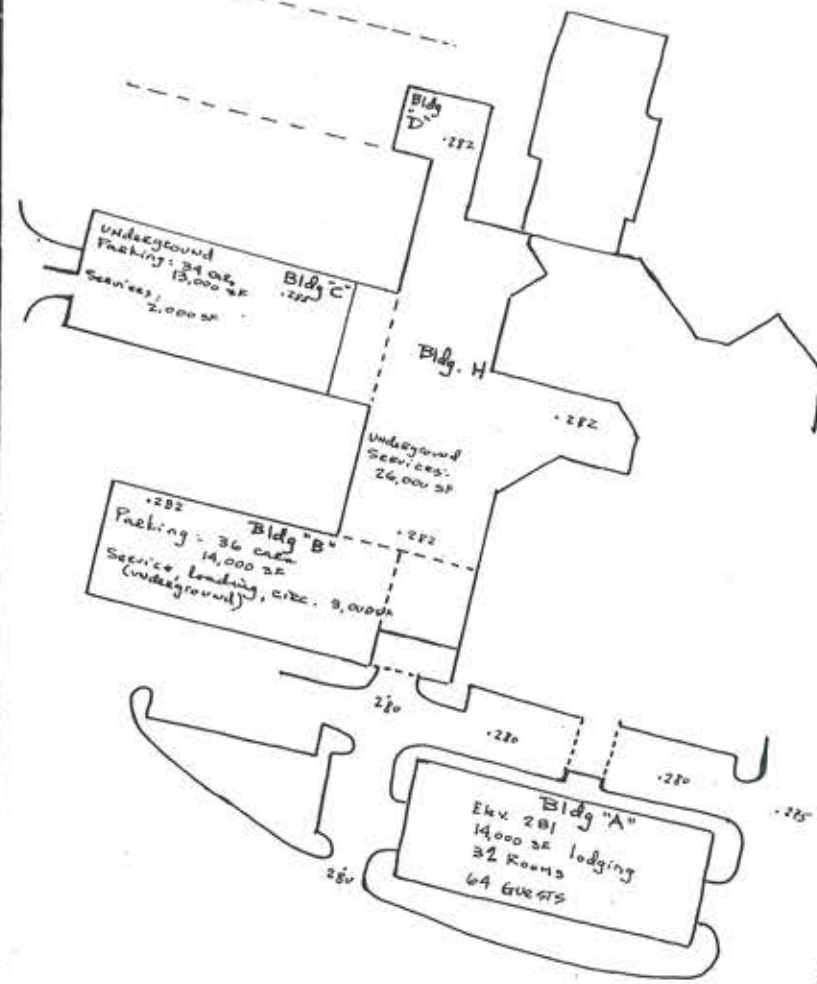
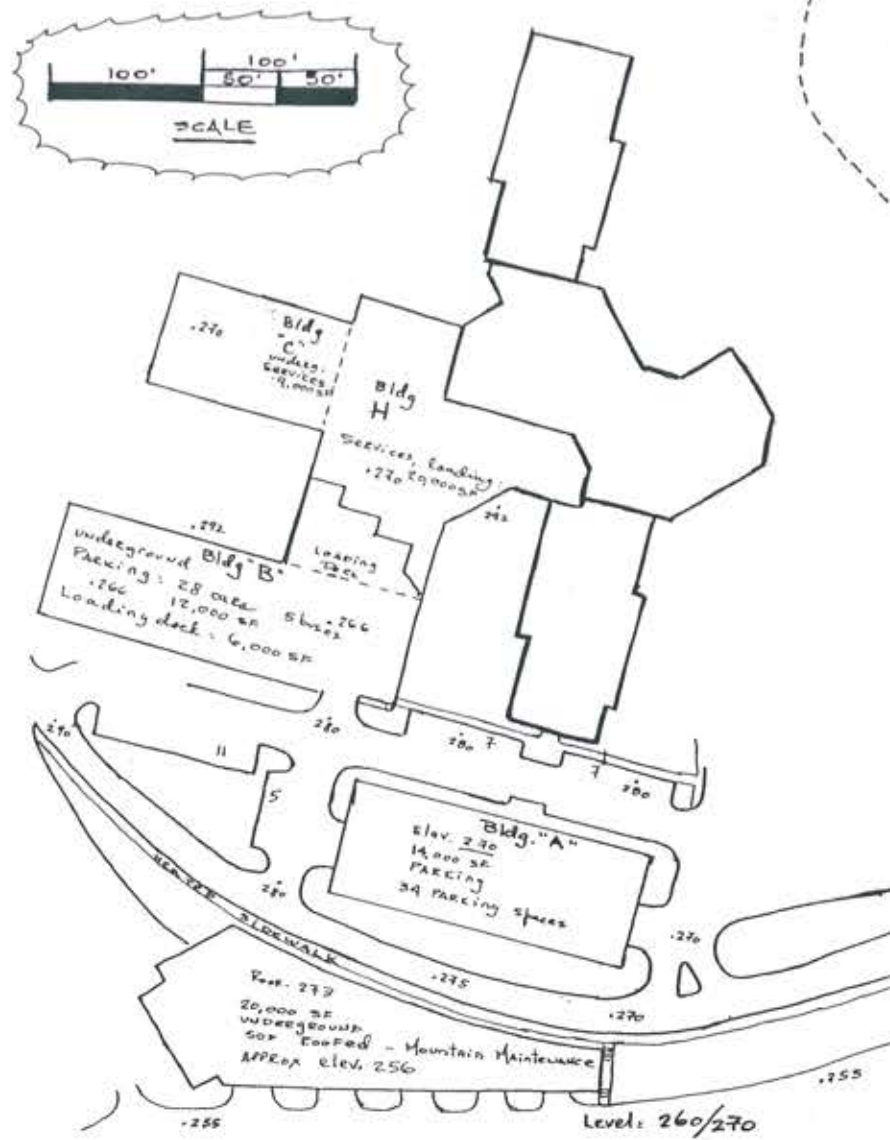
	KMG	TOTALS
Lodging Area	12,000 SF	12,000 SF
Lodging - Rooms	18	18
Lodging - Guests	36	36

Elev. 328

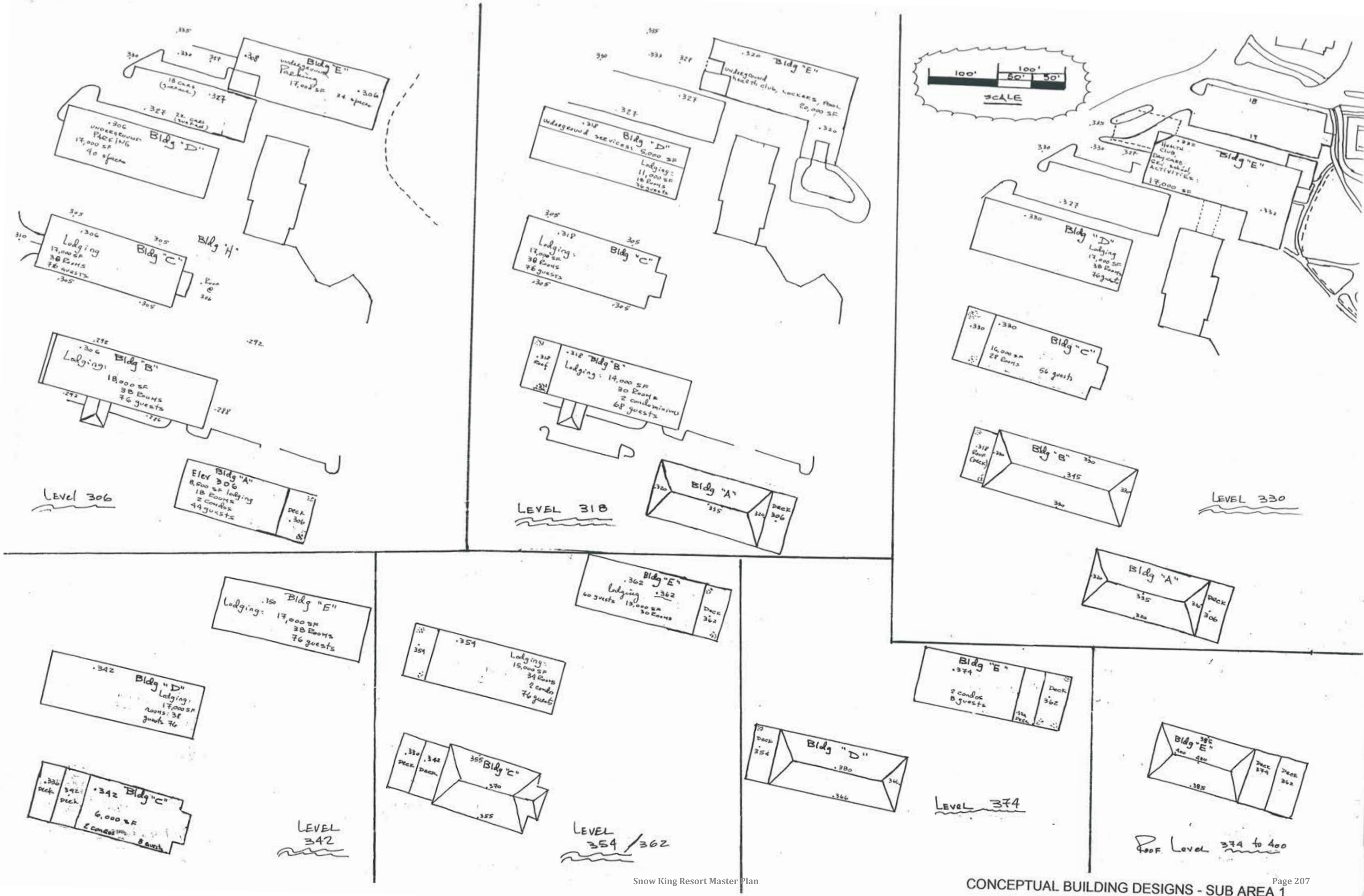


	KMG	TOTALS
Lodging Area	12,000 SF	12,000 SF
Lodging - Rooms	17	17
Lodging - Guests	34	34

CONCEPTUAL BUILDING DESIGNS - SUB AREA 2



CONCEPTUAL BUILDING DESIGNS - SUB AREA 1



Snow King
Planned Resort District
Master Plan

SNOW KING RESORT MASTER DEVELOPMENT PLAN

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AFFIDAVIT AFFECTING TITLE

Re: Snow King Planned Resort District Master Plan

COMES NOW JEANNE JACKSON, MAYOR OF THE TOWN OF JACKSON, WHO,
BEING SWORN ON HER OATH, DEPOSES AND SAYS:

That the Town of Jackson Town Council on December 18, 2000 did approve the Snow King Planned Resort District Master Plan and Conditions, attached. The Snow King Master Plan includes background information and explanations and is intended to specifically govern development at Snow King Resort.

Further your Affiant sayeth naught.

STATE OF Wyoming
COUNTY OF Teton

Jeanne Jackson

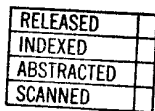
The foregoing Affidavit Affecting Title was subscribed, sworn to
acknowledged before me by JEANNE JACKSON
this 16th day of July, 2001

WITNESS my hand and official seal.



Cynthia A. Nicholson
Notary Public

My commission expires: 2/2002



Grantor: TOWN OF JACKSON
Grantee: THE PUBLIC
Doc 0547519 bk 429 pg 1-211 Filed at 07:55 on 07/19/01
Sherry L Daigle, Teton County Clerk fees: 444.50
By KIMBERLEE JANSEN Deputy

INTRODUCTION

Background

In April of 1997, the Town of Jackson and Teton County adopted specific regulations to allow for the review and approval of Planned Resort districts within each jurisdiction. The regulations, included as Division 2500 of the Town's Land Development Regulations (LDRs), outline the Purpose and Intent, Applicability, Procedure, Standing, Amendments, Expiration, Extension and Reconsideration, Standards Applying to all Planned Resorts, and Findings of Approval applicable in the Planned Resort District. In the Town of Jackson, the only Planned Resort District is the Snow King Ski and Summer Resort. Division 2500 of the Town's LDRs specifically pertains to the review of the Snow King Ski and Summer Resort located within the Town of Jackson. Thus, this Snow King Resort Master Plan has been reviewed and approved according to the procedures outlined in Division 2500 and is not be subject to the other requirements of the Town's LDRs.

This Snow King Resort Master Plan has gone through a series of Joint Town and County Planning and Zoning Commission, Town Council and Board of County Commissioners meetings and workshops prior to the submission and approval of this final document. Final approval took place on December 18, 2000.

A Text Amendment to Section 2550.M.3.b. (2) of the Jackson Land Development Regulations (LDRs) was also approved by the Town Council, and amended this section to ensure consistency between the LDRs and this master plan. Furthermore, the amendment provides clarity in regards to what square footage is included when calculating the total allowable square footage allowed in the Snow King Master Plan. The enclosed copy of Division 2500 incorporates this Amendment.

The review process of this Snow King Resort Master Plan included a thorough review of each Chapter of the plan by the Town and County Planning and Zoning Commissions. Subsequent to the comments and suggestions raised by the Commissions, the document was revised to address the identified issues. Staff made all the required findings for approval and recommended approval with conditions that have been incorporated into this final document.

At the December 13, 2000 Joint Town and County Planning and Zoning Commission meeting both Commissions forwarded a positive recommendation to Town Council on the proposed Master Plan. At their December 18, 2000 meeting, the Town Council unanimously approved this Master Plan. All the conditions for Approval that were part of the motion have been incorporated into this final document.

This Master Plan applies to all properties located within the Snow King Planned Resort District. This approved Master Plan acts as a Sketch Plan as per Section 51200 Development Plan of the Town's LDRs. Prior to commencement of construction or operation of a new land use within the Planned Resort District; each individual application will be required to obtain a Final Development Plan and Building Permit from the Town. References to Final Development Plans within this document! Refer to Intermediate and/or Major Development Plans as defined in the Town of Jackson Land Development Regulations (LDR's) Article V Division Section 51200.C.4 - Thresholds for Development Plans. Therefore, Minor Developments, as defined in the LDR's, are exempt from Final Development Plan Review. Also, any such Minor Development(s) will not trigger any of the requirements set forth within this Master Plan that are tied to a Final Development Plan application.

This Snow King Resort Master Plan addresses all the specific submittal components outlined in Section 2530.A.2 of the LDRs, which includes the following:

1. Statement of Purpose
2. Master Site Plan
3. Dimensional Limitation Plan
4. Design Guidelines
5. Transportation Demand Management Plan
6. Housing Mitigation Plan
7. Capital Improvements Plan
8. Land Use Plan
9. Phasing Plan

Chapter 1: Statement of Purpose and Existing Conditions

The LDRs state that the intent of this Chapter is to describe the rationale for the proposed resort expansion and describe the design theme for the resort. In addition, the Chapter should also describe how the resort master plan fulfills the intent of this Division 2500, as specified in Section 2510, Purpose and Intent.

This document clearly articulates the overall intent of the resort master plan and the rationale for the expansion of the resort in statements such as the following:

"A primary purpose of this Master Plan is to create a vibrant mixed-use resort complex including a multi-faceted conference/convention center and community facility for Jackson, a facility that contributes to the economy of downtown and also serves as a permeable border between the town and the mountain."

"As a community partner Snow King offers the community, through this Master Plan, limits of development predictability, preserved open space, access to forest lands, and many other positive attributes discussed in this document."

The purpose and intent as described in Section 2510 of the LDRs is further defined and clarified by this plan on pages I.A.5 and 6 with an additional twenty-four bullet points describing the purpose and intent to be achieved by the Master Plan in terms of the built environment, impacts on the community and the role the resort will play in the greater Jackson Hole area.

The second purpose of this chapter is to provide a background for the master plan by describing the existing conditions, extend of the master plan winter and summer use maps and land ownership within the subject area. This purpose has been additionally addressed through the inclusion of both written and visual descriptions of the subject property and explanation of both existing and planned resort development. This section also clarifies how the existing development already in place within the Planned Resort District is dealt with after this Master Plan was adopted.

Chapter 2: Consistent with the Comprehensive Plan

The purpose of this chapter is to ensure that the resort master plan is consistent with the goals and objectives of the Jackson/Teton County Comprehensive Plan. This document provides a clear documentation as to how the proposed plan meets the goals and objectives of the Comprehensive

Plan. Staff concurred with this document's statement that a balance between what the resort brings to the community in terms of jobs, tax revenue e, meeting space and recreational opportunities must be balanced with the associated impacts of these benefits on public infrastructure (roads, sewer and water systems, transit, etc.), and demand for employee housing. It is important to recognize that the Comprehensive Plan anticipated the growth and expansion of all resort areas in Teton County while at the same time maintaining the community character of Jackson Hole as shown in the following statements from the Comprehensive Plan:

"To support a balance of growth among residential, commercial and resort development to preserve and enhance community character."

"To manage the rate of growth in the residential, resort and commercial sec tors in a way that allows the community to change while preserving community character."

"Teton County's three ski resorts all have significant growth potential (described in Chapter 2). The resorts are obviously important to the community; they make Teton County a two season resort area and add to the quality of life for local residents."

Staff found that the proposed plan is consistent with the Comprehensive Plan by providing a well-designed and thought out plan that will be a benefit to local residents and visitors while at the same time addressing the associated impacts of the proposed expansion on the local community.

Chapter 3: Compliance with the Land Development Regulations

The LDRs in Division 2500 Planned Resort District state that an applicant for a Planned Resort master plan may propose, and the Town Council may approve, alternative standards for development that are consistent with the purpose and intent of Division 2500. In addition, Division 2500 states that it is fully consistent with the Division that Planned Resorts may have dimensional, design, and other development standards different from those described in other sections of these LDRs due to the unique circumstances of, and community objective for, resort development. Staff determined that this master plan meets the requirements for a sufficient application per Division 2500 LDRs and is thus in compliance with the LDRs. Furthermore, as described in Chapter 1: Statement of Purpose and further described in this chapter the proposed master plan is consistent with Section 2510 Purpose and Intent and Section 2150 which defines a Planned Resort District. Finally, the chapter addresses the required findings as per Section 2560 of the LDRs.

Chapter 4: Master Site Plans

The master site plans depicted in this Chapter clearly illustrate the proposed development and the site characteristics. This Chapter stresses that the backbone of the master plan is the pedestrian circulation routes that run through the resort connecting the various outdoor and indoor facilities and activities. These routes are clearly shown by the Snow King Resort Circulation, Pathways and Sidewalks Map and the Snow King Resort Vicinity Trail Network Map included in this Chapter. ~~The summer/winter master site plan clearly illustrates the location of development, vehicular and pedestrian circulation and interaction between the built and natural environment making up the resort. The inclusion of a sub-area plan is critical to show the resort in more focused and centralized areas for more detailed discussion throughout the remainder of the master plan.~~

Deleted: It is appropriate to provide two master site plans one for summer and one for winter, due to the differences in site circulation and activities at the resort depending on the season.

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Deleted: and

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Chapter 5: Land Use Plan

The intent of the land use plan is twofold. First, to identify the allowable land uses within a proposed Planned Resort. Second, to describe the amount and type of development that is to be expected as a result of the proposed master plan.

The land use designations are consistent with both the master plan's design theme and the character objectives for the resort, as specified in Chapter VI Design Guide lines of this master plan.

Various conditions for approval have been incorporated into the body of this Chapter.

This Chapter also includes a chart depicting the amount and type of development proposed in the master plan in an Example Development Chart. This proposed development example is only to be used as an example of what may be developed on site. The example development scenario is necessary in order to determine the possible impacts and required facilities and services as a result of the proposal. The proposed development example is consistent with the need for resort expansion as well as with the primary purpose of the master plan to: *"create a vibrant mixed-use resort complex including a multi-faceted conference/convention center and community facility for Jackson, a facility that contributes to the economy of downtown and also serves as a permeable border between the town and the mountain."*

Chapter 6: Design Guidelines

The intent of this Chapter is to provide design guidelines to establish standards for buildings, spaces signs and lighting within the resort district along with a mechanism for the implementation. The LDRs state that the design theme of the resort shall be defined by the applicant and be consistent with the standards of Division 2500.

Section 2540. G of the LDRs establishes seven individual criteria upon which the proposed Design Standards are to be evaluated.

The first criteria described as General in the LDRs establishes whether the proposed Guidelines will create a sense of place. The master site plan satisfies this requirement with three defined primary outdoor spaces. Each one of these locations (Entry Court, Pedestrian Plaza, Pool Courtyard) is designed for a specific function, provide connectivity between the various elements of the resort and take advantage of the natural features found in the area.

The second criteria: Architecture, is satisfied by the proposed Guidelines including sections on Building Form, Massing and Character, Roofs, Exterior Materials, Windows, Commercial Frontage, Entryway, Decks and Balconies, color and Sub-Area 2 Specific Guidelines. The description and criteria provided in these sections will provide base standards upon which individual Final Development Plans can be evaluated for consistency with the master plan.

The third criteria: Bulk and Scale, has been addressed in the Building Form, Massing and Character section of this Chapter. In addition, the Chapter VII Dimensional Limitations graphically shows the three-dimensional building envelope dimensions, Circulation Overlay Zone and Building Envelope Sections designed to control the bulk and scale of the proposed development.

The fourth and fifth criteria: signage and lighting, although addressed in the master plan, shall be further researched and approved as separate sections prior to the submission of the first Final Development Plan for the resort.

The sixth criteria: Site Planning, has been adequately addressed in the master plan in various chapters including Chapter II Master Site Plans, Chapter VI Design Guidelines, Chapter VII Dimensional Limitations Plan and Chapter IX Transportation Elements.

The seventh criteria: Character element, as per Section 2550.M, has been incorporated successfully into the proposed Design Guidelines. The resort will have a definable architectural character and site design that meets the standards identified in Section 2550.M of the LDRs for the Snow King Resort.

Chapter 7: Dimensional Limitation Plan

The intent of the proposed Dimensional Limitation Plan is to specify dimensional limitations necessary to achieve the design theme identified for the master plan. The plan includes floor areas and floor area ratios, densities, landscape ratios, height, setbacks, building envelopes, etcetera, or other lines delineating areas on which restrictions of development are to be imposed and areas in square feet for each lot or building. Any dimensional limitations unspecified by the Planned Resort master plan shall be established by the standards set forth in Section 2530.C, Other Development Options.

This Master plan accomplishes this through a method of three-dimensional building envelopes presented primarily in graphic format. The proposed three-dimensional building envelopes provides the ability to review proposed Final Development Plans against the proposed envelopes for consistency with the master plan. The building envelopes provide both height and setback requirements for the plan. In addition, standards for setbacks, open space, landscape surface area, landscape surface ratio, building floor area, lodging capacity and floor area ratio are also included as part of the master plan. The various dimensional limitation standards provided in this Chapter ensure that the proposed resort character is maintained.

Chapter 8: Housing Element

The intent of the housing element is to ensure a supply of affordable and employee housing that is commensurate to the demand for housing created by development within the Planned Resort.

The Housing Element adequately addresses the estimated demand and proposed location of employee housing required as a result of the proposed master plan.

Chapter 9: Transportation Element

The intent of the proposed transportation element is to ensure that the resort development does not produce an amount of vehicular traffic that undermines the community's character, and endangers the public health, safety and welfare (i.e. noise, air quality and traffic impacts). The Snow King Planned Resort master plan provides an optimum mix of automobile, transit and pathway facilities within the resort, encourage coordination of all resort transportation facilities with the County-wide transportation system, promote design and management which encourages shifts from single - occupancy vehicle trips to multi-occupancy trips, or other transportation modes, and provide equitable cost sharing for facilities and services.

The Traffic impact analysis adequately addresses the requirements described in Section 2540. H.1 of the LDRs. The proposed plan demonstrates how the travel behavior of resort visitors and employees will be managed to minimize the number of vehicle trips on the roadway network resulting from the resort development. Thirteen strategies are proposed that may be used to influence mode choice and reduce automobile trips as required by the plan.

The proposed shared parking analysis in combination with the proposed onsite parking will more than adequately meet the anticipated supply and demand for parking at the resort based on the example development plan. In addition, the proposed Entry Plaza planned as the vehicular hub for the resort will adequately handle the volume and wide range of vehicle types that will be utilizing the facility.

Chapter 10: Capital Improvement Plan

The intent of the capital improvements element is to ensure that infrastructure and essential services will be provided in an efficient and timely manner to accommodate projected resort demands. The capital improvements element identifies service providers, analyzes impacts and proposes a capital improvements plan for facilities and services needed by the resort.

This Masterplan accurately identified and acknowledged the necessary service providers required for the development of the proposed master plan. The impact analysis adequately meets the requirements outlined in Section 2540. 1.2.

The provided capital improvements program is consistent with the required impact analysis and clearly specifies how the deficiencies in infrastructure will be remedied or mitigated, including descriptions of the infrastructure improvements, the responsibility and sources of funding for the improvements, and the timing for completion of improvements. Concept plans for required improvements are also provided.

Chapter 11: Phasing and the Snow King Resort Master Association

The intent of the phasing element is to ensure that development within the resort occurs in a logical sequence, including amenities and necessary public service expansions. The resort is required to not only provide the necessary improvements and services as a result of the resort expansion, they are also responsible for the monitoring and long-term maintenance and replacement of all facilities, both on and off site.

The proposal to have all responsibilities for the phasing plan and implementation of the master plan be controlled by the Snow King Master Association (SKRMA) meets this requirement. This Association will be able to implement, control and monitor the required improvements and services required as part of this master plan. Detailed descriptions of the duties of this Association are described in this chapter.

Chapter 12: Community Services Element

The Snow King Resort has long played an important role in the community, providing facilities and recreational opportunities to both out of town visitors and the local community. Snow King is utilized as the primary conference/meeting room facility in the Town of Jackson. The Snow King

area provides an abundant array of recreational opportunities both summer and winter from hiking, mountain biking, and the alpine slide ride to skiing, tubing and ice skating.

Conditions of Approval

When the Jackson Town Council approved this Master Plan certain conditions were incorporated into the approval. Most of them are incorporated into the body of the various Chapters of this Master Plan. Other conditions that were part of the approval are:

- All Final Development Plans shall include a detailed Landscape Plan for the review and approval by the Town.
- A detailed signage program for the entire resort will be prepared by the resort and reviewed and approved by the Planning Director prior to the first Final Development Plan application.
- A detailed exterior lighting program for the resort will be prepared by the applicant and reviewed and approved by the Planning Director prior to the first Final Development Plan application.
- The applicant shall provide an employee housing requirement for Indoor/Outdoor Recreational Facilities to be and reviewed and approved by the Planning Director prior to the first Final Development Plan Application.
- The applicant shall be required to implement a minimum of two and a maximum of all thirteen proposed Transportation Demand Management strategies in order to meet the goals as described in the Transportation Element of this Master Plan.
- The applicant shall be required to implement the Travel Demand Management Monitoring System as described in the Transportation Element of this MasterPlan.
- The applicant shall be required to update the proposed shared parking analysis provided as part of the Transportation Element upon substantial completion of this Master Plan to ensure that the Example Development scenario used to develop the original analysis is working.
- The Capital Improvements Plan and other Chapters of this Master Plan include conditions of approval that were part of the approval of this Master Plan.
- The horizontal and vertical Building envelopes fronting Snow King Avenue have been revised in this final version of this Master Plan to comply with condition #28 of the Master Plan approval concerning the human scale aspect of Sub-Area 2 adjacent to the public thoroughfare.
- This Final Version of this Master Plan incorporates all the conditions that were part of the Town Council's approval and is the complete Final Version of the Snow King Master Development Plan as approved by the Jackson Town Council on December 18, 2000.

STATEMENT OF PURPOSE

Snow King has been a community resource and a community partner for over 60 years. This Master Plan presents a well-balanced next-generation vision of this partnership.

As stated in Section 2530 A.1, the purpose of this Planned Resort Master Plan is to *establish the development standards and serve as a guide to all future development within the Planned Resort. The Planned Resort Master Plan is intended to be of sufficient detail to describe the amount, type, size, location and impact of the proposed resort, but technical specifications of the proposed development, such as engineered plans or fully engineered plans or fully detailed architectural drawings are not required.*

Although sometimes repetitive, this Master Plan is consistent with the Comprehensive Plan, complies with the Land Development Regulations and adheres to all the procedures and standards of Division 2500 of the Land Development Regulations. The Goals, Objectives and Criteria listed in this Statement of Purpose are the guiding principles of this Master Plan.

Prologue

From a bird's eye view, the Town of Jackson is nestled into a narrow space between the Elk Refuge and the mountains, built at the fork of Cache Creek and Flat Creek and extending along the creeks at the foot of the mountains. The Town Square is at the center of this unique topography. The quality that makes the Town of Jackson attractive is the way in which it fits into this topography so that human habitation is seen as a natural part of the much larger landscape.

Snow King Resort, now and when developed as proposed in this Master Plan, aims to be an extension of this defining quality of the town of Jackson. As the border between the town and the mountains, Snow King "fits into the country" and it completes and compliments the downtown core.

As a blend between a visitor-serving resort and a community-serving facility, Snow King is a place where local residents and visitors share space comfortably. This proposed development is consistent with the traditional style of Jackson Hole hospitality: Snow King Resort invites visitors to join right in, relax and take part in the life of a unique community.

A primary purpose of this Master Plan is to create a vibrant mixed-use resort complex including a multi-faceted conference/convention center and community facility for Jackson, a facility that contributes to the economy of downtown and also serves as a permeable border between the town and the mountain.

Access to public lands (US Forest Service) from town through our private land in a seamless transition has always been a priority at Snow King. In fact, so unnoticeable is this transition that most people do not realize that they are entering private property. This tradition is intended to continue.

Among the stated purposes and intent of the resort district, as stated in the Land Development Regulations and the Comprehensive Plan, is to provide recreational opportunities that rely on indigenous natural attributes of the area. These opportunities are provided to both the community and the visitor through the development of Snow King's resort facilities. Snow King has provided the Town of Jackson, and the community at large, with in-town recreational facilities since 1939.

The ski area provides a venue for the junior ski racing programs, adult ski racing as well as recreational skiing and snowboarding, both day and night. During the summer the area provides a trail system, which has become a staple hiking, running, biking and riding area for residents and visitors alike. In turn other resort facilities and on mountain activities provide the financial and operational platform, which support and provide the ability to maintain and expand these recreational opportunities to both valley residents and visitors.

This Snow King Planned Resort Master Development Plan establishes the development standards and serves as a guide to all future development within the Snow King Planned Resort District. This Planned Development document represents a carefully balanced and well thought out development plans for the properties, it is organized in a clear manner responding to each Section of Division 2500 of the Land Development Regulations and is intended to expand on prior foundations through a collaborative plan, design and approval process between Snow King, the Town of Jackson and Teton County. This foundation is defined in the Land Development Regulations and is consistent with prior approvals dating back to 1972 and with prior presentations approved under the Complete Neighborhood provisions of the old Town of Jackson Development Guidelines.

Since the first chair lift was built in 1939, Snow King has been a community resource and a community partner. When the hotel opened in 1976, Snow King Resort opened its doors to a great variety of community meetings and events. Snow King has pioneered innovative relationships with the U.S. Forest Service, with the Town of Jackson and with many community organizations such as the Teton County Parks and Recreation Department, the Jackson Hole Ski Club, the Jaycees and many other community organizations. Virtually every non-profit organization in Teton County uses Snow King facilities to bring people together. Many local people regularly use Snow King's hiking and skiing trails as well.

Snow King Resort has, for years, been one of the largest employers in the Town and County. Among the large employers, we pride ourselves in maintaining a very stable level of employment throughout the year.

A very important consideration in this plan is to develop the property with porous edges and inviting corridors that allow circulation to the National Forest lands from the Town. It also considers the property as a bridge connecting the East and West ends of the Town via trails and pathways. Rather than stand out at the base, Snow King Resort melts into the mountain.

As owners of the largest contiguous land parcels with in the Town of Jackson, we have planned and given a great deal of thought to the future development of these lands. We have also proven our slow and careful approach to development. As a community partner Snow King offers the community, through this Master Plan, limits of development, predictability, preserved open space, access to forestlands, and many other positive attributes discussed in this document. Additionally, Snow King is operationally integrated in the community. As resort operators we differ from the standard sub - division developer since we continue to operate the product of our construction/development phase providing assurances of ongoing responsibility to the community.

In addition to the recreational facilities, the Snow King Resort Hotel has provided the largest year round meeting and conference facilities in the county since 1976.

Deleted: The heart of our lodging business is meetings and conferences, and as such the proposed new Conference Center is located in the center of our complex.

Within the resort core all buildings are interconnected by indoor and outdoor circulation corridors alleviating the need for guest and visitors to drive to services. Pedestrian and shuttle connections are planned to be developed and improved to connect the Multi Agency Campus, Town Square and Snow King. This Master Plan also encourages East/West and North/South pedestrian connections that complement the fabric of the Town and connect it to its mountain roots.

Functionally, visitors will be able to step out of our meeting rooms directly into the mountain environment. The pedestrian circulation system links the Resort to the mountain on both the north/south and the east/west axis so that Resort use is an integrated part of the mountain trail system. Outdoor recreation is the defining characteristic and largest land use of Snow King Resort summer and winter.

On the Town side, the entire downtown core is viewed as part of the resort in the sense that downtown amenities complement the convention facilities and lodging located on our site. Downtown shops and restaurants will be part of the immediate visitor experience, with both transit and pedestrian pathways linking Snow King to the Town Square conveniently.

The proposed development also blends sensitively with the adjacent residential neighborhood, as lodging facilities are bordered by condominiums and employee housing as a buffer for the residential neighborhood to the north and east. In addition, the Resort intends to provide an attractive Cache Street terminus that marks the end of the commercial development of the downtown core and the beginning of the residential neighborhood to the west.

Scale and Type of Development

An objective of this Master Plan is to develop a high-intensity resort node of development, which is compatible with its location and with its crucial relationship with downtown Jackson. The size and character of the proposed development is appropriate to its position as the center for year-round recreational, conference and resort activities within the Town of Jackson for both residents and visitors.

On the mountainside of the Town/Forest border defined by Snow King Resort, the proposed development blends into the contours of the mountain both physically and functionally. The buildings take advantage of the complex contours at the base of the mountain. The scale and shape of the mountain will make these structures appear modest. The Design Guidelines Chapter addresses how large structures such as the existing hotel and the Snow King Center and future additions fit into the topography.

The regulations set forth four basic considerations for establishing the amount and type of development: (1) rationale and character objectives for the resort area; (2) overall development which can be permitted while preserving community character; (3) infrastructure capacity; and (4) resort self-sufficiency to minimize vehicle trips.

The first two issues are discussed in the context of consistency with the Comprehensive Plan, the Land Development Regulations and the Design Guidelines. The issue of infrastructure capacity is discussed as part of the Capital Facilities Element. The issue of resort self-sufficiency is generally

Deleted: Jackson has long wanted a full-service, year-round convention center to complete its array of visitor services. This proposed Master Plan provides just such a convention center in a manner that will benefit the entire downtown area.

not applicable since the intention of this Master Plan is to be integrated with the down town area. However, the proposed uses do provide basic conveniences and amenities needed by on-site guests and conference center users. Land uses and intensity are consistent with the Land Development Regulations.

The proposed maximum scale of development is in keeping with Division 2500. Three-dimensional building envelopes and design guidelines are used to provide a level of predictability. These physical parameters, in concert with the intensity of use thresholds, allow this document to provide long range planning for infrastructure, capital facilities and community land use patterns. These predictions should enable the Town and the resort to equitably share responsibility for future infrastructure and capital facility improvements.

Goals and Objectives

Section 2510 of the Town of Jackson Land Development Regulations state that *the purpose of the Planned Resort District Standards is to provide and guide the creation or continuation of a planned development around a major recreational facility. The intent of this District is to:*

- A. *Encourage recreational activities that rely on indigenous natural attributes of the area, contribute to the community's character and economy and have had a long-standing, beneficial role in the community; and*
- B. *Provide flexibility for planning and developing recreational resort facilities in a creative, efficient and coordinated manner in order to provide quality visitor experiences; and*
- C. *Create a process in which applicants, Teton County and the Town of Jackson collaborate with landowners in planning and designing resort master plans that meet community goals and respond to the unique circumstances of the resort area; and*
- D. *Permit resort development that contributes to expanding the winter and shoulder economic seasons; and*
- E. *Ensure that resort plans incorporate a mix of land uses, promote alternative modes of transportation, and provide a pedestrian-oriented community in order to alleviate traffic related impacts; and*
- F. *Ensure resort plans are consistent with the Comprehensive Plan, and therefore, are beneficial to the community; and*
- G. *Enable long-range planning for infrastructure, capital facilities, and community land use patterns by establishing a level of predictability in the maximum potential size and character of each resort area; and*
- H. *Ensure a balance is maintained between tourism and community that promotes social diversity but does not cause undesired shifts away from rural, western community character; and*
- I. *Produce resort plans that make significant contributions toward protecting attributes of the community that are considered critical to the community's long-term health, welfare, and wellbeing.*

The Town of Jackson LDR 's also state that the Objectives of the Planned Resort District is:

To be a mixed-use district configured around a resort complex. Resorts are to be well balanced they are to provide tourist accommodations as well as seasonal and year-round housing. The design of resorts is to be compatible with adjoining areas and is to be connected to the community at large by roads, transit and pathways. A portion of the resort workforce, particularly seasonal employees of hotels and restaurants are to be able to find housing within the resort district. Commercial development is to provide both tourist and local convenience shopping opportunities as appropriate.

Division 2500 includes the following factors and resort characteristics that are important in Snow King's future development:

Capitalization on the location at the terminus of Snow King Avenue.

Creation of a sense of arrival.

Creation of an active, attractive, pedestrian streetscape along the eastern end of Snow King Avenue.

An attractive, safe and direct pedestrian streetscape connection to the Town Square.

A layout that blends the edges of the resort into neighboring developments, creating a porous edge to the resort that encourages pedestrian travel into and through the area.

Structure sizes and layout that draw people into the resort area.

A continuity of architecture and activities within the resort, creating a multi-use sense of place.

Pathways throughout the resort and connections to the Jackson Hole pathways system.

Continued provision of the amenities of "town hill" skiing.

All of these factors and characteristics are discussed and considered in detail throughout this Master Plan.

This Master Plan endorses and complies with all the above Goals and Objectives and adds this additional criterion:

- Create a vibrant year-round district in a unique resort-oriented urban commercial environment, serving both visitors and residents.
- Maintain and enhance access to public lands through private lands in a seamless transition. Preserve open space, ski runs and extend existing Town parks into the mountain.
- One dominant central hotel oriented towards conferences and meetings without lying accommodations of various types.
- Create meaningful outdoor activity areas that relate to both buildings and open space considering long vistas, and within a comfortable urban pedestrian framework.
- Solidify Snow King's role as the main convention and conference facility in the community.
- Create East/West trail networks that interconnect with other trails leading from Town up the mountain.
- Frame the access to the mountain West of the Snow King Center with a companion building, [One Town Hill](#).
- Locate services and parking underground, wherever feasible, within a comfortable walking distance of destination, while creating building facades that conceal these uses.
- Separate service/delivery areas from the guest areas of the resort.
- Careful use of density to reduce the need for transportation within the district and from Snow King to the Town Square area.

Deleted: Pine Lodge

- Create a Sense of Arrival at the Resort convenient for both visitors and local guests and with sufficient space for various concurrent functions and with clearly visible key destination points.
- Balancing activities to create an efficient distribution of usage throughout the day and the year.
- Create a festive resort-like atmosphere, with a variety of eating and recreational experiences. Lively all seasons.
- Integration into the town's fabric in a non-competitive symbiotic commercial relationship to downtown. Commercial areas should act as adjuncts to recreation, lodging and conference facilities.
- Community oriented Resort and Conference Center with a variety of year-round recreational activities and amenities for visitors and residents, achieving sufficient volumes of pedestrian circulation to create vibrant public spaces.
- Within the resort, pedestrian, bicycle and skier circulation shall be encouraged through the use of a pathways system. Pathways will be integrated into the resort and the Town's fabric and segregated, as much as possible from automobile circulation. The overall plan will be pedestrian friendly.
- Planning with landscape scenic values in mind.
- Design guidelines that enhance the natural attributes of the site and encourage architectural by distinctive design.
- Encourage design diversity with common themes.
- Create a Pedestrian Plaza from the hotel to the Snow King Center with porous building edges.
- Maintain the appearance of a resort set at the edge of town with public access through it to the National Forest Service land. Keeping a sense of connection to the mountains.
- Intercept as much vehicular traffic as possible at or near the Resort's entrance.

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Submittal Components

This Snow King Planned Resort Master Plan document considers, addresses and ultimately assists in achieving these Goals and Objectives, while taking advantage of the unique characteristics of the site.

When considered as whole, the Master Site Plans, Land Use Plan, Design Guidelines and Dimensional Limitation Plan provide a clear vision of the visual and physical character of the resort.

Other components such as the Housing, Transportation, Capital Improvements, Phasing and Community Service Elements address the impacts and remedies associated with the development of the Resort.

Various Chapters of this Master Plan identify, address and respond to all the requirements of Division 2500 in a clear, complete and comprehensive manner.

Introduction to Existing Conditions and Vicinity Maps

This chapter of the Snow King Master Plan defines the existing conditions within the Snow King Resort District (PRD) and its immediate neighborhood. The maps are designed to provide distinct information and to assist in the familiarization process as well as providing reference information with respect to the later chapters. The first three maps provide information about the current zoning in the Snow King Planned Resort District (PRD) vicinity, and the current status of the built environment at Snow King Resort. The fourth map builds upon the existing conditions by including the approved, and presently being built, Love Ridge Lodge Homes project. The fifth map in this section indicates the extent of this Master Plan.

The "Extent of the Master Plan" excludes areas within the PRD that have been previously developed and exist as separate subdivisions. They include the Pitchfork, Grand Vista, Clark's Knoll and Remington Condominiums as well as the Stevens' project. The "guest (APO) count" allocated to these mostly existing developments (252) has been deducted from the maximum lodging capacity authorized in the District (2,460 guests), netting a maximum lodging capacity available for this Master Plan of 2,208 guests (APO).

The next map in this chapter is the Land Ownership Map that indicates the mosaic of private owners, as well as US Forest Service and Town of Jackson parcels, which comprise the base of the resort.

All the owners within the Master Plan Area (Extent of Master Plan) have agreed to this submission and are presenting this Master Plan jointly. Property owners within the "Existing Condominiums Areas" are participating to a limited extent since most development on these parcels has already occurred. The "Statement Regarding Existing Condominiums" details the development permitted within the Existing Condominium Areas.

The Extent of this Master Plan is therefore limited to a 62,364-Acre area, all within the PRD district. This area has been divided, for presentation purposes, into 5 Sub-Areas defined in the "Sub-Area Plan". These Sub-Areas are used for presenting the Master Plan into better manageable components.

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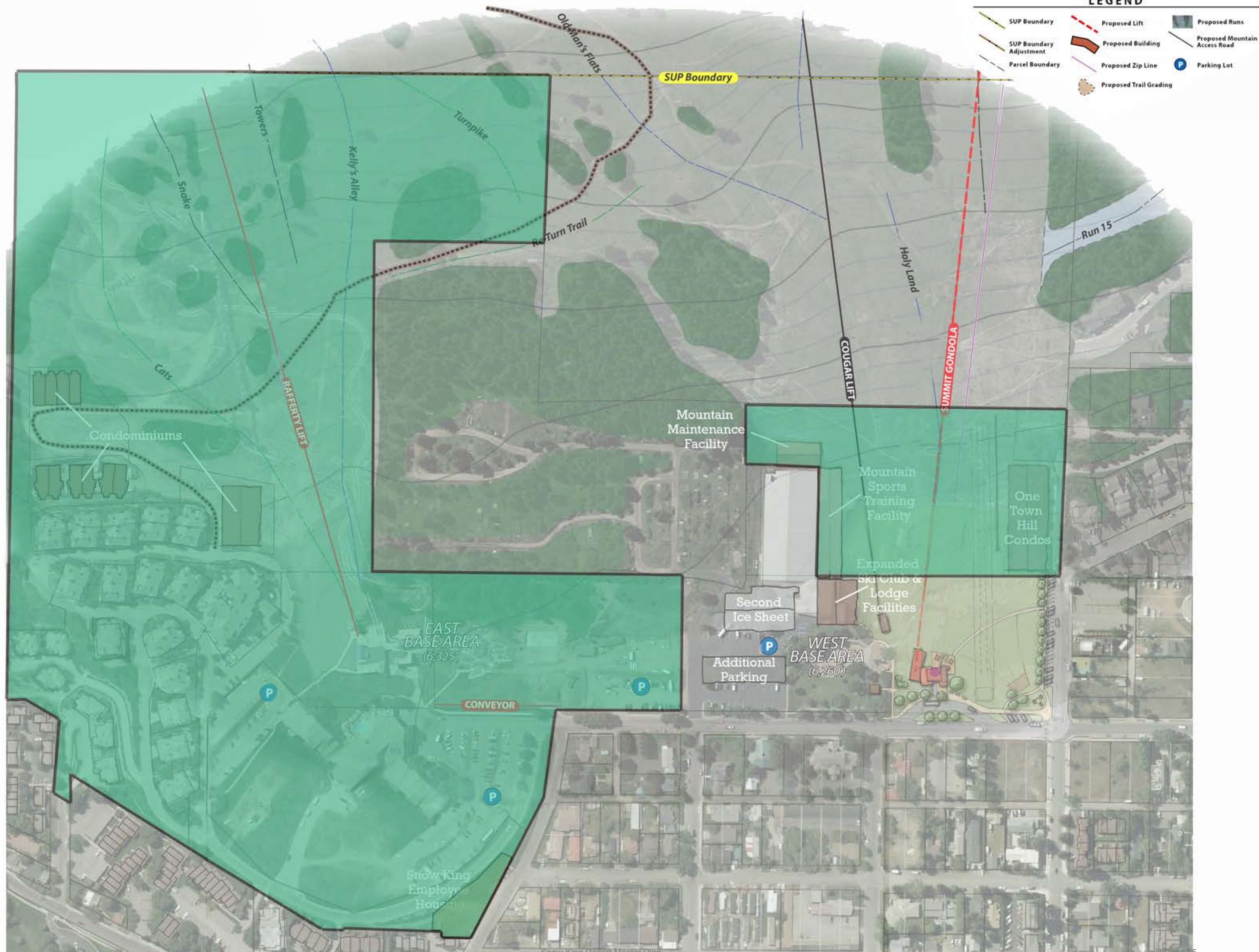
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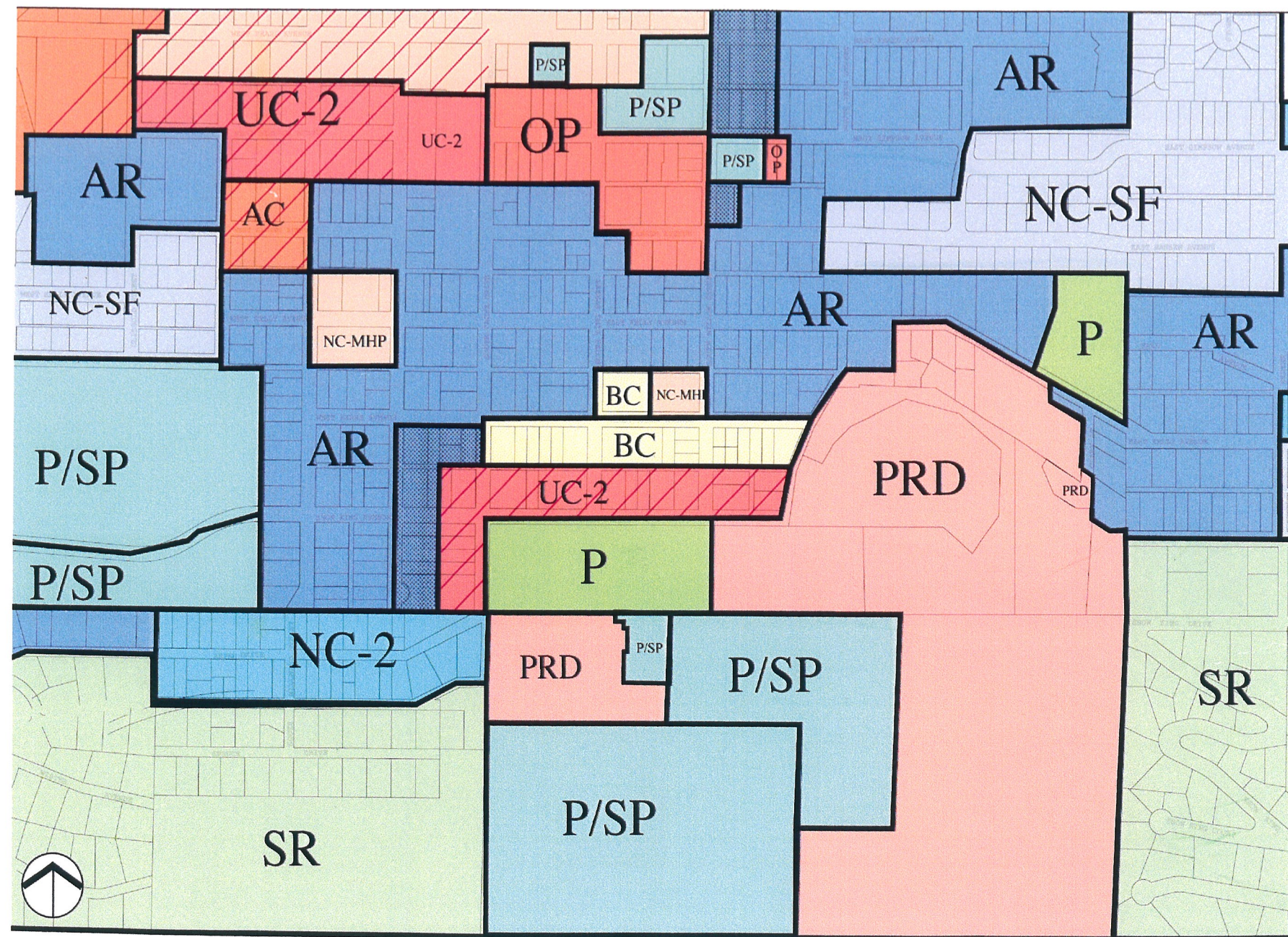
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Extent of This Master Plan





D. Neighborhood Zoning Map

AC	Auto-Urban Commercial
AR	Auto-Urban Residential
BC	Business Conservation
NC-2	Neighborhood Conservation - Two Family
NC-MHP	Neighborhood Conservation - Mobile Home Park
NC-SF	Neighborhood Conservation - Single Family
OP	Office Professional
P	Public Park
P/SP	Public / Semi-Public
PRD	Planned Resort District
SR	Suburban Residential
PRD	Planned Resort District
SR	Suburban Residential
UC-2	Urban Commercial - Two

	Lodging Overlay
	Office Overlay



E. Existing Conditions Map

This Plan reflects the Snow King Resort Area as it is in its present state. Structures Include:

- The Snow King Resort Hotel
- The Grand View Lodge Conference Center
- The Snow King Sports and Event Center
- Grand View and Love Ridge Condos
- Rafferty Center

Major Site Features include:

- Snow King Ball Park
- Phil Baux Park
- Rafferty, Cougar, and Summit Ski Lifts
- Alpine Slide, Mountain Coaster
- Miniature Golf, and Maze



E. Existing Conditions Plus Approved Plan

This Plan reflects the existing Snow King Resort Area with the addition of the approved KM6 and Snow King Hotel Development. Included in the approved development are:

- Proposed buildings A-E of the Snow King Hotel.
- Proposed conference center, commercial development, and housing on the KM6 parcel.
- Pine Lodge development now known as One Town Hill condominiums.
- Storage facility behind ice rink.
- Mid-mountain lodge, accessory buildings, and pavillion.
- Condominium building 27 located on lot 58 above Grand View Condominiums.
- Mountain maintenance facility located on Vine Street.
- Cabins located on lots 53 and 57 above Grand View condominiums.

I. G. Extent of This Master Plan

The previous map, I.G., indicates the extent of area in the Snow King Planned Resort District area that is pursuant to this Master Plan. This map differs from the "Extent of the PRD" map, J.B., because it excludes the "Existing Condominium Areas" (Parcels 2- A, 2- B, 2-C, 2-D and 2-E). For planning purposes, the remaining 62.364 Acres has been subdivided into five Sub-Areas. These areas are described on page IV D., SUB-AREA PLAN. Extent of This Master Plan• Sub-Areas 1-5

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I. H. 2. Statement Regarding Existing Condominiums

The following projects, have a limited part in this Master Plan presentation:

- Pitchfork Townhomes
- Grand Vista Townhouses
- Remington Townhomes
- Stevens Property
- Clark's Knoll Townhouses

Deleted: all located in Sub-Area 7,

These projects encompass a total of approximately 4.85 acres and can accommodate a maximum of 252 guests. These 252 guests reduce the maximum lodging capacity remaining in the balance of the Snow King Planned Resort District to 2,208 (2,460 - 252 = 2,208). Legal descriptions of the parcels encompassing these projects are attached in the Addendum Section.

The Pitchfork, Clark's Knoll and Grand Vista projects were constructed from 1990 through 1996 and are expected to remain as they are regarding dimensional limitations, parking and impervious surfaces.

The Remington and Stevens properties are not completely built-out and have been assigned 20 and 24 guests respectively.

- Units within all these projects can be rented for short-term purposes.
- The Remington project is allowed a maximum 20 guests (APO's) and therefore is allowed to build an additional unit sized similarly to the 4 existing units.
- The Stevens lot is allowed a maximum of 24 guests (APO's) and 9600 SF of livable space.
- The Remington lot has been built with one employee unit and will remain so.
- The Stevens lot will need to provide its own employee unit or make an arrangement for compliance with the Housing Mitigation Plan for the Snow King Planned Resort District.
- Any redevelopment may not exceed these maximum Floor Areas

-Pitchfork	95,200 SF	-Grand Vista	6,800 SF
-Clark's Knoll	44,000 SF	-Stevens	9,600 SF
-Remington	9,400 SF		

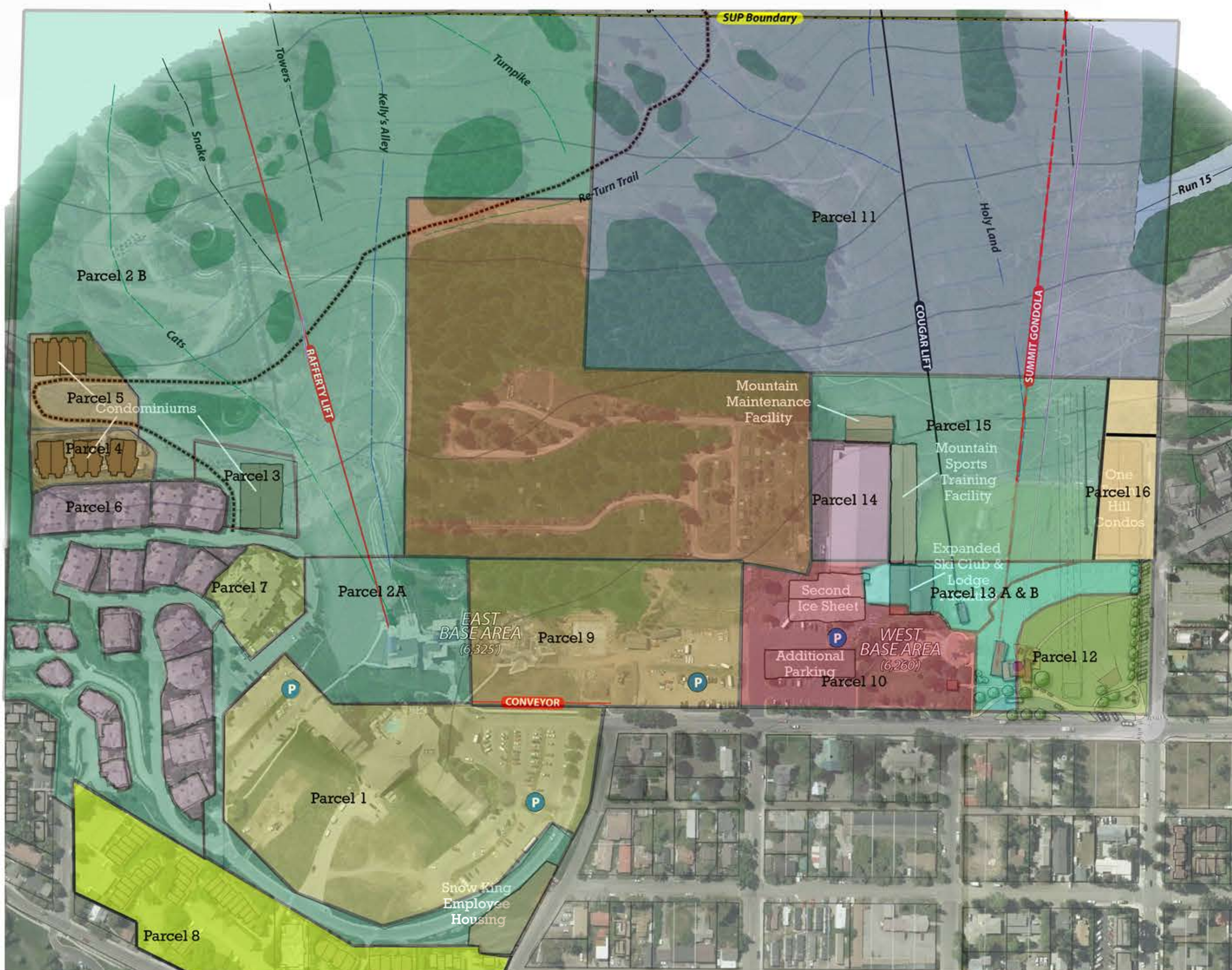
and cannot exceed the # of guests assigned in the table below.

All applicable sections of the Town of Jackson Land Development Regulations, including but not limited to, parking, employee housing, landscape ratios, height restrictions and impervious surface ratios, apply to any redevelopment that may occur within [these developments](#). The Town of Jackson under Section 2530 shall review all these properties after approval of this Master Plan.

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	Pitchfork	Clark's Knoll	Grand Vista	Stevens	Remington	TOTALS
Condominium Units #	30	19	3	6	5	63
Doors#	48	19	3	12	10	92
Guests#	120	76	12	24	20	252
Site Area - Acres	2.8	1.3	0.2	0.28	0.27	4.85 Acres
Site Area - SF	122,000	56,400	8,700	12,300	12,000	211,400 SF
Parking Spaces - #	60	38	6	16	10	130
Employee Units - #				As needed	1 (2Bdnn)	



I. Land Ownership

This map indicates the private and public land ownership in the Snow King Area. The Parcels owned by Snow King Mountain Resort LLC, JMIR Snow King LLC, KM6 LLC, CCC's Town Hill Lofts LLC, ABSK LLC, and privately owned condominiums pertain to this Master Plan. These parcels are:

JMIR Snow King LLC:

- Parcel 1 8.29 Acres
- Parcel 7 (Grand View Lodge Commercial)

Snow King Mountain Resort LLC:

- Parcel 2A & 2B 35.2 Acres
- Parcel 3 .83 Acres
- Parcel 15 5.2 Acres

KM6 LLC:

- Parcel 9 4.92 Acres

ABSK LLC:

- Parcels 4 & 5 1.89 Acres

CCC's Town Hill Lofts LLC:

- Parcel 16 1.3 Acres

Privately owned condos at Grand View, Love Ridge, and Simpson Patent:

- Parcel 6 4.73 Acres

Total Extent of this Master Plan 62.364 Acres

Legal description of these parcels can be found on the Teton County Map Server.

Other Parcels within the PRD:

Existing Condominium Areas:

- Parcel 8 4.85 Acres

See: Statement Regarding Existing Condominiums

Other Parcels presented here, although not part of this Master Plan:

Parcels owned by Town of Jackson under lease to Snow King Mountain Resort LLC

- Parcels 11, 13 A & B, and Parcel 12 in winter only
- Approximately 32 Acres.

USDA Forest Service Special Use Permit

Issued to Snow King Mountain Resort LLC - 369.51 Acres

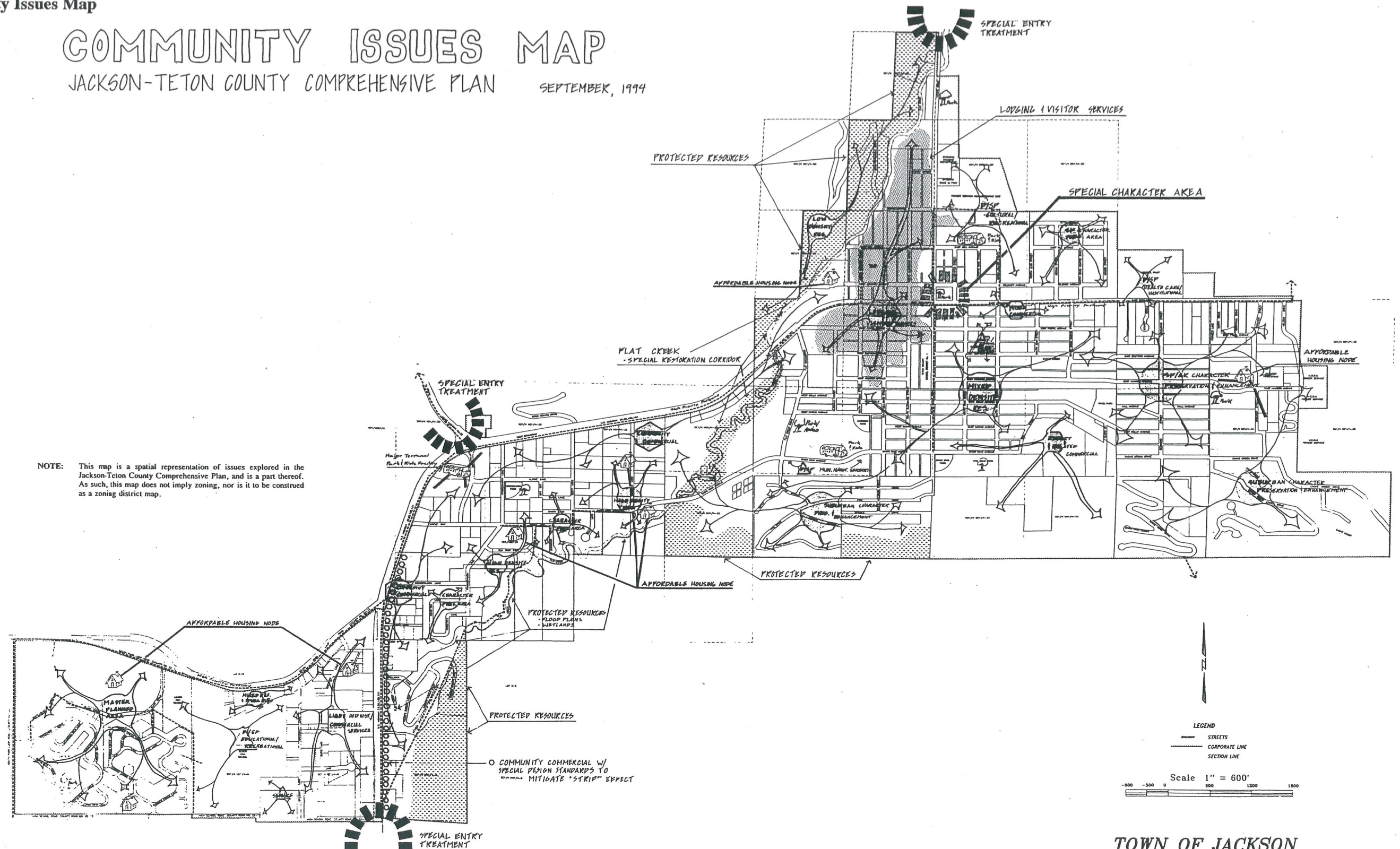
I. Community Issues Map

COMMUNITY ISSUES MAP

JACKSON-TETON COUNTY COMPREHENSIVE PLAN

SEPTEMBER, 1994

NOTE: This map is a spatial representation of issues explored in the Jackson-Teton County Comprehensive Plan, and is a part thereof. As such, this map does not imply zoning, nor is it to be construed as a zoning district map.



TOWN OF JACKSON
TETON COUNTY, WYOMING

I. J
Page 25

COMMUNITY ISSUES MAP

Trail Improvement Program
Snowking/ Cache Creek
(see Scoping Document of May 12, 1998 by Jackson
Ranger District, Bridger-Teton NF)

1"=1200'

ORTHO PHOTO
USGS-1976

TOPOGRAPHY
NELSON
ENGINEERING
HORIZONS FILE
4-1853

Prepared:
August 18, 1998

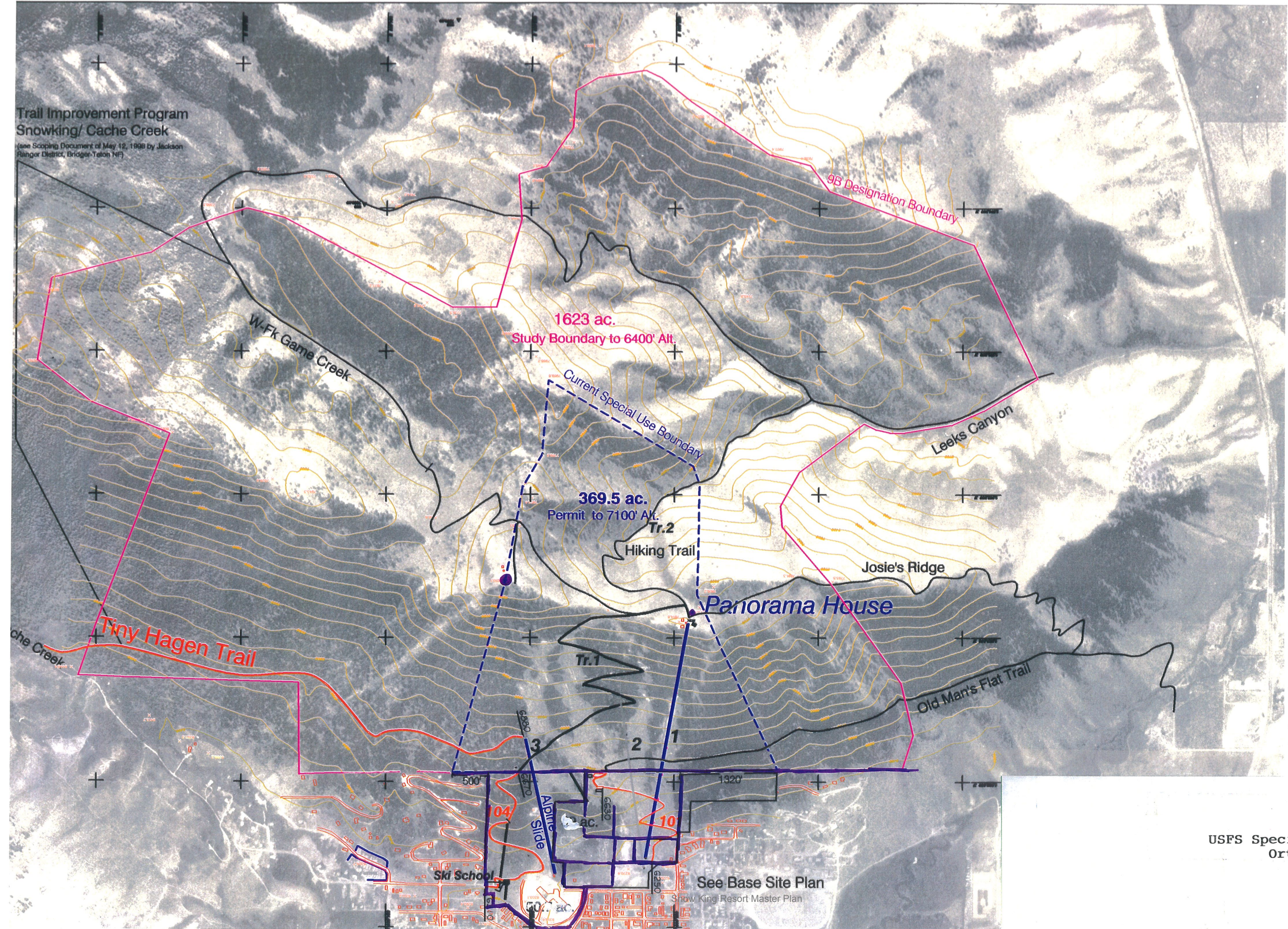


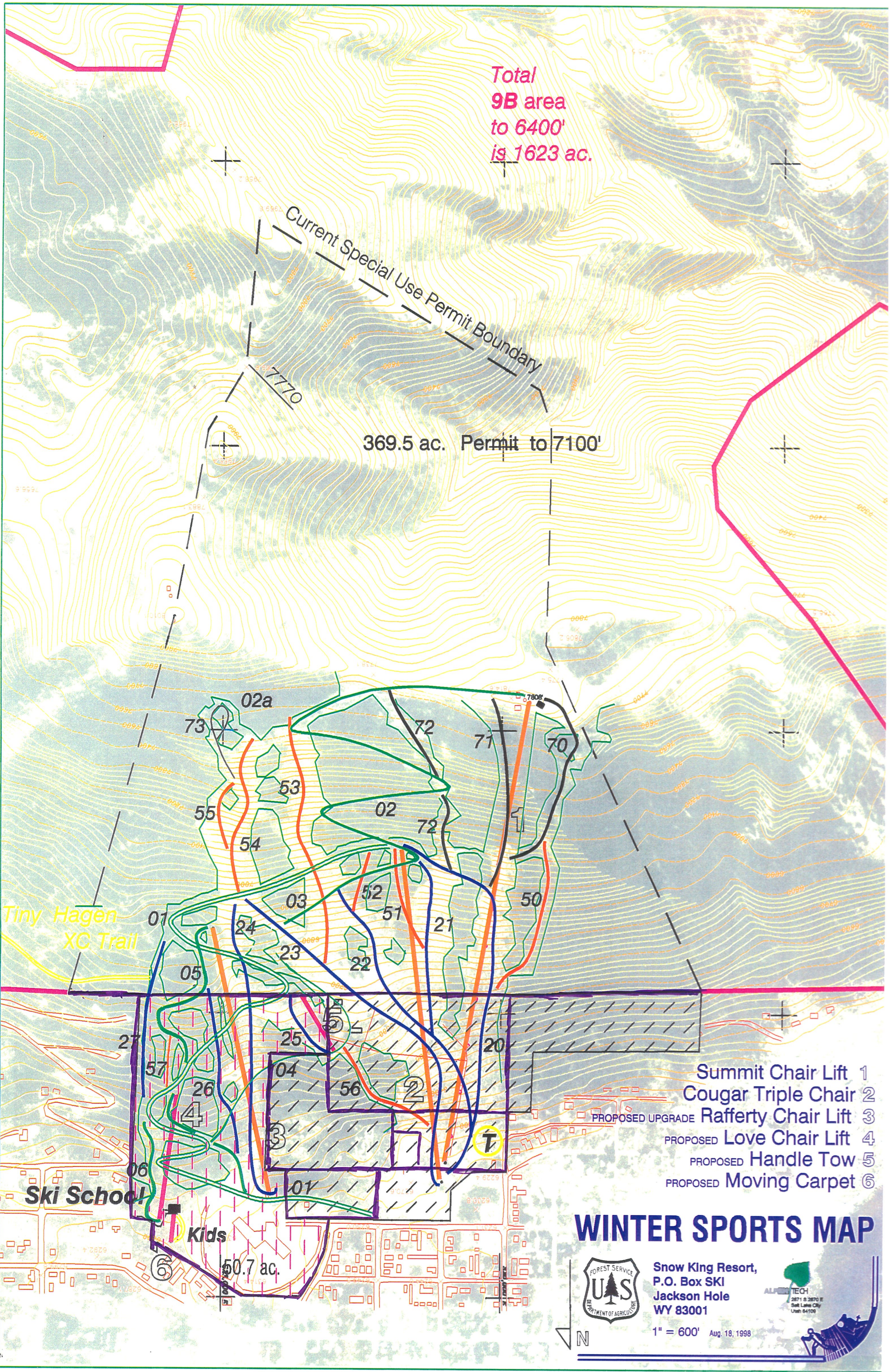
Salt Lake City, Utah

SUMMER
USE,
MOUNTAIN
Snow King
Resort

Box SKI
Jackson Hole
WY. 83001

USFS Special Use Permit Area
Ortho Photo





Total
9B area
to 6400'
is 1623 ac.

Current Special Use Permit Boundary

369.5 ac. Permit to 7100'

Tiny Hagen
XC Trail

Ski School

Kids

50.7 ac.

- Summit Chair Lift 1
- Cougar Triple Chair 2
- PROPOSED Upgrade Rafferty Chair Lift 3
- PROPOSED Love Chair Lift 4
- PROPOSED Handle Tow 5
- PROPOSED Moving Carpet 6

WINTER SPORTS MAP

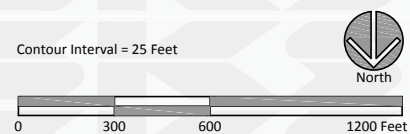


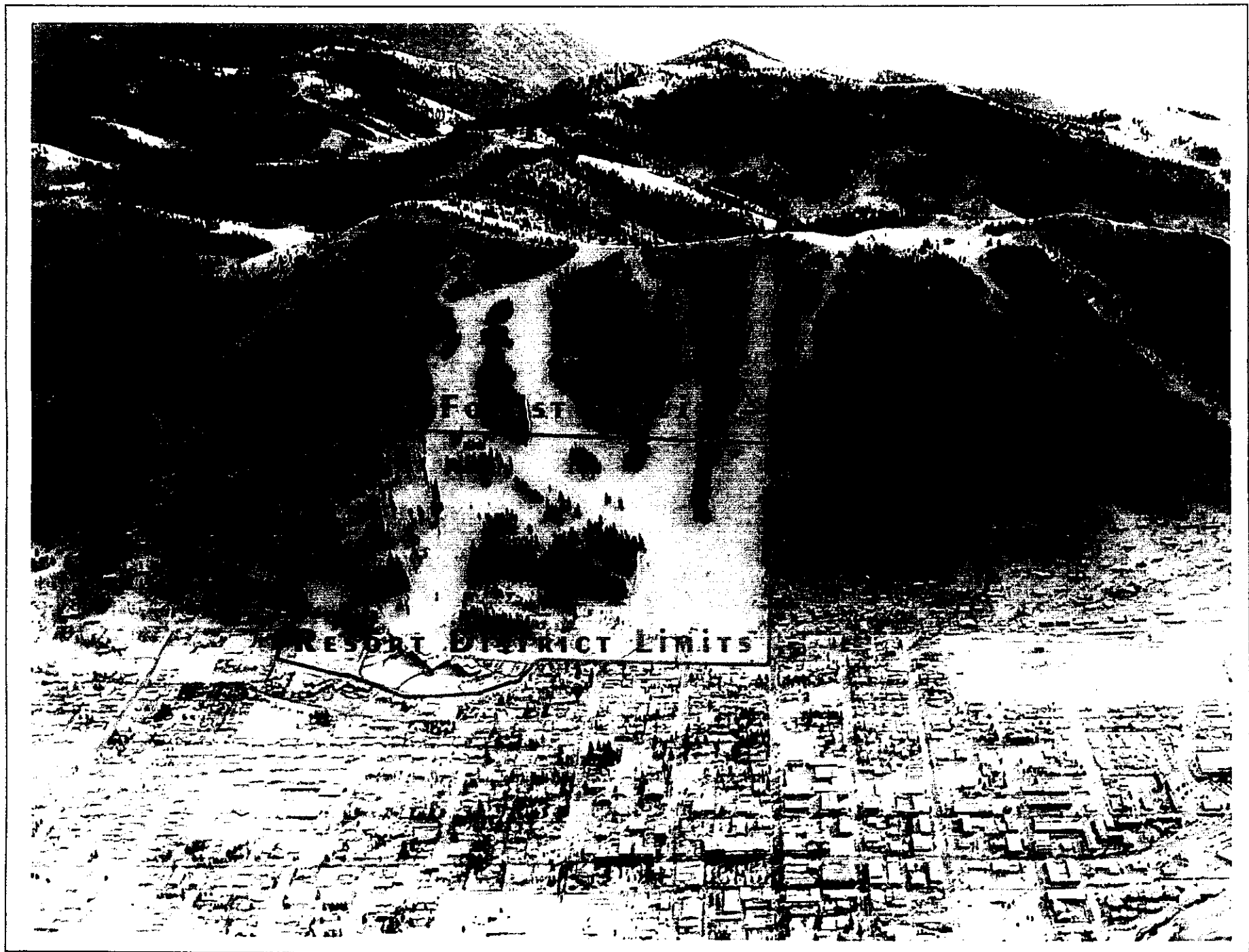
Snow King Resort,
P.O. Box SKI
Jackson Hole
WY 83001



1" = 600' Aug. 18, 1998

- LEGEND**
- | | | | | | |
|---|-------------------------|---|------------------------|---|-------------------------------|
|  | SUP Boundary |  | Existing Run |  | Proposed Tree Skiing Terrain |
|  | SUP Boundary Adjustment |  | Ski Patrol |  | Proposed Runs |
|  | Parcel Boundary |  | Parking Lot |  | Proposed Mountain Access Road |
|  | Existing Building |  | Mountain Coaster |  | Upgraded Ski Patrol Facility |
|  | Proposed Lift |  | Proposed Zip Line |  | Proposed Maintenance Facility |
|  | Proposed Building |  | Proposed Trail Grading |  | Proposed Wedding Venue |





II. CONSISTENT WITH COMPREHENSIVE PLAN

This Master Plan is designed to help realize the vision statement and to reflect the guiding principles adopted by Teton County and the Town of Jackson as part of the Comprehensive Plan, and is consistent with the Comprehensive Plan as a whole and specifically addresses goals and objectives in every Chapter of the Plan. In addition to the statements in this Chapter, other submittal components further articulate the relationships between the Snow King Master Plan and various community goals.

The Snow King Resort is indicated on the Community Issues Map as having a unique role serving both the residents of the community and the visitor-based economy of the valley. The Resort is intended to be a "Community Resort" with unique access to residents. This access is exemplified by the pathway and trail system, which is the integral fabric of the Resort.

It should also be noted that the Comprehensive Plan preceded the adoption of Division 2500 of the Land Development Regulations referring to Snow King. Therefore, Division 2500 already incorporates, within its body, most pertinent issues concerning the Comprehensive Plan. Various impacts were addressed in economic, planning and other studies that were part of the process of adopting the Snow King Planned Resort District Ordinance.

Three important community character goals specially relate to Snow King: maintaining social and economic diversity, maintaining a balance between visitation and the community and to enhance this economic center through redevelopment. The proposed plan will maintain and enhance the social and economic diversity by offering a variety of potential uses internally within the resort. New commercial, office and retail space in addition to improvements in guest facilities such as rooms, condominiums and conference areas will provide a balance of services for both guests and residents.

This proposed development is intended to help the Town of Jackson realize the vision statement in the Comprehensive Plan (pages 1-6 and 1-7), as follows:

"It is the vision of the citizens, planners and elected officials, who have all contributed to this plan, to guide and manage change and development to:

- ***Support and promote a diverse social and economic population that includes a resident work force:***

Snow King Resort currently employs over 260 persons in a variety of professional levels most of them on a year-round basis and expects to continue this pattern in its expansion. Snow King is among the top five year-round employers in Teton County. The proposed housing plan will assist us in housing more of our employees in Town. The conference facilities assist in attaining a stable year-round work force.

- ***Preserve the traditions and character of the Rocky Mountain West and Wyoming, including ranching and through architectural design;***

The design of the proposed development will help to preserve the traditional character of the region, both architecturally and functionally. The traditional character of Jackson Hole is the outcome of blending outdoor recreation, visitor services and community life and is expressed not only through architecture and appearance, but also through its functions. Snow King has proven for over 60 years our commitment to the community.

- ***Promote economic sustenance that does not depend on population growth;***

Sustainable, sensitive tourism, concentrated in already-developed areas, designed with the landscape and outdoors in mind, benefits this community economically and functionally. This proposed development aims to continue and enhance this kind of low-impact tourism.

- ***Set aside, for generations to come, scenic vistas and wildlife habitat;***

Unlike other resort development in Teton County, Snow King takes advantage of all the infrastructure and commercial development in the downtown core. It concentrates visitor impacts in the downtown core and invites them to "step outside" and enjoy our natural resources. Snow King has a proven track record of harmonious relationship with the U.S. Forest Service. This Master Plan provides generous areas of meaningful open space.

- ***Maintain and enhance environmental quality, including air and water quality;***

All new buildings will make use of technologies that help enhance environmental quality, and be connected to the existing Town of Jackson utility network. The Snow King Resort Master Association will assist in controlling air and water quality. The resort already has a strong recycling program that will continue and be expanded.

- ***Maintain outdoor recreation and adventure opportunities;***

This proposed development provides varied outdoor recreational opportunities as part of the downtown experience. Enabling both locals and visitors to ski, skate and hike right in town, minutes from the Town Square, is one of Snow King's primary contributions to the community. Outdoor recreation at Snow King will be enhanced by this proposed development and access to the mountain through private lands preserved.

- ***Offer a spectrum of housing types, especially for resident workers.***

This proposed development meets the Town's employee housing requirement, with the overwhelming majority being provided within the limits of the Town, as an integral part of the Town and the town's housing stock.

The guiding principles adopted in the Comprehensive Plan (pages 1 - 7 and 1-8), state that "*Teton County is a community first and a resort second*" and "*it is the intent of this Plan to create conditions for a sustainable visitor-based economy...that reflects the unique, small-town, Western commercial character of Jackson, and the outdoor recreational opportunities of Teton County as key components of the visitor experience.*" Snow King Resort is shown on the Community Issues Map as having a unique role serving both residents and visitors because of its location and history. This proposed development would make a crucial contribution to the long-term sustainability of the downtown, visitor-based economy.

In reference to Chapter 2 of the Comprehensive Plan (Population, Economy and Growth), this proposed project directly serves two goals stated on page 2-1. It will "*enhance visitor services that emphasize the area's unique outdoor attributes*" by providing a conference center that opens to the mountains as well as through its use of outdoor recreational spaces and pedestrian circulation and plazas. The Master Plan also "*defines the future boundaries of growth necessary to preserve community character.*"

This project contributes directly to maintaining community character in three ways.

- It will help to maintain social and economic diversity both by providing a range of employment opportunities and through an exceptionally strong employee-housing program. The project also enhances the social and economic diversity within the resort itself by greatly expanding the mix of uses for both visitors and residents.

- It will help to maintain a balance between visitation and community life by serving these two functions within a single facility. The conference facilities are intended to be used by visitors and residents alike, as they are now.

- This project will also help to maintain community character through redevelopment and improvements of the existing economic center at Snow King. Snow King is the largest lodging facility and resort in the Town of Jackson and currently plays a key role in the area's economy.

In Chapter 3 (Community Character), it is noted that part of the process of maintaining community

character is through providing for a style of tourism that highlights regional differences and unique characteristics. *A recent study stated that "it is a joy to encounter places that preserve, enhance and celebrate those things that set them apart and give them a meaning and personality all their own."* (Page 3-1) Snow King's role is an interface between the town center and the mountain and combines the use of its facilities by residents and visitors alike. This integration sets Snow King apart and gives it its own personality. The seamless transition from Town to Resort is emphasized in this Master Plan.

In Chapter 4 (Natural and Scenic Resources), this project addresses three objectives (pages 4-7 and 4-8).

- It will *"improve the visual quality of existing development"*. Visual quality is addressed throughout this Master Plan and buildings are carefully placed to minimize visual impacts. A visual impact study is part of this Master Plan.
- It will help to *"preserve open space"* by providing for ample open space as part of the site plan design.
- It will help to *"provide and manage access to natural resource areas in a manner consistent with natural resource protection goals"* through a network of trails which improve access as well as concentrate other uses in specific, already-impacted areas.

Regarding Chapter 5 (Housing), this project will *provide a variety of affordable and employee housing as the resort continues to develop*, as called for in the Town's housing goals shown on pages 5-6 and 5-7. Because of stable year-round employment, this development also helps the resort's workforce afford available housing. The Housing element proposes housing both within the PRD and in other locations in the Town of Jackson. It also proposes a variety of housing types to meet the needs of different levels of employees. Snow King is proud of the broad spectrum of employment opportunities it offers and intends to support this spectrum with appropriate housing.

In Chapter 6 (Commercial and Resort Development), tourism and related services are recognized as the economic base of the community. The conference center is a key component of this sector. The Comprehensive Plan also calls for *avoiding strip development and encouraging outdoor-oriented tourism*. With the ski hill, hiking and biking trails, skating and other outdoor amenities located near the center of town, this proposed development addresses both of these goals. An additional plus is the ready accessibility to the community of our resort facilities. The proposed development also fulfills the goal of creating a full-service conference /convention center and provides a stabilizing year-round foundation to our seasonal economy.

In Chapter 7 (Community Facilities), this Master Plan will enable us to *collaboratively anticipate community facility needs*, a primary goal (page 7-19). It also helps locate demand for community infrastructure in an appropriate location.

In regards to Chapter 8 (Transportation), the Comprehensive Plan calls for *transportation planning, which helps to preserve and enhance community character*. The location of a conference center within walking distance of downtown, helps to minimize traffic demands. The transportation element of this Master Plan takes into consideration transit, pathways, traffic impacts, parking and airport capacities.

The recurring theme of this chapter is balance: seeking a balance between what the resort gives to the community in terms of jobs, tax revenue, meeting space, and recreation and, in turn, what the resort requires in terms of water, sewer, mass transit and employee housing. The theme of balance also relates to the scale and character of the development and how well it fits into the fabric of the community and the landscape. As mentioned in the Statement of Purpose, this proposed development is an excellent example of balance.

In all of these ways, and many others, the proposed Master Plan is consistent with the Comprehensive Plan and helps to meet its community goals.

II. COMPLIANCE WITH LAND DEVELOPMENT REGULATIONS

All the lands within this Master Plan are zoned "Planned Resort District" in the Official Zoning District Map, and all development is governed by Division 2500, Planned Resort District, of the Town of Jackson's Land Development Regulations. This Division specifies the purpose, intent procedures and standards applying to such developments and guides all aspects for this Master Plan. This Master Plan is fully consistent with the regulations in Division 2500.

The Master Site Plan utilizes and complies with the intensity of use and performance-based thresholds established in Section 2550 M of the regulations. The land under this Master Plan will be used as a mixed-use district designed in such a manner as to preserve open space by concentrating development only in specific portions of the district, and allocating access routes to the national Forest and to pathways that connect the East and West sides of the Town.

This document, as a whole, responds and complies with all the sections of the zoning and development regulations relevant to Snow King. Even when compared with other zoning Districts, the proposed Landscape Surface Ratio (.50 for the total of Sub-Areas 1, 2, 4, 5 and 6 and .30 for the area within Sub-Areas 1, 2 and 4) and Floor Area Ratio (.40 for the total of Sub-Areas 1, 2, 4, 5 and 6 and .60 for the area within Sub-Areas 1, 2, and 4) compare favorably even with those for residential areas and with the requirements of Division 2500.

As specifically stated in Section 2550.B, *"it is fully consistent with the Division that Planned Resorts may have dimensional, design and other development standards different from those described in other Sections of these LDR's due to the unique circumstances of, and community objectives for, resort development."* This Master Plan presents its own Dimensional Limitation Plan in accordance with Section 2550. E, that takes into account the specific topography and location of the lands encompassed in this Master Plan.

The Dimensional Limitation Plan explains its rationale and establishes vertical and horizontal dimensional limitations that are a product of the existing built environment and the topographical context of this site. Floor areas are necessarily large to insure Snow King's position as the largest conference facility in the valley. These aspects of the built environment are tempered by a three-dimensional building envelope system specific to all the high use areas. The types of allowable uses are many and varied to insure community needs, diversity, synergy and increased economic viability. These uses are consistent with a high-intensity resort development node tucked against the base of Snow King Mountain.

The following is a summary of how this Master Plan meets the requirements of each section of Division 2500 and the required findings for approval.

SECTION 2510 PURPOSE AND INTENT

Section 2150 of the Town of Jackson Land Development Regulations defines the Planned Resort District Zoning District as follows:

"Planned resort (PR) District. The purpose of the Planned Resort (PR) is to provide for a mix of recreational, retail and service-oriented activities, which has a high degree of self-containment and provides economic and other benefits to the community. Typical uses include, but not limited to, ski slopes and associated facilities, lodging, conventions facilities, retail and restaurants."

The Snow King Resort Master Plan is responsive to every objective of Division 2500. As the largest convention facility and resort in the Town of Jackson, and encompassing a large contiguous undeveloped land located between Town and forest, the proposed development represents perhaps the only opportunity available to the Town to meet these objectives. The goals of this Master Plan and the purposes of these regulations are closely matched. The purposes of these regulations are stated as to:

A. Encourage recreational activities that rely on indigenous natural attributes of the area, contribute to the community's character and economy and have had a long-standing beneficial role in the community;

Snow King Resort blends conference facilities and other visitor services with varied year-round recreation on the mountain, including skiing, skating, tubing, hiking, biking, horseback riding, activities for children and a summer chairlift and alpine slide. Snow King has evolved as an important part of Jackson's community character because of the way it functions, as a gathering place for both residents and visitors. The existing conference and hotel facilities have benefited Jackson Hole residents and visitors since 1976, while the ski hill and other mountain recreation uses represent a tradition going back to 1939.

B. Provide flexibility for planning and developing recreational resort facilities in a creative, efficient and coordinated manner in order to provide quality visitor experiences;

The proposed development has been planned within the context of the entire downtown area and is coordinated with plans for the Multi-Agency Campus and the Community Center for the Arts to contribute to an animated, viable and vibrant downtown. Snow King's development encourages a concentration of services in the downtown area, leading to more pedestrian activity and efficient corridor use that will bring people to the Town Square. Snow King is an integral part of a holistic downtown vision, and the proposed convention facilities will be the mainstay of a year-round downtown economy.

C. Create a process in which applicants, Teton County and the Town of Jackson collaborate with landowners in planning and designing resort master plans that meet community goals and respond to the unique circumstances of the resort area;

This Master Plan is another step in a long-standing pattern of collaboration and partnership between Snow King and the Town of Jackson, which includes the joint development of Snow King Center and many aspects of the ski operation including snowmaking water and land leases. All the landowners within the more than 62 Acres extent of this Master Plan are acting in unison.

D. Permit resort development that contributes to the winter and shoulder economic seasons;

Convention facilities are key because they attract year-round use. Currently our meetings and convention business provide us with a better off-season occupancy than the Teton County average. With the proposed development, we will be able to accommodate a much broader variety of meetings, and as a result, expect a better spring and fall occupancy rate.

E. Ensure that resort plans incorporate a mix of land uses, promote alternative modes of transportation, and provide a pedestrian-oriented community in order to alleviate traffic-related impacts;

As expressed in various Chapters of this Master Plan, non-motorized pathways are the backbone of this mixed -use resort. In addition to the obvious benefits of providing convention facilities in the immediate downtown area with pedestrian and shuttle access to all the Town Square Businesses Snow King also provides pedestrian access to the mountain. Many people take advantage of Snow King's trails and recreational facilities to enjoy the outdoors without leaving town. Snow King's unique mix of land uses helps ease transportation demands in various ways. This Master Plan includes all the required components of a transportation element and proposes a transportation plan that will serve the goals adopted in the Town's Transportation Plan. Snow King will be an integral part of a multi-modal downtown transportation system. In addition, Snow King's trails and pathways will add a valuable amenity above and beyond what is required by the regulations.

F. Ensure resort plans are consistent with the Comprehensive Plan, and therefore, are beneficial to the community;

Consistency with the Comprehensive Plan is discussed in detail in another Chapter.

G. Enable long-range planning for infrastructure, capital facilities, and community land use patterns by establishing a level of predictability in the maximum potential size and character of each resort area,

This Master Plan establishes maximum development potential in keeping with the maximum established in Division 2500, and provides the framework for collaboration in the provision of infrastructure needed for a successful development.

H. Ensure a balance is maintained between tourism and community that promotes social diversity but does not cause undesired shifts away from rural, western community character;

Snow King's development is a continuation of a pattern of use, which is already well established for our property. This development will maintain the existing balance between visitor and resident use of the facilities and bring much-enhanced benefits to the community as a whole. We cannot claim that it will not contribute to the shift away from rural character, but this shift is a consequence of other factors as well. No doubt each discreet development small or large, contributes to this change. Although some portions of the site will be developed in an urban manner, over half of the land is dedicated to open recreational space.

I. Produce resort plans that make significant contributions toward protecting attributes of the community that are considered critical to the community's long-term health, welfare and well-being;

The proposed convention facilities will make a significant contribution toward a sustainable economy for the Town of Jackson, as documented in prior studies. The Resort as a whole will make a large contribution to the economic health of the downtown area. The proposed employee-housing element will make a significant contribution to the housing stock for working people in the downtown area. The proposed recreational development will benefit the entire community and existing recreational uses will be maintained. The design will be a visual enhancement of the mountain base area.

SECTION 2520 APPLICABILITY

Snow King Resort is specifically named.

SECTION 2530 PROCEDURE

This Master Plan is in compliance with the procedures outlined in Section 2530.

Section 2530 A3 I. and 2. Require the following submittal components:

- (a) *Statement of Purpose*
- (b) *Master Site Plan*
- (c) *Dimensional Limitation Plan*
- (d) *Design Guidelines*
- (e) *Transportation Demand Management Plan*
- (f) *Housing Mitigation Plan*
- (g) *Capital Improvements Plan*
- (h) *Land Use Plan*
- (i) *Phasing Plan*
- (j) *Community Services Element*

The Chapters of this Master Plan are organized, as much as possible, in response to this requirement.

SECTION 2550 STANDARDS APPLYING TO ALL PLANNED RESORTS

This Master Plan application is complete as per Section 2550 requirements. Each section of this Master Plan explains how it intends to meet the standards for various components and elements set forth in Section 2550.

SECTION 2550 (M) (3) STANDARDS SPECIFIC TO SNOW KING RESORT

These standards fall into six categories:

- a. *Character and design*
- b. *Capacity*
- c. *Land use*
- d. *Landscape surface area*
- e. *Environmental analysis*
- f. *Relationship to Town Square*

Regarding (a) character and design, this is discussed in detail under "Design Guidelines", Chapter VI of this Master Plan. The proposed development meets and exceeds every one of the specific design standards for Snow King. Although some of the buildings are necessarily large, the scale needs to be considered in the whole context of the goals and objectives of this Planned Resort District.

Regarding (e) environmental analysis, the site does not contain any wetlands and does not interfere in wildlife migration routes. Environmental and hazardous materials assessments have been conducted and no underground storage tanks are located in any of the parcels under consideration. Soils analysis has included studies of the maps prepared by Dr. Love and Harry Covington pertaining to steepness of slopes, ground stability, geologic maps, loam y soils and snow slides possibilities. In addition, visual inspections have been conducted with Dr. Love and results of soil test borings, pits and actual foundation excavations have been analyzed.

All structures in this Master Plan are located in appropriate and stable soil areas. Some of the small

structures located within the steeper slopes of Sub- Area 4 are located on soils that will require engineered foundations. Visual impacts are discussed in detail in various chapters of this Master Plan.

As an operating business, consideration has also been given to operational efficiency and the wise use of resources. Snow King presently follows, and will continue to adhere to, OSHA, DEQ, EPA, ADA and BATF regulations regarding the storage, handling and disposal of dangerous materials as well as other employee and guest related requirements. Impacts are also minimized through the use of management guidelines, such as the National Ski Area Association's Environmental Principles for Ski Areas.

Regarding (f) relationship to Town Square, the transportation element of this Plan describes components, which encourage non-motorized access and public transit access to the Town Square.

Other various aspects are presented in written or graphic form throughout this Master Plan.

SECTION 2560 FINDINGS FOR APPROVAL

This Master Plan positively responds to and meets or exceeds all the findings for approval described in Section 2560:

- A. *Consistency with Comprehensive Plan. The Planned Resort master plan is consistent with the goals and objectives of the Jackson/Teton county Comprehensive Plan.*
- B. *Consistency with purpose and intent. The Planned Resort master plan is substantially consistent with the purpose and intent of this Division, as set forth in Section 2510, Purpose and Intent.*
- C. *Affordable and employee housing. The Planned Resort master plan ensures a supply of affordable and employee housing that is in accordance with the requirements for housing created by development within the Planned Resort.*
- D. *Design guidelines. The Planned Resort master plan contains design guidelines that*
 - 1. *Establish standards for buildings, spaces, signs and lighting within the Planned Resort*
 - 2. *Promote the design concepts set forth in Section 2550.G, Design element; and*
 - 3. *Establish a method for consistent implementation of the guidelines.*
- E. *Transportation element. The Planned Resort master plan contains a traffic impact analysis and transportation demand management plan that:*
 - 1. *Promote multimodal forms of transportation that are consistent with the transportation goals of Jackson /Teton County Comprehensive Plan;*
 - 2. *Manage the generation of resort related traffic to avoid undermining community character and endangering the public health, safety and welfare; and,*
 - 3. *Identify an equitable cost sharing plan for transportation facilities and services*
- F. *Capital improvements plan. The Planned Resort master plan contains a capital improvements plan that ensures infrastructure and essential services will be provided in an efficient and timely manner to accommodate projected resort demands.*

Deleted:

A Visual Environmental Assessment has been carried out, as required, to evaluate the visual impacts at the mid-mountain lodge area, including computerized photography.

G. Land use element. The Planned Resort master plan promotes land uses that support and maintain the character of the resort as specified in Section 2550.M, Character Element.

H. Phasing plan. The Planned Resort master plan contains a phasing plan.

I. Character element. The Planned Resort master plan ensures the resort 's development will be in keeping with the community's goals.

This Master Plan is consistent with the Comprehensive Plan and the purpose and intent of all these regulations. In the following chapters, the introduction for each chapter specifies how this Master Plan meets the requirements for affordable and employee housing, design, transportation capital improvements, land use and phasing. We believe that this Master Plan meets and exceeds the standards for each of these elements.

The final finding required for approval is that the Master Plan "ensures the resort's development will be in keeping with the community's character and the planned character for the vicinity of the resort." This issue is addressed in the Statement of Purpose.

Among the many features of this Master Plan is that it meets the present and future needs of the Town of Jackson by enhancing an already-existing pattern of use. By expanding Snow King's capacity, the Town of Jackson can attain several desired goals with minimum impact. The impacts that are anticipated are generally compatible with the resort's vicinity UC-2 zoning.

A particular and unique strength of this Master Plan is its conformance to the Community Services standards (Section 2550, which call for the Resort to function as *"integral parts of the community by participating in civic initiatives and by implementing the goals of the community."* These standards encourage *"programs designed to retain access to the resort's main recreational activity and facilities, ... help to maintain a balance between out-of-town visitors and the community, and contribute to the quality of life of the community."* As a community partner for over 60 years, Snow King is proud of its close relationship with the community. The various Chapters of this Master Plan clearly address all of the impacts and the rationale of the proposed development in a cooperative spirit with the community.

Issues of building height are considered in the Dimensional Limitations Chapter.

It must be noted that goals such as creating a sense of arrival, a dense development oriented towards pedestrian circulation, creating meaningful open spaces and activity areas, proximity to parking, incorporating employee housing and in general creating a vibrant mixed-use district necessitates higher buildings than in other zoning districts. The topography of the site clearly helps in blending larger buildings into the mountains. The Dimensional Limitations and Design Guidelines Chapters expand on this topic and also compare future buildings with the existing hotel and Snow King Center. When taken together, a balance is reached that achieves the stated goals and objectives of this Master Plan.

Regarding (b) capacity, the maximum lodging capacity of 2,460 guests and the maximum building square footage of 915,000 SF are to remain in adherence to the intensity of use established in Section 2550 M.3.b. as amended.

This appropriate capacity and size of the resort was discussed in detail during the process of adoption of Division 2500. Independent studies conducted by the Town and County took into consideration

not only the site characteristics of each resort, but the inter-relationship between Snow King and other resorts, mainly Teton Village. The size of private land parcels, floor area ratios, landscape surface ratios and other specific site factors were also considered in the process. The size of the resort was also determined to be appropriate in relation to the conference/convention facilities desired by the community and the need to make this conference center financially feasible.

These and other aspects were factors determining the optimum size of the Snow King District Planned Resort and these results were incorporated into Division 2500 of the Land Development Regulations.

When fully developed, Snow King Resort's goal is to have the best-equipped conference facility in the State of Wyoming. As proposed these facilities will be highly flexible, much more pleasant than most urban conference centers and will be visually and functionally connected to the surrounding landscape with ready access to the outdoors. When enhanced by Jackson's allure as an exciting destination, this facility will have the potential to attract meetings from all around the region as well as from the highly competitive national market. The objective will be to accommodate conferences for 100 to 300 participants with sufficient space for breakout rooms and to accommodate concurrent groups and functions. This scale is compatible with our community's transportation systems and other commercial infrastructure.

Additionally, Snow King hosts many conferences that use other lodging facilities in town. As their enrollment and programming needs expand, more conference and exhibit space are required to accommodate these town-wide meetings. These meetings provide a stable, low-impact base for the visitor services sector of our economy and, as envisioned in these regulations, contribute to other long-term community goals.

In this context, it is important to note the purpose of this Master Plan is to define maximum build-out for Snow King Resort. This proposal represents the complete facility that will be available to Jackson and these facilities will be developed in phases, over a period of time. As time passes space requirements for individual uses change, while the overall caps remain in place.

Regarding (c) land use, the standard calls for convention facilities capable of competing successfully in the *"year-round convention market."*

Regarding proposed commercial development, the health club, daycare and ski school are all integral parts of a full-service facility and will benefit the lodging guests and other community needs. New food and beverage facilities are proposed in addition to the existing restaurant and kitchens, as well as unassigned commercial space for neighborhood convenience business and for on-site guest services. The proposed movie theatres will be able to be used for conferences during the day and attract visitors to invigorate the pedestrian plaza at other times.

Regarding (d) landscape surface area, the standard calls for a minimum LSR of .25 within developed areas of the Resort. This Master Plan provides a higher minimum LSR of .30 within these developed Sub-Areas. As called for in this standard, the Plan also provides an attractive streetscape along Snow King Avenue, a porous edge and high quality outdoor public space for events and interaction. The goal is to achieve a festival marketplace atmosphere for the plaza area by combining the multiple functions of conference center, commercial space, food and beverage service and open space. The creative mix of businesses and functions will be the key to success.

IV. A. Introduction to Site Plans

The Master Site Plan on the following pages is a refined product of the Conceptual Master Plan submitted in 1995 during the Planned Resort District presentations that were the basis of the PRD ordinance. While slight variations occur, the foundations of the proposed Master Plan are based on the attached Concept Plan and is consistent with prior presentations and masterplans dating back to 1973.

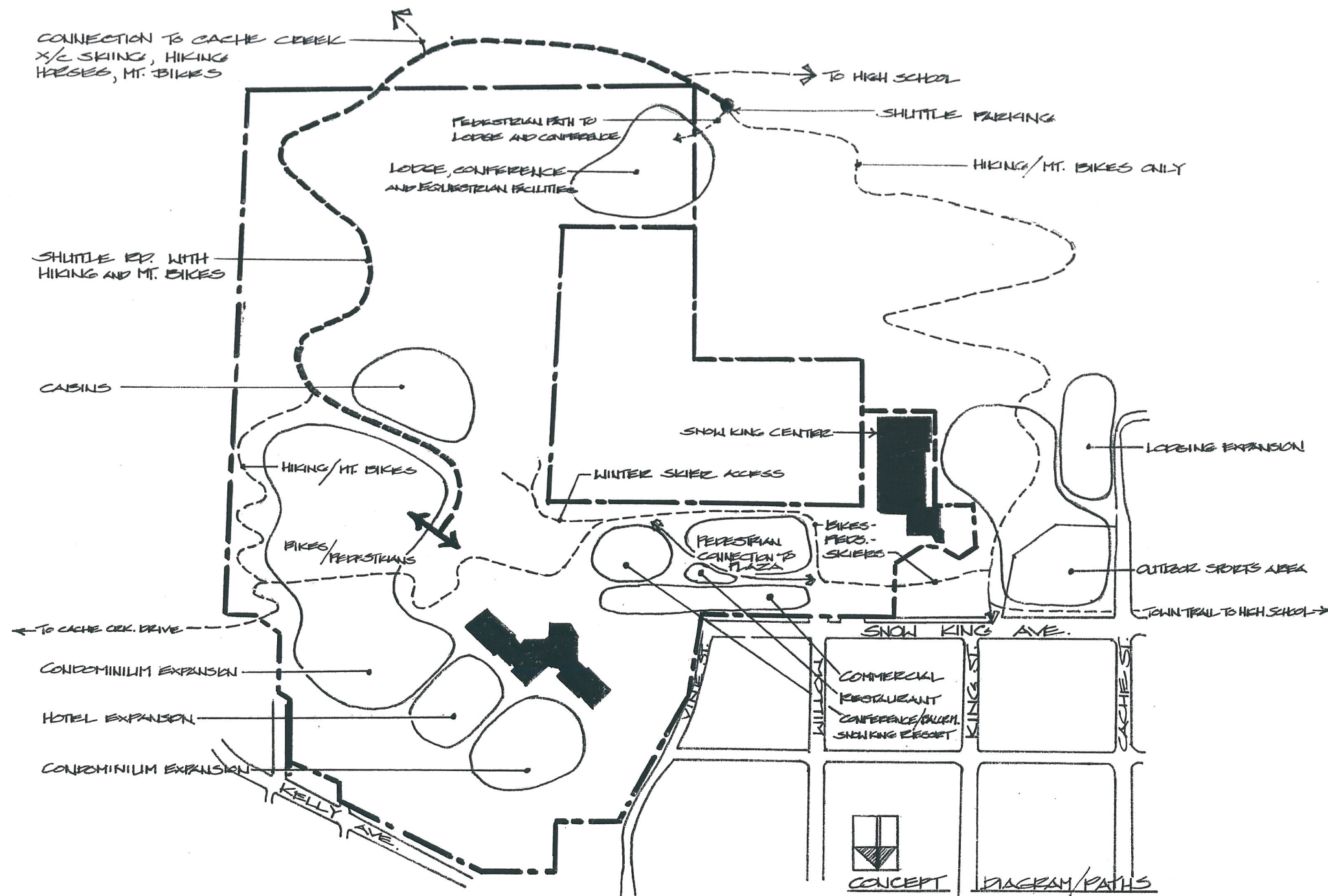
The large contiguous undeveloped land holdings being considered in this Master Plan afford a great opportunity in designing a successful project. Careful consideration has been given to its topography, vegetation, and location. Hiking trails, wind, soils, vehicular, pedestrian and services access, orientation, light and other aspects of the site have been inventoried and considered. This plan is the result of many years of careful thought and studies.

The backbone of This Master Plan is the pedestrian circulation routes connecting Town to Forest lands and the various functions of the Resort. Pedestrian and vehicular circulation is separated as much as possible and East/West and North/South pedestrian/bike connectors are of primary importance. Two primary hiking, riding and bike trails cut across the face of Snow King providing summer shuttle access to the mid-mountain area and additional opportunities for hikers and mountain bikers. The KM6 area (Sub-Area 2) fully develops the pedestrian plaza with connections to Willow Street and the downtown area of Jackson, as well being the nexus of the East/West pedestrian/bike trail network.

This Master Plan places various functions in the most appropriate location and within reasonable walking distances of one another. Dense lodging and conference facilities are located in close proximity to allow conference participants mostly interior circulation. At the same time, priority is given to convenient access to the outdoors from lodging and conference areas, as well as to the availability of natural light to most meeting rooms. The Conference Center is centrally located in close proximity to parking, porte cochere, lodging, underground services and within walking distance to the existing hotel meeting rooms and the Snow King Center.

Building envelopes are a result of their relationship to many aspects, but most importantly indoor and outdoor pedestrian circulation, proximity and access to recreation/assembly areas and intended to create meaningful outdoor spaces. Other Chapters of this Master Plan discuss the rationale for the many aspects of the proposed development. The resulting design accomplishes the goals and objectives of this master plan in a manner complimentary to its location and site characteristics.

This Chapter presents graphic information about the proposed development after build-out. Two separate maps present the proposed Site Plan. The Summer Master Plan depicts the proposed development with both existing and approved features, as they would appear during the summer season. The Winter Master Plan does the same for the winter season. The importance of pedestrian circulation is better portrayed in these two separate maps and in the Transit Routes, Trails, Pathways and Sidewalks plans. The Snow King trail map puts the Master Plan into the larger context of the Snow King massif. The Sub-Area plan sub-divides the total area of this Master Plan into smaller sections for purposes of clarity and ease of analysis.





C. Proposed Master Plan

The proposed Summer / Winter Master Plan depicts the proposed development along with existing and approved features. Proposed site development features include:

Love Ridge / Grand View Vicinity

- Grand View Lodge & Conference Center
- Grand View & Love Ridge Condos
- Proposed development on lots 53, 57, & 58

Hotel Additions

- Buildings A, B, C, D, E
- Extended Porte Cochere
- Paved Parking Areas, Roads and Walks
- Heated Parking Areas, Roads and Walks
- Swimming Pool, Soaking Pool Plaza

KM6 Area

- Conference Center
- Buildings K, L, M
- Walks and Stairs
- Heated Plaza, Walks and Stairs
- Existing Miniature Golf and Maze

East Base Area

- Rafferty Center & Mountain Coaster
- Alpine Slide & Rafferty Lift

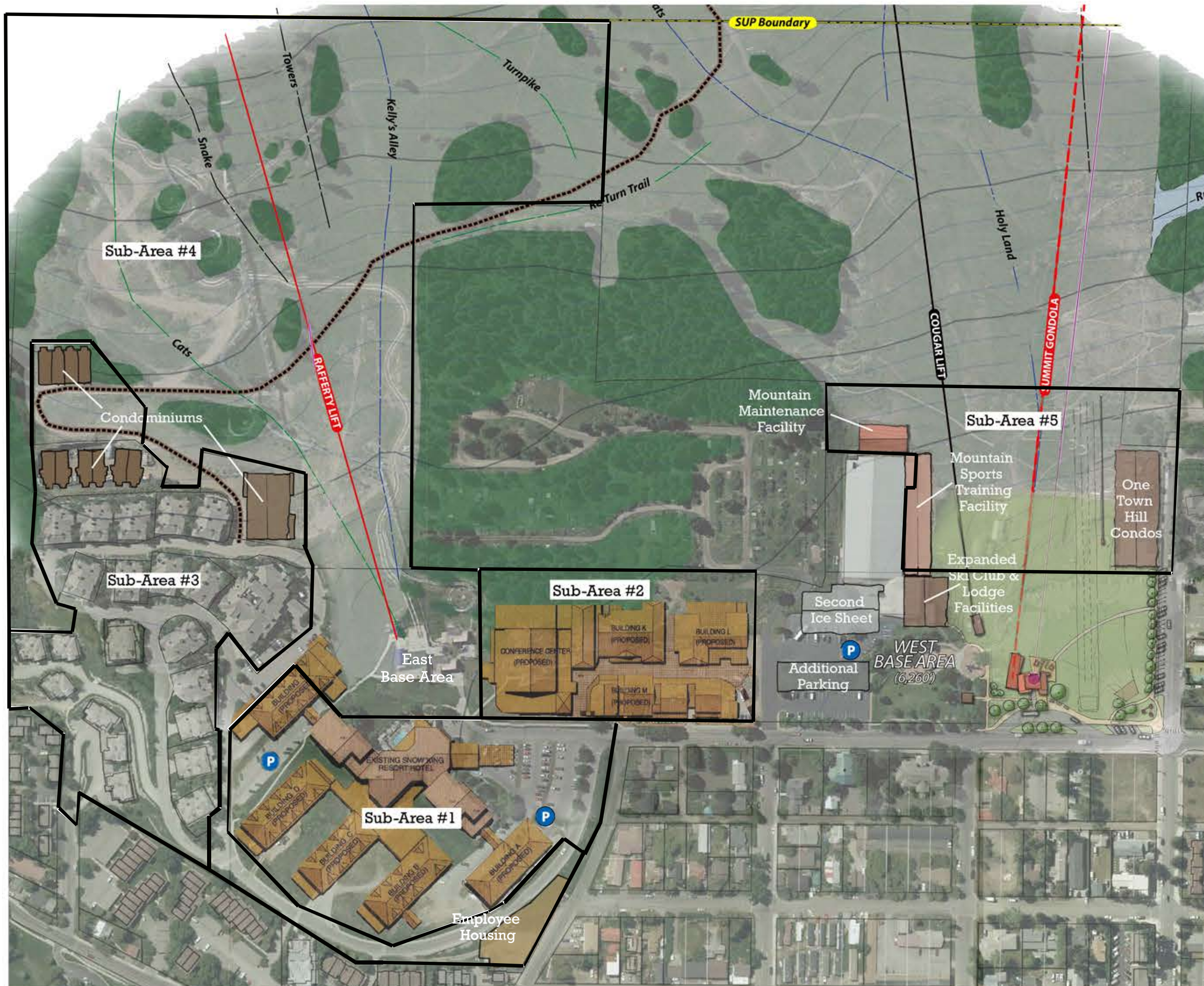
West Base Area

- One Town Hill Condos
- Proposed Mountain Sports Training Facility
- Proposed Mountain Maintenance Facility
- Snow King Sports and Event Center
- Proposed Expanded Lodge Building
- Proposed Gondola and Zip Line

Vine Street Area

- Employee Housing
- Mountain Storage Facilities

*Includes original proposed plans for Hotel and KM6 properties

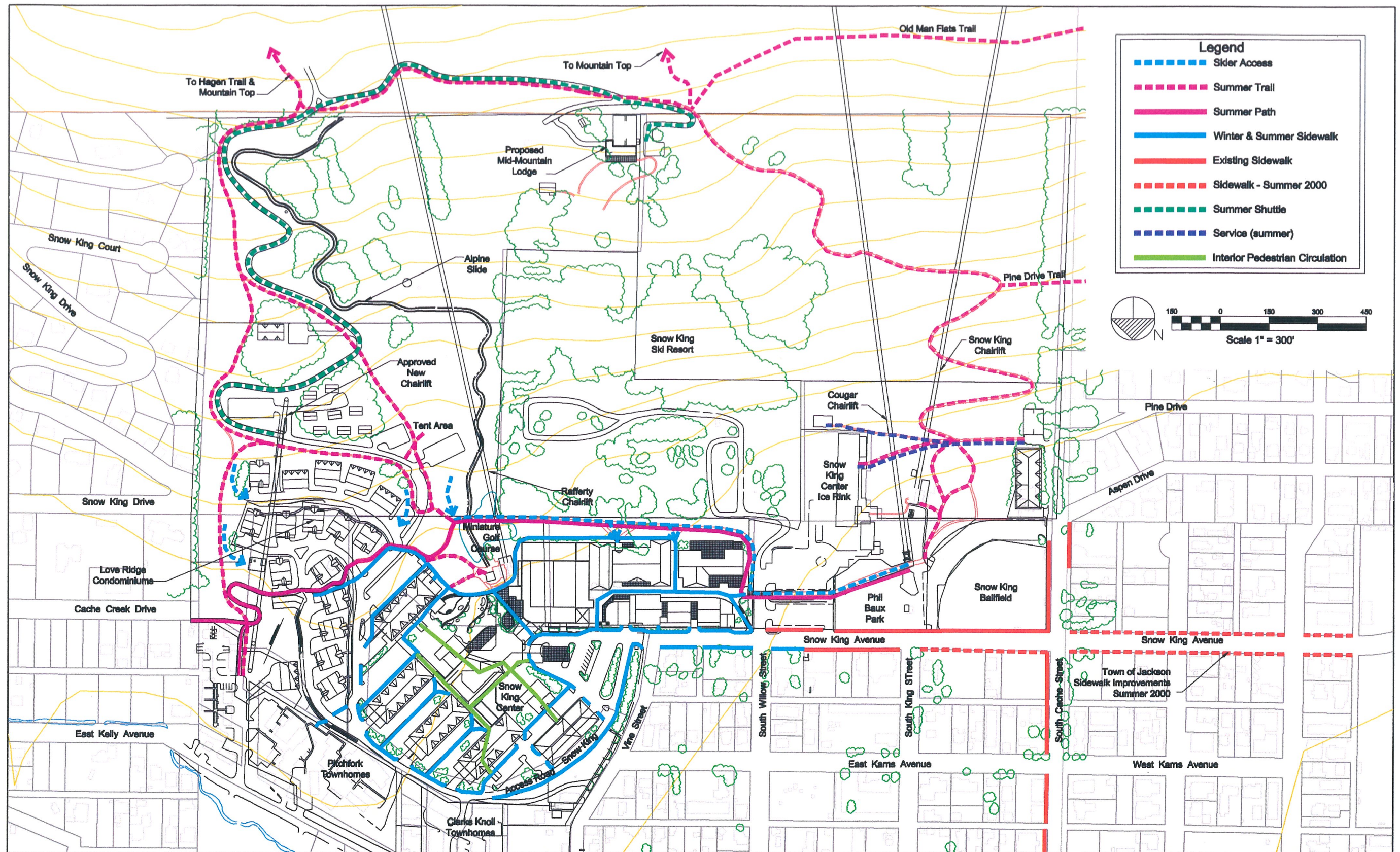


B./D. Sub-Area Plan

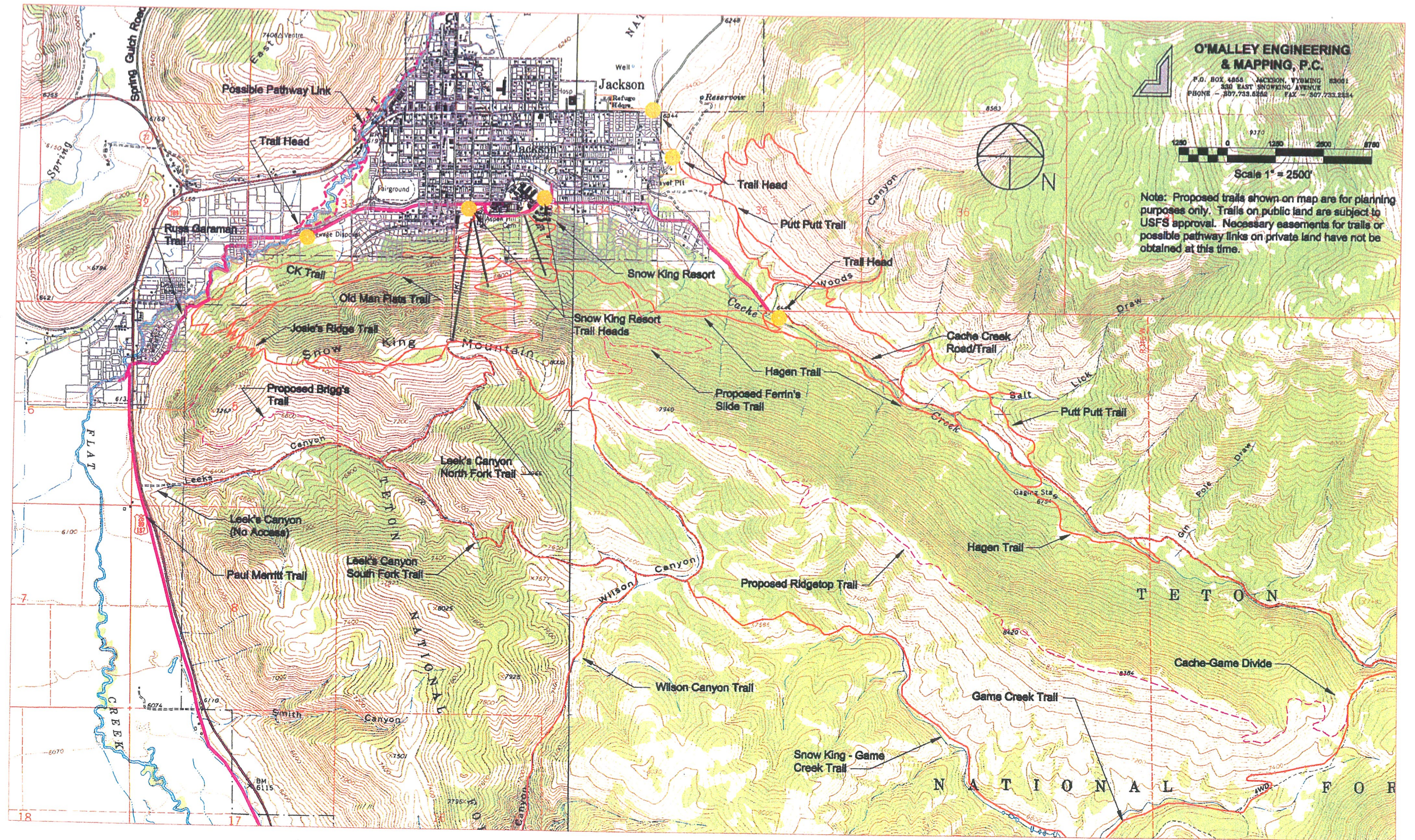
For planning purposes the land in the Snow King Planned Resort District has been reconfigured as follows:

- Sub-Area #1: Existing Hotel and Hotel Additions
- Sub-Area #2: KM6 Area-between Hotel and Snow King Center
- Sub-Area #3: Existing and proposed Condominiums
- Sub-Area #4: Snow King Mountain recreation area and proposed employee housing
- Sub-Area #5: Snow King Mountain West Base Area and One Town Hill

*Includes original proposed plans for Hotel and KM6 properties
Snow King Resort Master Plan



SNOW KING RESORT - CIRCULATION TRAILS, PATHWAYS AND SIDEWALKS



SNOW KING RESORT AND VICINITY TRAIL NETWORK

V. THE LAND USE PLAN

Introduction to Land Use Plan

Section 2560 of the PRO regulations requires a Land Use Element that supports and maintains the character of the resort. The regulations set forth permitted uses and guidelines for the amount and type of development.

As stated in other Chapters of this Master Plan, a major goal is to create a vibrant mixed-use resort. To attain this goal, many varied uses are allowed and the whole site is considered as an integral unit in order to maximize efficiency and create the desired results. The objective of this Master Plan is to develop a high-intensity resort node of development, which is compatible with its location in the neighborhood, and with its crucial relationship with downtown Jackson.

Permitted uses are defined in Section 2550.J. Permitted uses include residential uses, uses necessary to support the resort's primary recreational activities and uses necessary to support the resort's lodging, day visitors, employees and use by local residents. In the case of Snow King, conference center uses are emphasized and commercial uses serving on-site guests and the adjacent neighborhood are permitted. Special events are also permitted. Prohibited uses include regional serving commercial uses and commercial amusement activities, which are deemed detrimental to community goals and character.

The regulations set forth basic considerations for establishing the amount and type of development:

(1) Rationale and character objectives for the resort area; (2) overall development which can be permitted while preserving community character; (3) infrastructure capacity; and (4) resort self-sufficiency to minimize vehicle trips.

The first two issues are discussed in Chapters II, III, VI and VII, in the context of Consistency with the Comprehensive Plan, Compliance with the Land Development Regulations, Design Guidelines and Dimensional Limitations Plan. The issue of infrastructure capacity is discussed as part of Chapter X, Capital Improvements Plan. The issue of resort self-sufficiency is generally not applicable since the intention of this Master Plan is to be integrated with the downtown area. However, the proposed uses do provide basic conveniences and amenities needed by on-site guests and conference center users and assists in decreasing vehicle trips.

Overview of Permitted Uses

The uses allowed in this Master Plan provide a balanced mix that will enliven the resort and support its dual purpose as a center for both visitors and residents. All the allowed uses fall within the scope of permitted uses, and most descriptions are derived directly taken from the definitions provided in Section 2220 of the Town of Jackson Land Development Regulations.

Although future uses cannot be completely anticipated, the intent is to comply with the overall goals and objectives of this Master Plan. The Resort District can be characterized as having similarities either in part or in whole, to all zoning districts. These similarities are mixed together into a constantly evolving balance. In order to maintain a healthy balance for the future, flexibility in the type and intensity of use is essential.

The Land Use Plan and its associated land uses are divided into two broad categories; those uses allowed within the building envelopes and those uses allowed outside the building envelopes (Recreation Land Use Zone).

Uses within the building envelopes are generally characterized as residential, commercial institutional, amusement /recreation and home uses. Recreation Land Uses are allowed to spill into the building envelopes.

Uses outside the building envelopes can generally be classified as non-residential, amusement/recreation and temporary uses. While these uses may require the need for structures or other physical improvements they are usually small in scale and quite specific in use. To attempt to confine development, which is related to the recreational activities such as skiing, biking, horseback riding, alpine slide etc. seems an impractical, if not impossible task. Hence the rationale for allowing recreational use flexibility outside the building envelopes.

Other various recreational uses such as swimming pools, hot tubs, playgrounds, picnic areas and shelters, pathways, trails, tennis and volleyball courts, alpine slide, miniature golf, outdoor function areas, sign structures, bridges, ticket windows, barns, tents, performing stages and platforms, dance floors, band stands, BBQ areas, ski lifts, decks, loading areas, nurseries, equestrian operations, ski school and day care facilities are allowed both within and outside the Building Envelope areas.

The following descriptions are intended to familiarize the reader with the uses particular to this Master Plan, as well as other uses which the resort feels are appropriate consequently establishing the nexus between this multiple use district and the LOR's. Definitions will be as per Section 2200 of the current Land Development Regulations unless otherwise noted. Thresholds for size and number of permitted uses is discussed in the Dimensional Limitations Plan.

Uses Permitted Within Building Envelopes.

Residential Uses - Snow King anticipates the following residential uses: Conventional Single Family Units, Accessory Residential and Institutional Residential. Employee housing is also to be located throughout the site and integrated within the Resort in various nodes.

While it appears that residential use within the Snow King PRD will be limited, Snow King believes that residential uses may still have a place in the resort. Consequently, the previously stated uses as defined by Section 2220 are allowed.

Accessory Residential Unit. -While these types of residential uses are highly unlikely within the resort area, Snow King does not want to preclude their use.

Institutional Residential-Employee Housing. Units of this type are permitted. Institutional-Residential Employee Housing is meant to comply with this Master Plan 's Employee Housing requirements. Unit types may vary and may include, but not limited to, dormitories and multiple occupancy units.

Institutional Residential. Other. Like accessory units this type of use is currently not being considered by the resort. However, it is not out of the realm of possibility that a private school dormitory housing or some type of group living facility or dormitory might be a future possibility.

Deleted: Love Ridge Lot #11 will continue to be dedicated to the Recreation Land Use Zone and Lot # 12 will continue to be a Residential Lot.

Non-Residential Uses - Snow King has the following commercial uses included in this Master Plan: Commercial Lodging (including hotel, condominiums, condominium-hotel, interval ownership units and support facilities associated with residential and non-residential short-term rentals), Commercial Retail, Office uses, Restaurant /Bars and Service uses. Although not currently in the group of contemplated commercial uses the resort believes that Bed and Breakfast operations could increase the Resort's ability to provide a viable center for both visitor and residents. These uses are all defined by Section 2220, and are appropriate to include herein.

Commercial Lodging - Commercial Lodging (or simply lodging) can take the form of hotel rooms, cabins, lodges, townhouses, condominiums, condominium-hotels or interval ownership units. Condominiums or other units can be sub-divided into separate sub-units called "lock-offs". A lock-off is a portion of a larger residential unit that can be used, or rented, separately from the rest of the unit. A unit can have more than one-lock off portion; for instance, a 3-bedroom condominium unit can be subdivided into 3 separate rental units, each with a separate entrance door. Interval ownership unit is defined as "Condominium-Time Share" in the Land Development Regulations Definitions.

This Master Plan indicates four hotel areas within the resort that are intended for lodging: the existing hotel and additions, Sub-Area's 2 and 3, and the One Town Hill condominiums. The vast majority of new lodging is proposed in the area of the existing hotel and additions. Uses are interchangeable and only limited by the capacity limits in the Schedule of Dimensional Limitations. Although for purposes of the Example Development a larger ratio of hotel rooms than condominiums have been used in the breakdown of the total guests allowed, it is not believed that this will be the ultimate lodging breakdown. Since hotel rooms have a greater per square foot and per guest impact on traffic, parking and housing the "worst case scenario" was chosen in order to calculate impacts.

Conference and Assembly Facilities. - Conference space is defined as the actual square footage of the meeting rooms whereas assembly space is defined as foyer or gathering space outside of the conference rooms. Assembly space accommodates registration tables, displays, receptions and other activities associated with a meeting event. The majority of the new conference and assembly space is anticipated for the Sub-Area 2.

Restaurant and Bar. -Expanded Food and Beverage facilities are contemplated throughout the Resort, but mostly concentrated in the core areas. Smaller Food and Beverage outlets are envisioned within the ropes course and miniature golf areas. Outdoor food and beverage facilities are also contemplated throughout.

Commercial Retail. These types of retail sales operations are contemplated for the street level shops along Snow King Avenue as well as within and surrounding the pedestrian plaza. The locations provide efficient access for neighborhood local convenience as well as access to lodging and parking and assists in creating vibrant pedestrian spaces. The close proximity to dense neighborhoods and the numbers of guests staying at the resort should increase the diversity and viability of retail operations. Any single commercial retail space exceeding 15,000 SF shall require a Conditional Use Permit, all other commercial retail is permitted by right.

Deleted: Pine Lodge

Deleted: and the Mid-Mountain Lodge

Deleted: Some small conference space has been allocated to the Pine Lodge and Mid-Mountain facilities.

Deleted: Pine Lodge and Mid-mountain

Office. Commercial office space is planned for the spaces above the commercial retail and is envisioned as including professional services and other activities, which are conducted in an office environment. Similar to the Commercial Retail these types of use are appropriate throughout the resort and will provide a consistent level of local traffic to diversify the mix of activity and commercial viability of the area. Resort uses, such as the Resort management itself, will also require office space.

Service Use. The successful balance of local convenience and visit or services is intended by allowing this use type as defined in Section 2220. These diverse types of uses will be allowed and encouraged within the building envelope system.

Bed and Breakfast. This type of use shall require a Conditional Use Permit.

Residential Short-Term Rental. This use is allowed throughout the extent of the PR District.

Institutional Uses. As defined in Section 2220 three non-residential institutional uses are considered. Snow King Resort considers all to be valid and appropriate uses within the building envelope areas. Additionally, utility uses outside the envelopes are also allowed particularly in consideration of Snow King Mountain's expanding role in providing a base for valley wide telecommunications. Although the current plan does not contemplate most of the types of institutional uses named in Section 2220, these uses are allowed since in almost every instance large segments of the community would utilize the resort and its many activities and services.

Day Care Center Group. A day care center is not currently planned; however, it may be part of future development within the resort district and could serve the needs of guests, employees and valley residents. Day care can also take the form of a "Discovery Center" and can be operated in conjunction with the Ski School. Snow King Mountain does offer a summer day camp program to local school age children from ages 7 to 14.

Deleted: A large daycare operation is planned. This operation is intended to fulfill the needs of guests, employees and valley residents. This operation complies with the Group Day Care definition under the institutional designation in Section 2220.

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Amusement and Recreation Uses. Within the building envelope area, the following uses are appropriate; Commercial Amusement and, Indoor Recreation. In addition, the uses of Outdoor Recreation, Tour Operators / Outfitters and Ski Area may in whole or in part of their operation occur within the building envelope area.

Commercial Amusement. Commercial Amusement uses are permitted as follows:

- Permitted by Right: noncommercial theatres and music halls, video arcades, and indoor skating rinks.
- Conditional Use: bowling alleys, commercial movie theatres and music halls, pool and billiard halls and shooting arcades.
- Other uses shall require a Conditional Use Permit unless determined to be unnecessary by the Town Planning Director.

Indoor Recreation. Planned Indoor Recreational uses include a health club and spa, intended for use by both residents and guests. A large indoor/outdoor pool is also planned. In addition, similar types of operations may be feasible and are appropriate from the standpoint of providing diverse opportunities to visitors and residents.

Home and Temporary Uses. While none of the uses defined under the Home Uses and Temporary Uses designations are currently contemplated, the Resort believes that they are compatible, appropriate and may have a place in the future of the resort. The presence of home businesses, small day care operations and cottage industry would help to diversify the social fabric within the Resort. Temporary Uses such as Special Events are perfectly adapted to the plaza in Sub Area #2.

Uses Permitted within the Recreation Land Use Zone

Outdoor Amusement/recreation. Outdoor Recreational uses are permitted as follows:

- Permitted by Right: youth recreation camps, bicycle facilities and uses, swimming pools and hot tubs, tennis, volleyball courts, paddle tennis, stables and corrals not associated with an agricultural use, cross country ski trails and facilities, playground, picnic areas and shelters, zip lines, [yurts, splash pads and water features, mountain coasters, mazes, ropes courses, outdoor food and beverage facilities, pathways,](#) trails, alpine slide, miniature golf, outdoor function areas, performing stages and platforms, dance floors, band stands, BBQ areas, ski lifts, [summer and winter](#) tubing park, decks, climbing walls, loading areas, ski school facilities and other related ski facilities and amenities.

Deleted:

One of the greatest assets provided by Snow King to the community is the continuing existence of both summer and winter recreational opportunities. Summer outdoor recreation uses considered in the Master Site Plan include, but are not limited to, [indoor and outdoor](#) climbing walls, miniature golf, and an expanded trail system for hiking, biking and riding [including both cross country and downhill bike trails.](#) Phil Baux Park, and its seamless expansion into Snow King's private lands is also an integral part of this Master Plan.

Deleted: , sand volleyball courts

Deleted: horse stables

Winter outdoor recreation includes tubing, skating (both indoors and outdoors) and of course skiing and snowboarding. Skiing and snowboarding activities comprise the bulk of these activities from the perspective of land and support facilities. In addition to the existing base facilities and lifts near term improvements include a new [gondola to the summit](#) and continuing improvements to the snowmaking operations. [A proposal for a modest expansion of the ski area to include a safe access road to the summit has been presented to the USFS and is included as part of this master plan.](#) Snow King supports the definitions for Outdoor Recreation and Ski Slopes provided in Section 2220 since it allows the flexibility to construct and operate all the ancillary facilities associated with both summer and winter activities.

Deleted: beginner lift and ski trail adjacent to the Love Ridge Condominiums

Deleted: Ultimately, the area could expand, but this expansion is not contemplated in this Master Plan

Other uses such as Day Care Center, [summer day camp,](#) ski school, utilities and nursery, allowed within the Building envelope area, will also be allowed in the Recreational Land Use Zone.

Ski slopes are obviously allowed, as well as all the facilities required to operate the ski area such as maintenance and storage spaces, snowmaking facilities, explosive storage, lifts and ski slopes lighting.

- Conditional Use Permit will be needed for Skateboard parks, equestrian centers.
- Other uses not mentioned above shall require a Conditional Use Permit unless determined to be unnecessary by the Town Planning Director.

Agricultural Uses. Snow King does not have any plans to rear livestock or grow crops nor does the applicant believe that this is an appropriate use within a resort setting.

Deleted: The resort does, how ever, foresee the potential need to operate a nursery facility to meet the landscape needs of the Resort. The scale of this operation is not known at this time and the use is not shown on any of the Master Plans.

Tour Operators/Outfitters. Seasonal facilities such as warming buildings or restaurants are intended to be used, as much as feasible, year-round and may be used for these purposes.

Temporary Uses. As stated in the section on Uses Within the Building Envelopes the resort acknowledges Temporary Uses as one of the most important uses to be allowed within the Resort District. Particularly important is the Special Event definition provided in Section 2220. Winter ski races, the Hill Climb, mountain bike races and summer Hill Climb are a few of the important events held on the mountain each year. The Annual 4th of July fireworks has been considered in allocating open space. Over the years, other outdoor uses will come up. Snow King assumes that the desire for more of these types of events will grow in number and diversity. With the exception of Gravel Extraction all the Temporary Uses listed in Section 2220 may have a place at the resort and are allowed.

Special Events. Special events such as music and dance festivals, [snowmobile events](#), art and craft show, concerts, live theater, and similar events, which are compatible with the resort and its facilities, shall be permitted.

The attached Land Use Schedule is intended to summarize the above descriptions. Where the Limited note is used in the Schedule, reference the above text for details.

Although Final Development Plans will determine the precise areas dedicated to each use, an Example Development has been created in order to calculate impacts such as traffic, parking, employee housing and utilities needed at the site. As discussed in Chapter VII, this is only an example and relative sizes and locations of various uses will change over years. This Example Development only represents Snow King's best estimate of uses within Building Envelopes at this point in time.

Uses not governed by this Master Plan

This Master Development Plan does not directly pertain to land owned by the Town of Jackson (TOJ) or the United States government and managed by the United States Forest Service (USFS). However, included with the 2018 amendment to this master plan and update are maps that show future proposed plans on USFS lands and TOJ property. Among the proposed uses indicated on TOJ land are an additional sheet of ice added to the North of the existing Snow King Sports and Event Center, a zip-line and gondola landing in the existing parking area of Phil Baux Park, a climbing gym and indoor training complex adjacent to the existing ice rink, and concert pavilion in Phil Baux Park. The accepted 2017 USFS Master Development Plan covers all uses proposed on USFS managed lands which can be seen in the included 2017 USFS Master Plan Map.

SNOW KING RESORT LAND USE SCHEDULE

	Building Envelope Zone	Recreation Land Use Zone		Building Envelope Zone	Recreation Land Use Zone
Gravel Processing			Commercial		
Extraction			Office	Y	
Disposal			Planned Commercial	Y	
Temporary Uses			Commercial Retail	L	
Christmas Tree Sales			Heavy Retail/Service		
Contractor's Office	Y	Y	Services	Y	Y
Special Event	y	y	Restaurant/Bar	y	L
Real Estate Sales Office	y	y	Drive-in Facility		
Shelter	y	y	Commercial Lodging	y	
Farm Stand			Bed and Breakfast	C	
Gravel Extraction & Processing			Dude/Guest Ranch		
Amusement/Resort			Residential short-term Rental	y	
Commercial Amusement	Y	Y	Agricultural Support/Service	L	L
Campgrounds			Institutional Residential-Other	C	
Outdoor Recreational	Y	Y	Residential		
Indoor Recreational	y	y	Agricultural Employee Housing		
Tour Operators/Outfitters	y	y	Conventional Single-Family Unit	y	
Ski Slopes	y	y	Conventional Single-Family Subdivision	y	
Home Uses			Planned Residential	y	
Home Occupation Home Businesses	y		Planned Unit Development	y	
Day Care Home, Family	y		Mobile Home		
Day Care Home, Group	y		Mobile Home Park		
Cottage Industry			Working Ranch Subdivision		
Aeronautical			Guest House/Guest Unit	L	
Airports			Accessory Residential Units	y	
Landing Strips			Institutional Residential/Employee Housing	y	
Heliports			Nonresidential		
Balloon Operations			Agricultural		
Industrial			Agriculture	L	L
Institutional			Nurseries	L	L
Light Industry					
Heavy Industry					
Institutional					
Institutional	C	C			
Utilities	C	C			
Day Care Center Group	y				

Y:::Permitted by Right, C:::Conditional Use , S:::Special Use

L= Limited -See Text for details

EXAMPLE DEVELOPMENT

Land Use by Sub- Area	Sub- Area 1 Motel	Sub- Area 2 KM6	Sub-Area 3 Love Ridge	Sub-Area 4 Love Ridge Vicinity	Sub-Area 5 Pine Lodge	Sub- Area 6 Mid - Mountain	TOTAL For All Sub- Areas
Condominium Units (Number)	10	15	40	28			93
Hotel Room (Number)	698	100		32	60	28	918
Total Units	708	115	40	60	60	28	1,011
Statistics: Lodging SF/Guest	234	330	481	398	225	255	276
Total Guests (Number)	1,436	260	160	176	120	56	2,208
Above-Ground Uses (Square Feet)							
Lodging	336,000	86,000	77,000	70,000	27,000	14,000	610,000
Lobby / Reception	12,000	6,000			1,000	2,000	21,000
Conference / Meeting	9,000	40,000			2,000	3,000	54,000
Assembly	1,000	23,000					24,000
Commercial: F&A	27,300	11,000				3,000	41,300
Commercial: Unassigned	11,200	42,000	4,000		11,000		67,200
Commercial: Theaters		9,000					9,000
Health Club, Daycare, Ski School, Etc.	17,000						17,000
Services: Back of House & Storage		17,000					17,000
Services and Circulation	8,500				5,000	1,000	14,500
Supply & Mech	2,000						2,000
Services - Offices	3,000						3,000
Supply - Public		6,000					6,000
Office		4,000					4,000
Outdoor Recreational Uses	25,000						25,000
Total Above-Ground Building Area	452,000	244,000	81,000	7,000	45,000	23,000	915,000
Underground Uses (Square)							
Hack or House		18,000					18,000
Supply, Mechanical, Maintenance	18,000	28,000					46,000
Services Loading / Circulation	84,000						84,000
Loading Dock Area	6,000	22,000					28,000
Kitchen Storage Services					4,000	7,000	11,000
Maintenance / Services	20,000						20,000
Storage and Misc.				5,000			5,000
Supply Services – Public		2,000					2,000
Underground Conference		22,000					22,000
Underground Assembly		9,000					9,000
Lockers + Health Club	20,000						20,000
Total Underground Building Area	148,000	101,000	0	5,000	4,000	7,000	265,000
Ground Surface Area (SF)	551,000	284,000	217,000	611,000	282,900	770,000	2,716,500
Floor Area Ratio (FAR)	0.82	0.86	0.38	0.12	0.16	0.03	0.34

VI. DESIGN GUIDELINES

A. Introduction:

Division 2500 requires Design Guidelines, which establish standards for buildings, spaces, signs and lighting within the PRO. These Design Guidelines respond to and specifically address the standards set forth in Section 2550-m-3 of the Town of Jackson Land Development Regulations that state:

- **Character and design.** *As indicated on the Community Issues Map of the Jackson/Teton County Comprehensive Plan, Snow King Resort will continue its role as a unique, resort-oriented urban commercial node serving both visitors and residents. Improvements and expansions at Snow King will solidify its role as the main convention and conference facility in the community. Factors and resort characteristics important in Snow King's future development include:*
 - (1) *Capitalization on the location at the terminus of Snow King Avenue.*
 - (2) *Creation of a sense of arrival.*
 - (3) *Creation of an active, attractive, pedestrian streetscape along the eastern end of Snow King Avenue.*
 - (4) *An attractive, safe and direct pedestrian streetscape connection to the Town Square.*
 - (5) *A layout that blends the edges of the resort into neighboring developments, creating a porous edge to the resort that encourages pedestrian travel into and through the area.*
 - (6) *Structure sizes and layout that draw people into the resort area.*
 - (7) *A continuity of architecture and activities within the resort, creating a multi-use sense of place.*
 - (8) *Pathways throughout the resort and connections to the Jackson Hole pathways system.*
 - (9) *Continued provision of the amenities of "town hill" skiing.*

The following Design Guidelines address the specific characteristics and issues excerpted above. These Design Guidelines will be administered by the Snow King Resort Master Association (SKRMA). Final Development Plans will be reviewed and approved by SKRMA prior to presentation to the Town for approval as per Section 2530. B.

The visual presentations accompanying this Master Plan show the character and quality of the buildings that these guidelines will produce. New development is intended to visually enhance the existing resort, add a new and exciting dimension to the Town of Jackson, and blend with the built and natural landscape. The plaza, storefronts and entry tower are intended to provide a pleasant and attractive Snow King Ave. streetscape, inviting to the visitor or resident approaching from the West.

B. Design Guidelines. Character and Design Objectives

1. Capitalization on Location at Terminus of Snow King Avenue

The current main entrance to Snow King Resort is at the East end of Snow King Avenue. This entrance will remain and be strengthened in a number of ways. The entryway will be re-graded to a slightly gentler slope and equipped with snow-melting surfaces. The street frontage will be lined with three-and four-story buildings with retail uses at street level and other uses above. These buildings will create an important street edge designed to provide visual interest to pedestrians and motorists. The East/West axis will be improved with the addition of landscaped islands that will screen the paving surfaces and soften the approach. The entrance to the hotel will be brought further West by means of a large Porte Cochere, which will serve as a drop-off for the hotel and conventions users, as well as for buses, cars, shuttles, limousines and taxis.

2. *Creation of a Sense of Arrival*

By expanding the Porte Cochere and creating a courtyard, the sense of arrival is enhanced and circulation, both pedestrian and auto, clarified for the arriving guest. Consideration is given to loading and unloading requirements for both guest and residents attending functions at the Resort. The large vehicular plaza is designed with large vehicles (buses, outfitter vans, and trailers) in mind. The row of buildings along the south side of Snow King Avenue, starting with the entry Tower and plaza at the west, will help draw people visually into the resort and is an important feature necessary to create a sense of arrival. Pedestrians will be able to walk along an outdoor arcade lined with retail windows, providing visual interest and shelter from the weather.

3 & 4. *Creation of Pedestrian Streetscape Along East Snow King Avenue and a Connection to the Town Square*

The addition of buildings fronting the street with retail and commercial uses will enhance the pedestrian experience by adding visual interest, sidewalks and lighting. Snow King Resort will work in concert with the Town of Jackson to direct pedestrians between Snow King Resort and the Town Square. Willow, King and Cache Streets are all options for pedestrian connections to downtown.

5. *Porous Edge Encouraging Pedestrian Travel*

The building edge along Snow King Avenue is articulated to reduce the apparent bulk and scale of the two-, three-, and four-story structures. Small retail and commercial spaces connected by a covered arcade will disguise the parking structure behind and give an active and inviting facade. By using different building heights and varying the roof forms, the street edge is given scale and visual interest. The facade facing Snow King Ave. East of Willow is designed to integrate with potential future development along the north side of the street. The open areas to the East and West will encourage hiking and biking up the mountain. On the West, behind the ballpark, the [One Town Hill](#) building will define the western edge of the resort and be visible when approaching the Resort from the North. The large open space area between the Snow King Center and the [One Town Hill](#) will continue to act as a magnet for mountain access and be enhanced with additional outdoor activity areas.

Deleted: Pine Lodge

Deleted: Pine Lodge

6. *Size and Layout that Attracts People*

The new master plan is built around three primary outdoor spaces, each of a very distinct character and purpose. The centrally located Entry Court, with re-graded drive and expanded pick-up and drop-off areas, is the vehicular centerpiece of the new plan. Arriving visitors will be able to pull in under the cover of the Porte Cochere and will be directed to check-in areas or to the convention center. Access to the parking structure will be clearly marked and easily accessed. The second major public space is the plaza above the parking structure, which is affronted by lodging/commercial buildings. This entirely pedestrian space connects the main hotel, the convention center and other condominium and hotel wings through a pedestrian bridge, to the Snow King Center, the Ski hill, and Phil Baux Park. This pedestrian plaza is to be lined with food and beverage outlets, shops, kiosks and outdoor activities and is intended as the center of pedestrian activity for the Resort. The third major public space is the Pool Courtyard, which will be enhanced under the new master plan with terraced gardens, water features, and hot tubs stepping up the hill from the hotel lobby. This space commands south sun, exceptional views up to Snow King Mountain and is well protected from prevailing winds. This will be the recreational centerpiece of the hotel and condominium complex and will also be visible from the main hotel lobby attracting guests to the outdoors. The new Health and Fitness Club will overlook and connect to this Pool Courtyard. The effect of these three spaces will be to give the visitors distinct spatial and programmatic experiences and will serve to attract and amuse people in many different ways.

7. *Continuity of Architecture and Activities/Multi-Use Spatial Sense*

The spatial experience outlined above is enhanced by the fact that it incorporates mixed uses and by the variety of activities that will take place at the Resort. The mixture of retail, office, restaurants recreation, and lodging mimic the uses typically found in active urban areas, and the proposed density is necessary to activate these outdoor spaces.

8. *Pathways Connecting to Pathways System*

The Pathways and Trail system is the backbone of the Snow King Resort Master Plan. The proposed system will provide a nexus for the regional trail system. The special location of the Snow King properties allows for East/West and North/South Trail and Pathways connections. Special emphasis is placed on the separation of pedestrian and vehicular circulation and the creation of meaningful interior and exterior spaces for pedestrians to congregate. The pathway system within Snow King Resort expands, and connects to the off-site pathways (See Summer Circulation and Pathways and Winter Circulation and Pathways).

9. *Continuation of the Amenities of "Town Hill" Skiing*

The Snow King Ski Hill is intended continue in operation as an amenity for both residents and guests alike. Skiing, sledding and other activities figure prominently in the new Snow King Master Plan. The increased intensity of the resort is hoped to lead to an expansion of the amenities as the need arises.

C. Design Guidelines. General Purposes

The purpose of these conceptual design guidelines is to give some idea of the physical character that is being envisioned in this Master Plan and will be used to assist Snow King Resort in the planning, design and construction of projects build under this master plan. They reflect the goals of the master plan in attempting to create a true resort experience with visual variety, pedestrian activities, and a unique character which will make the resident and visit or experience more memorable. It is the intent of these guidelines to strike a balance between control and creativity, to allow enough flexibility in the choice of materials and style to give life to the resort, while at the same time maintaining a sense of cohesiveness. The world's great cities were not designed by one architect at one time, but rather grew and developed over time with the creative input of many. Snow King Resort is attempting to create a broad enough palette of possible materials and design elements to encourage a unique blend of architecture, which will give it variety and visual interest.

Snow King Resort has an important role as anchor for the Town, a counterbalance to the Town Square and the proposed Visitor and Multi-Agency Camp us at the North end of Cache Street. As such, it must act as a terminus, a destination for both residents and tourists. This Master Plan, by adding significant intensity to the Resort, makes it a much more varied and desirable destination than it currently is. The combination of Convention Facilities, the Snow King Center/ice Rink, an array of lodging facilities, retail, commercial functions and a Health Club/Spa, all reinforce Snow King's role as a multi-use center for the community.

As the Master Plan builds on the existing Snow King Resort, so do the architectural guidelines, which build on the existing character that has developed during the life of the resort. The new architecture of the Snow King Resort will build on the community character of Jackson with well-designed buildings, clean rooflines, taper-sawn shake roofs and a clearly expressed structure. The materials palette, while encouraging a preponderance of wood and stone, will also include stained concrete, painted or oxidized steel, stucco, and high quality cultured stones.

Indigenous architecture has long had a powerful association for people who visit the West, from the log cabin in the woods, to the burl wood columns in the Cowboy Bar. Snow King has established a

character that is clean and somewhat modern. Its new character must tie to the old and yet be firmly rooted in today's world. While rustic character has been adopted for other resorts, a more direct simple architecture that capitalizes on large areas of glass, simple roof forms and tautly detailed elegant materials, will distinguish Snow King from other Jackson experiences. Tying the new buildings with the old will create a powerful and unique style for Snow King as it develops in the new millennium.

The resort and convention business has changed over the years and the new Snow King Master Plan incorporates changes intended to keep it apace in this intensely competitive business. By more effectively attracting today's conferences and tourists, Snow King will continue to provide a strong economic infusion for the community.

Section 2550. G requires Design Guidelines that establish parameters for buildings and spaces in the Planned Resort following this outline.

1. General. *The design theme of the Planned Resort shall have an emphasis on outdoor recreational activities and create a sense of place. A sense of place is created when site planning and architecture:*

- a. Concentrate activities and human interaction into identifiable spaces, such as a plaza or mall;*
- b. Assemble a build environment that connects buildings, spaces and structures through common scale, design and materials;*
- c. Incorporate into the build environment the natural features and cultural heritage of the area; and*
- d. Produce an identifiable image that is associated with the planned resort and with Jackson Hole.*

There shall be visual continuity among the resort structures and design elements without unduly limiting variety in design. Development shall be compatible with the surrounding built and natural environment in both scale and character.

2. Architecture. *Building design guidelines shall reflect:*

- a. The community's architectural character and themes*
- b. A human scale, pedestrian-orientation, which are created when:*
 - (1) The height of buildings does not overwhelm people walking beside the buildings; and*
 - (2) The ground level doors, windows and design features of buildings create an interesting diversity for people walking past the buildings.*
- c. A built environment in keeping with the cultural and aesthetic values of the community*
- d. Natural attributes of the immediate vicinity*
- e. Building materials and colors compatible with the surrounding natural and built environment.*

3. **Bulk and scale.** The design guidelines shall ensure the bulk and scale of individual buildings within the Planned Resort achieve compatibility with:

- a. Other structures within the Planned Resort, when the resort development is completed, and
- b. Neighboring structures that are not a part of the resort, and
- c. The natural environment.

4. **Signs.** The design guidelines shall include a sign component that sets forth the sign theme for the Planned Resort and specifies criteria for determining permitted sign sizes types and locations. The guidelines shall contain prototypical examples of all types of signs, including wall, canopy, freestanding, directions, and informational signs. The flexibility extended to Planned Resorts via this Division, to propose standards for signs different from those specified in Chapter 15.28, Signs, of the Jackson Municipal Code, is encouraged with the purpose of having sign guidelines in keeping with the unique character and needs of the resort.

5. **Lighting.** The design guidelines shall include an analysis of proposed project lighting. Areas to be illuminated (parking areas, walkways, entries, etc.) shall be identified and general standards should be set forth. Identification of models and types of standards and fixtures is encouraged, but specific illumination plans and photometric footprints are not required. Generally, lighting shall be low-intensity, low-profile, and shielded to avoid "light pollution" and glare to offsite areas. General illumination standards are set forth in Section 49370, Exterior Lighting and Glare.

6. **Site planning.**

A. **Orientation and aspect.** Structures and public spaces within the Planned Resort, generally shall be arranged with views of, and access to, the principal resort recreational amenity.

b. **Entrance features.** Entrances to the Planned Resort shall create a sense of arrival. A sense of arrival is created when the entrance into the Planned Resort is easily identifiable and is consistent with the design theme of the resort.

c. **Natural Resources.** The site design shall highlight the natural resources within the Planned Resort and integrate them into the layout of the resort in order to promote a connection to the natural environment. Consequently, natural features of the site, such as significant vegetation, rock outcroppings, water bodies, etc., shall be preserved and incorporated into the project design to the extent practicable.

d. **Pathways and pedestrian facilities.** Pathways and pedestrian facilities, including access for the disabled, shall be integral components of the site design. The site shall provide an attractive, outdoor atmosphere that encourages use and reliance upon pathways and walkways.

- (1) **Safe, convenient and direct access.** Pathway and pedestrian systems shall provide safe, convenient, and direct access throughout the resort, to public lands, transit facilities and the existing or planned community pathway system, when adjacent to the resort.

(2) Pathways. Pathways shall be provided for non-motorized transportation, except motorized wheelchairs for the disabled shall be permitted. Bicycle racks, ski racks, etc., shall be provided at various destination points within the resort.

e. Transportation facilities. Site design shall integrate safe, convenient, and direct access to transportation services and facilities (i.e., bus shelters, information kiosks,) and shall incorporate the facilities necessary for the proper functioning of the Transportation Demand Management Plan (see subsection H.2, below).

f. Circulation. The layout of local street, alleyways, and parking lots shall be sensitive to the natural terrain and landscape. Cut and fill areas shall be minimized and natural features of the site such as wooded areas, rock outcroppings and water bodies, shall be preserved to the maximum extent practical.

g. Access. Safe vehicular access appropriate for refuse removal, recycling, emergency services, and delivery shall be provided. Service access shall not create unsafe conflicts with automobile and pedestrian access to primary destinations within the resort.

h. Landscaping. Project landscaping including hardscape areas shall be consistent with the overall design theme of the resort. Use of indigenous plant materials is encouraged. Existing vegetation shall be preserved and incorporated into the design of the project to the extent practical, especially wooded areas and other significant vegetation which provides shelter or habitat for wildlife.

The Guidelines and the plans and sketches incorporated in This Master Plan, when considered as a whole, address the above sections of Division 2550.

D. Architectural Design Guidelines

1. Building Form, Massing and Character: Buildings must feel as if they fit in the context of the Town of Jackson. They should not seem "imported" from someplace else. They must not overwhelm the pedestrian scale. Building masses will be broken down through the use of covered arcades at pedestrian levels and thru the use of building envelopes that require the structures to step back away from the street or plaza.

Architectural forms will be simple and practical, not elaborate. They must reflect an ability to deal with the severe climate and have honesty and directness similar to the best indigenous structures such as barns and sheds, or some of the structures in Yellowstone and Grant Teton National Parks.

In general, building forms should be used to create definable public spaces between buildings. Buildings affronting plazas should create an edge that defines the space. Buildings on the south side of a plaza step back above the second story to allow light into the plaza. Where building facades face the mountains or non-pedestrian spaces, buildings will be allowed to rise without necessarily stepping back.

Buildings should be sited to help shape the spaces around them and to create a sense of "street space" by lining up with adjacent buildings where possible.

Buildings should employ various architectural devices to help bring the masses to a more friendly, pedestrian scale. Changing materials, breaking the wall line, using different roof forms and adding balconies or projecting bays are some of these devices.

Larger buildings may be broken into smaller elements that appear to be an aggregation of smaller buildings. Overly differentiated facades on a single building are to be avoided however.

2. **Roofs:** in order to be sympathetic to the existing Snow King Resort, new buildings must relate to existing architecture by using similar roof forms, generous roof overhangs, and some similar materials such as heavy timber beams holding up roofs overhangs.

Primary roofs must be sloped and in keeping with existing roofs, their slopes should predominantly be in the range of 4:12 to 7:12. Flat roofs and parapet roofs will be allowed where they act as connectors from one gabled roof to another and at larger spaces where necessary and not visible from street or plaza levels or where practical for best incorporating structures into the surrounding built environment. Special consideration is to be given to designing roofs in reference with nearby pedestrian uses. Roof materials should be as consistent as possible throughout the Resort. ▼

Large roof overhangs should be held up by heavy timber beams or knee braces. Eave lines should be kept thin to avoid the heavy look of typical cold roof structures with 20" fascia's.

3. **Exterior Materials:** Buildings shall sit on masonry bases, and feel as if they are firmly rooted in the ground. Stone, cultured stone, stucco, synthetic stucco and concrete will withstand the extreme weather conditions and pilling up of snow along the foundations.

Appropriate materials above the ground level will predominantly be stone, cultured stone, wood siding, wood shingles, heavy timber, logs and glass. Other materials such as brick, stucco, synthetic stucco, oxidized steel, and board-formed concrete will also be allowed to a lesser extent. Buildings should have texture and visible structural purpose.

4. **Windows:** Windows at the pedestrian level should be as large as possible given the function behind them. For retail and/or hotel frontage windows should represent approximately 75% of the linear frontage.

Above the ground floor, there is no minimum requirement of window to wall. In keeping with the existing Snow King Hotel and its available views in all directions, large windows are encouraged. When in heavy walls of stone or concrete, windows should appear to be "punched", and they should have lintels of timber or stone. Metal clad windows, wood windows, and non-reflective aluminum storefront windows are all permitted. Darker colors of the windows are encouraged.

Deleted: Sloped roof materials will be limited to fire-treated cedar shingles or shakes, standing seam copper, or oxidized steel.

Divided light windows, if used, must have real divisions, either true divided light or simulated divided light with metal spacers between the double panes of glass. Snap-in false mountings will not be permitted. Generally larger expanses of glass are preferred to small divisions.

5. **Commercial Frontage, Entryways:** At the pedestrian level, Retail and Hotel storefronts should appear light, glassy and as transparent as possible. As a goal, approximately 75% of the linear frontage of walls opening onto the public plazas and arcades should be glass.

Stone, stained concrete, and painted steel are recommended materials for the pedestrian level walls between the glass.

6. **Decks and Balconies:** Decks and balconies add functional amenity to the resort but also become part of the design palette used to add character and create variety on the building exterior. Where possible balconies and decks should be located to take advantage of solar exposure and/or views. Long, linear balconies are not permitted.
7. **Walkways:** To promote the sense of a unified resort with pedestrian accessibility, buildings should have covered walkways on facades along which connections can be made to other buildings in the village. Wherever possible these walkways should have retail stores and restaurants and other visually interesting spaces along them. All buildings must take into account pedestrian access to all adjacent buildings and the rest of the Snow King Resort.
8. **Color:** The use of color should support and reinforce the overall design theme for Snow King Resort. As a year-round resort, colors chosen must work well in all seasons and help the resort blend with its town context as well as with the natural landscape. Color schemes should be built around natural materials, such as stone and wood. Earth hues, natural colors of foliage, deadfall timber and dried grasses are all appropriate. Primary or bright colors should be used sparingly, as accents to highlight the more muted color schemes. Use of "day glow" colors is not allowed. On wood, stains are preferred over paint.
9. **Lighting:** The lighting systems will serve functional and aesthetic roles that include:
 - Providing security and visual safety
 - Serving as directional indicators for vehicular and pedestrian traffic
 - Providing extended outdoor use time, particularly in pedestrian areas,
 - Reinforcing the identity and character through form, color, and materials of fixtures, visual light quality and placement

Lighting must be designed and configured in conformance to Town of Jackson standards. Light sources must be shielded so as not to reflect direct light upon adjacent buildings or properties.

Pedestrian scale lighting: The use of low level light sources at the pedestrian scale to accent or illuminate the ground plane provides a special opportunity to reinforce Snow King's unique identity and character. This is achieved by the use of proper fixtures at lower mounting

heights to produce a more intimate effect. At night, the fixtures provide light necessary for safety and visual effect. By day, the fixtures should lend animation and scale to the pedestrian environment. Fixtures at a maximum height of 16 feet will be used for these pedestrian areas. Painted steel will only be used for accent.

Additional pedestrian scale lights may be used including bollard lights at approximately 42' in height, and canister type lights on overhead structures. Lighting for pedestrian areas should be incorporated into the buildings whenever possible.

- 9. Disabled Accessibility:** Consideration for the disabled must be a part of the design process for any project. Every structure shall be accessible by the disabled through the use of ramps (not to exceed 8%) and/or elevators. All outdoor pedestrian areas must be accessible.

10. Sub Area 2. Specific Guidelines.

One of the key design elements is the pedestrian connection between the existing hotel area and the Snow King Center. This connection is intended to be made through a pedestrian mall located above underground parking. It is intended that this route be lined with covered arcades as defined below, and given ample visual and special variety to create a lively streetscape.

Key components of this pedestrian mall are:

Properly scaled buildings lining a properly scaled "street", storefront spaces with a predominance of glass, interesting shop windows and doors inviting to the pedestrian, indoor and outdoor food and beverage outlets, visual variety and not just a straight line of facades. Public spaces, lobbies, restaurants and similar extroverted uses should be placed along the mall to help enliven the spaces and make them inviting to passersby.

As a means to allow, and in fact require, this kind of streetscape in a future design whose exact programmatic needs are to be left flexible, a number of rules need to be followed:

- A 65' wide "overlay" zone has been created and called the "Pedestrian Mall Overlay." This overlay defines an area of Primary and Secondary pedestrian connectors that must fall within this overlay. See Pedestrian Overlay Drawings in the Dimensional Limitations Chapter of this Master Plan.
 - Two types of Pedestrian Connections are established: Primary and Secondary.
 - The width of the connections is flexible but is governed by the following parameters:
 - Primary Connection:** The open width of this connection shall be between 25' and 65' and should be able to structurally support fire equipment loads. Building height along this Primary Connection is governed by a 1 to 1 proportion of height of building to width of Pedestrian Connection, so where the Connection is say 35' wide, the height of buildings on either side shall not exceed 35'. In the event that there is room left in the maximum height plane of the building envelope grid, buildings can set back a minimum of 8' and extend up to the limit set by the building envelope grid. The 3-dimensional building envelope grid, as defined in the Schedule of Dimensional Limitations Sub-Area 2, shall take precedence. Areas designated T-1 and T-2 in the building envelope grid has special parameters as described in the Dimensional Limitations Plan.
- Primary Connections must be lined, on at least one side, with a covered arcade ranging in width from 10' to 16' and at least 12' in height. Structural elements such as beams, trusses and knee braces may drop below the 12' height to a minimum of 9'.

-Secondary Connections are not subject to the above height to width limitation. However, these secondary connections must measure a minimum of 16' in width and 12' in height and are to occur approximately within these Secondary Connection overlays. These secondary connections can be bridged by buildings above, as long as the covered area does not exceed 40' in length.

- Building facades must be articulated, and are not permitted to run straight for more than 200' in length. Jogs or setbacks breaking a straight run must be at least 8' in depth. Curved facades will be allowed and considered breaks.
- Building facades must be organized into a base, middle and top, with appropriate changes of material, varying of the massing and the use of balconies to help break down the massing of the buildings.
- Among the conditions of approval of this Masterplan were proposed revisions to the schedule of dimensional limitations regarding the height and massing of building envelopes fronting Snow King Avenue along its South side. These conditions have been addressed in the building envelopes that are part of this Master Plan. These envelopes, as shown herein, are now in compliance with the conditions of approval. Town staff will review the final design of Sub-Area 2's public thoroughfare frontage at the Final Development Plan stage to ensure that this street level frontage is treated architecturally to achieve the appropriate scale.

As the Snow King Resort develops, these guidelines will ensure that it does so in ways that will greatly enhance its character and make it a more exciting place to visit.

Within this Chapter, as well as in the Schedule of Dimensional Limitations Chapter, drawings and sketches have been included. These are intended to clarify and define the intent of the written guidelines.

E. Site Design Guidelines. Plant Palette.

Site design at the Snow King Resort focuses on plant palette and design, pedestrian circulation, site architectural features and the colors and materials that comprise the build environment. Snow King's setting is both urban and rural. On the one hand the in- town location provides a diverse urban design context. This context generally implies that the site design will be dominated by landscape with formal plantings. Conversely, the resort is built into the base of a forested mountain and is bounded by the Bridger-Teton National Forest. This context usually implies a more random or natural site design. The objective will be to intertwine these two design goals, in a transitional manner, without creating confusion.

Just as the resort straddles a seam between the urban and rural environments it is located at the interface of three different plant communities. The lower portions of the site are dominated by the sage/grassland and the Aspen/Chokecherry communities; remnants of these communities still exist along the eastern boundary of the PRD. The higher, moister portions of the site exhibit a Douglas Fir and Spruce plant community.

Plantings around the resort should mimic these existing communities. Replication of the endemic plants also provides an excellent opportunity to provide visitors with information about the local flora. These plants will also provide an adaptable palette necessary to flourish in the wide variety of moisture, light and temperature conditions, which large buildings create and will also help to weave the rural with the urban environments.

Other planting materials of sufficient caliper will be used to screen and enhance the buildings. In general, the plant material will be in accordance with sections 4140, 4150, 4160, and 4170 of the Land

Development Regulations, except for areas designated as Ski Trails and Outdoor Recreation.

Within Sub-Area 4, only evergreens will be used to minimize visual impacts.

Deleted: 6 and the upper reaches of Sub-Area

Detailed Landscape Plans will be part of each Final Development Permit Application.

F. Pathways and Circulation Elements

As described in Section 2550. G.6.d., the Planned Resort District is designed to *'provide an attractive, outdoor atmosphere that encourages use and reliance upon pathways and walkways.'*

The proposed pathway and circulation system of the Snow King Resort is comprised of a network of diverse pedestrian passageways that collectively provide a full range of use and circulation functions throughout the resort and adjacent properties. The system is intended to extend and enhance the existing pedestrian/recreations fabric of the town as well as to accommodate the functional demands of the proposed Snow King Resort expansion. In order to facilitate future pedestrian traffic growth, both within and without the PRD, direct and convenient linkages to transit facilities, parking and community pathways are incorporated in the system.

The proposed pathway system consists of the following physical components:

- 10' wide paved bike /pedestrian pathways
- Concrete sidewalks and stairs
- Heated concrete sidewalks and stairs
- Paved pedestrian pathways and plazas
- Gravel surfaced trails (pedestrian only)
- Gravel surfaced hiking /mountain bike /horse trails

The primary objectives of the proposed pathway system can be described as follows:

To provide links to existing paths the planned trail system connects to the [Sink or Swim](#) Trail up the mountain and to the East-West and Hagen Trail leading to Cache Creek.

To encourage pedestrian use. The pathways system is integrated into the proposed and existing buildings to create an open, convenient, non-hierarchical system of movement. By not directing or restricting pedestrian traffic the user is encouraged to wander and explore. The buildings and paths are situated in such a way that the pathways can be perceived as extensions of the internal building passageways, thereby, further encouraging pedestrian use.

The pathways system also promotes utilization by providing facilities for recreational activities including walking, hiking, running, biking and riding.

To provide safe pedestrian movement Much of the KM6 and Hotel Sub-Area pedestrian spaces located outside the Extent of Winter Skiing boundary are proposed to be heated for winter use. Pedestrian pathways are to comply, where feasible due to topographic conditions, with ADA requirements.

To provide an aesthetically pleasing and enjoyable experience. The pathways system takes full advantage of the natural attributes of the site and the various exposures to long vistas.

G. Signage

Signage within the resort can be divided into two categories: resort signage and commercial signage. Resort signage provides direction to basic resort services. It is to be homogenous in style, color and material. Commercial signage advertises services or products for individual businesses. Consequently, great latitude of style, color and material must be anticipated.

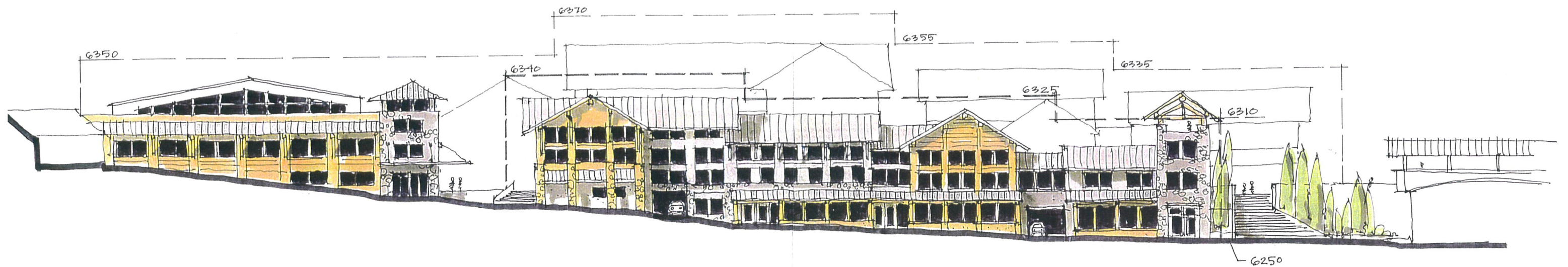
Sign Face Materials: The primary goal is to employ materials, which are non-reflective and have a soft or smooth textured appearance. Some acceptable material examples are: wood which has a natural oil or flat paint finish, unfinished metals which oxidize to a flat finish, or metals painted with a flat finish and other materials which can be shown to have flat, non-reflective surfaces.

Sign Standard Materials: Generally, the preferred standard material will be stone, stained concrete and wood. Standard materials should relate to the context of the site, particularly to the building with which they are associated. Signs should be incorporated into the structure of the building rather than being stuck on the outside as an afterthought. Metals, plastics and other material may be acceptable if it can be shown that they relate to and integrate the sign into the site and/or building. Large structures could be introduced at the Resort's entrance to enhance the sense of arrival, but must be composed of wood or stone.

Sign Face and Standard Color: Colors should generally be muted earth tones similar to the endemic Jackson Hole soils. The use of earth tones in non-reflective media is another subtle method of unifying the build environment with its rural surroundings. This color theme is not intended to prohibit bright colors entirely; however, it is intended to define the predominant surface area of the sign face and all of the base and/or standards.

Signage Lighting: Fixtures for lighting sign faces should be incorporated into the structure of the sign. The fixture should be a 90-degree cutoff type, which is adjusted to prevent the lamp from being visible.

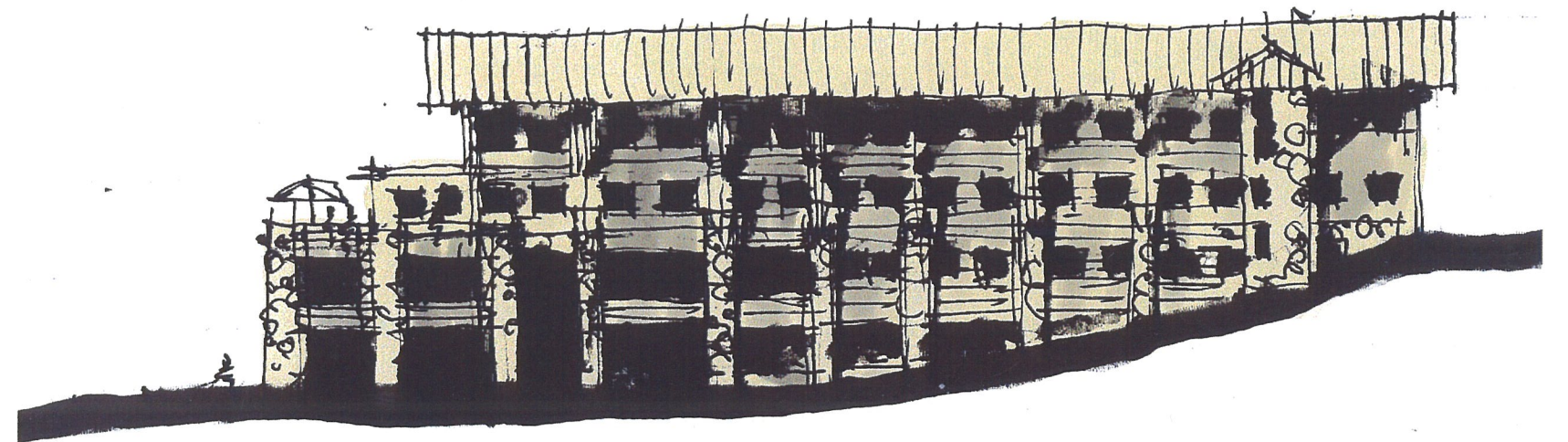
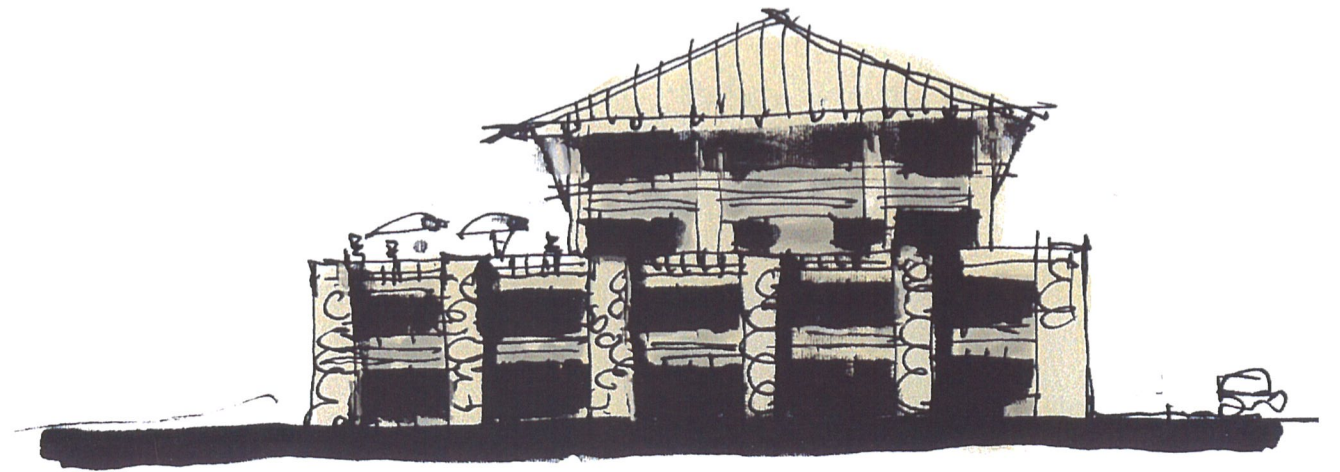
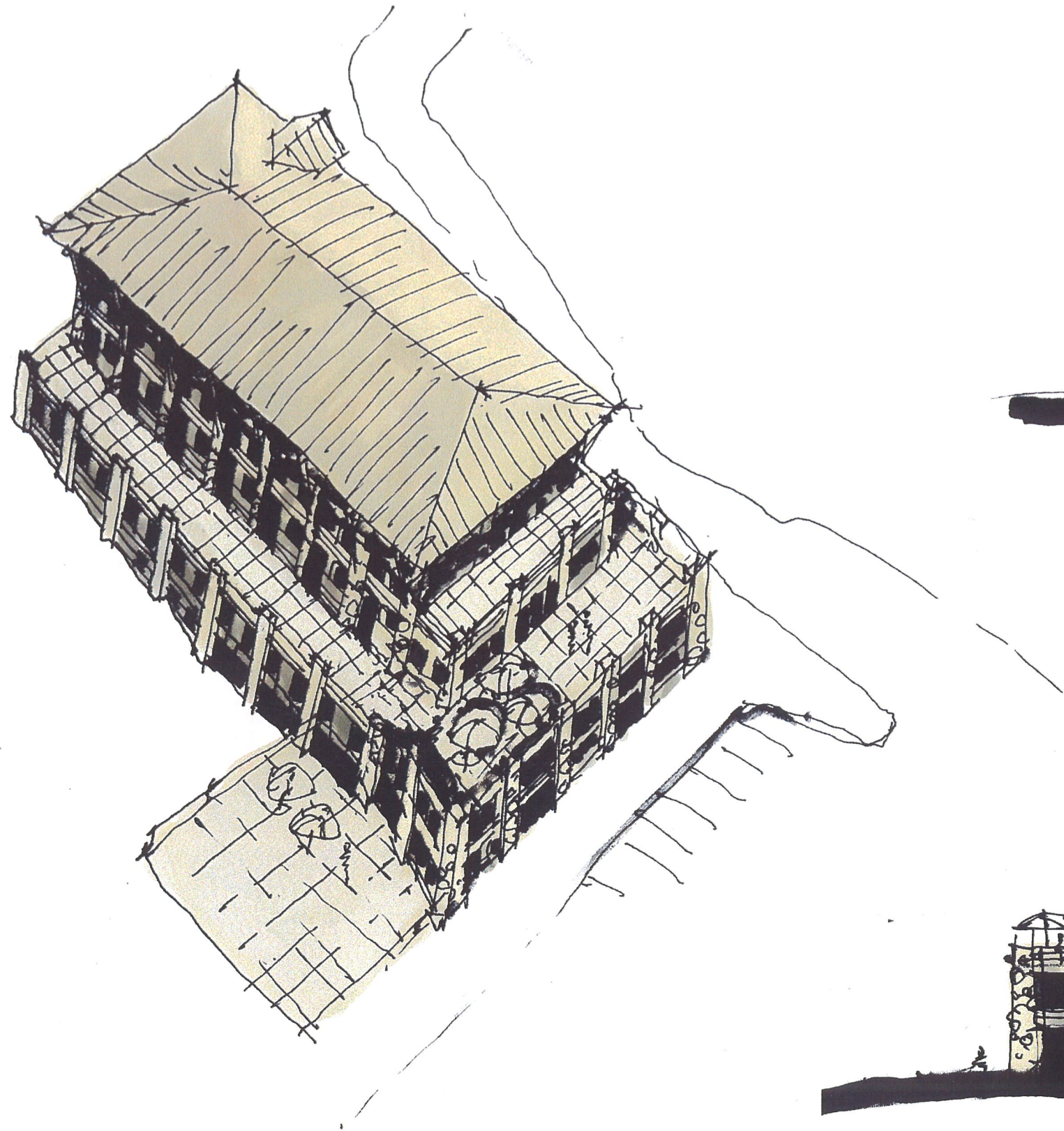
A detailed signage program for the Resort will be prepared, for Town Staff approval, prior to filing the First Final Development Plan Application.



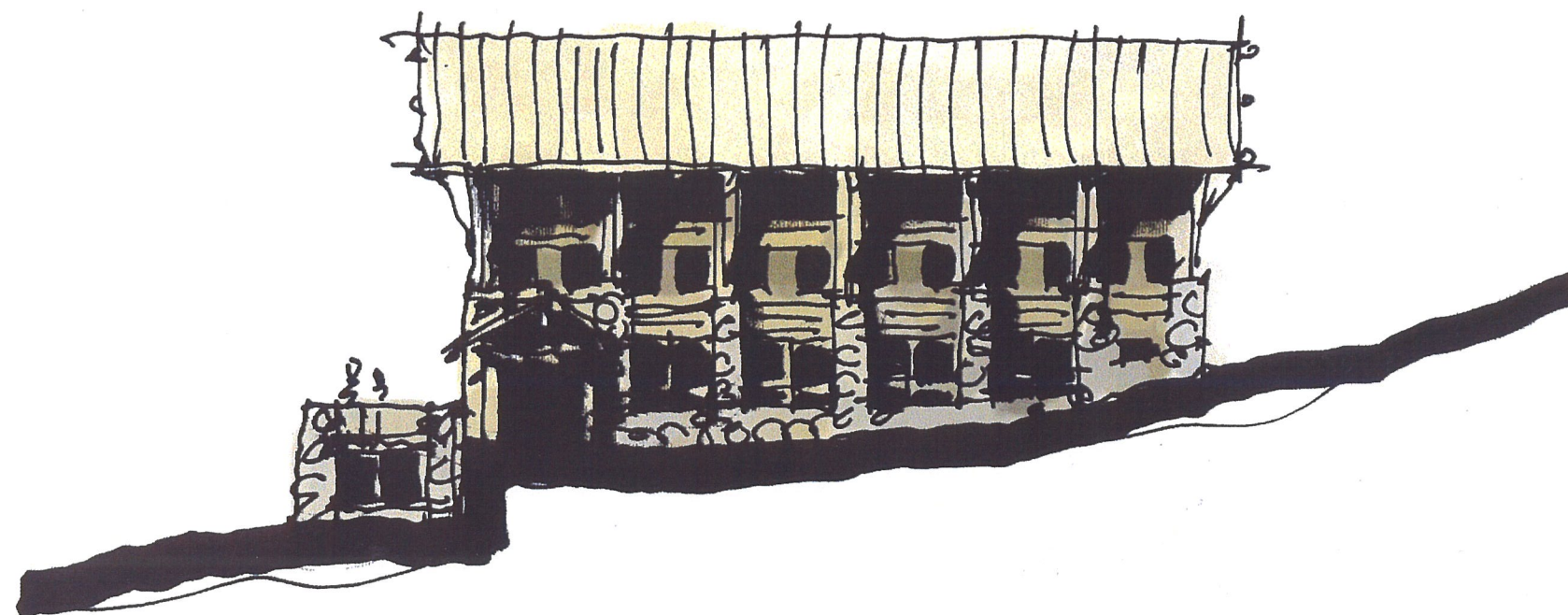
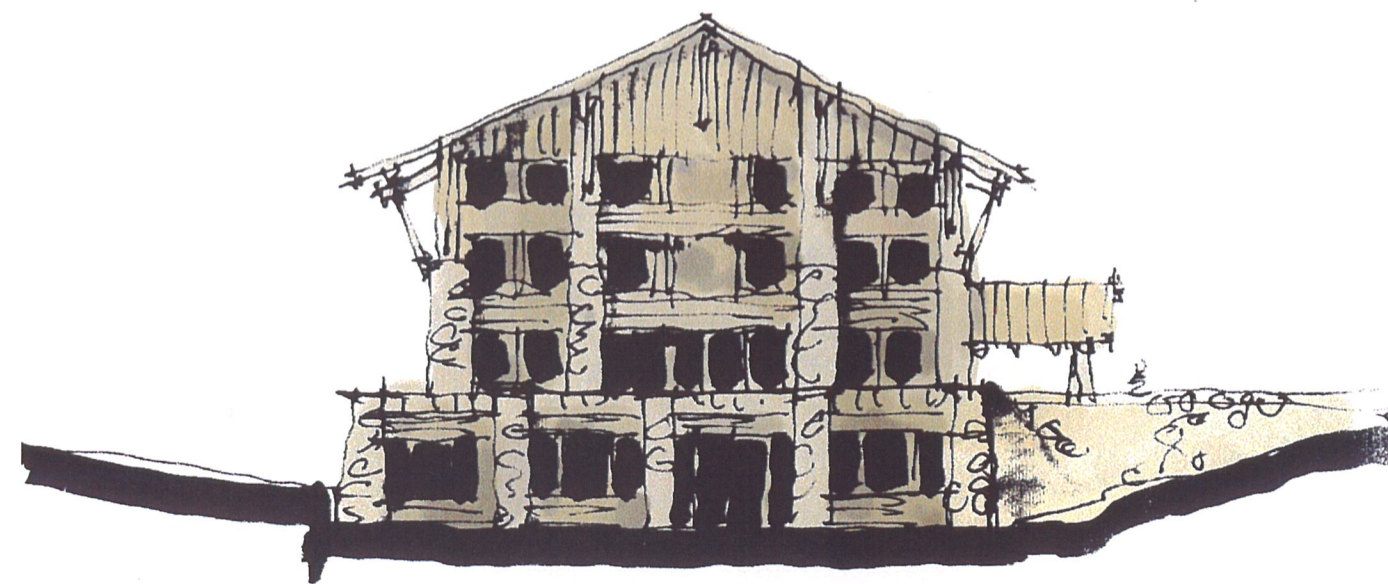
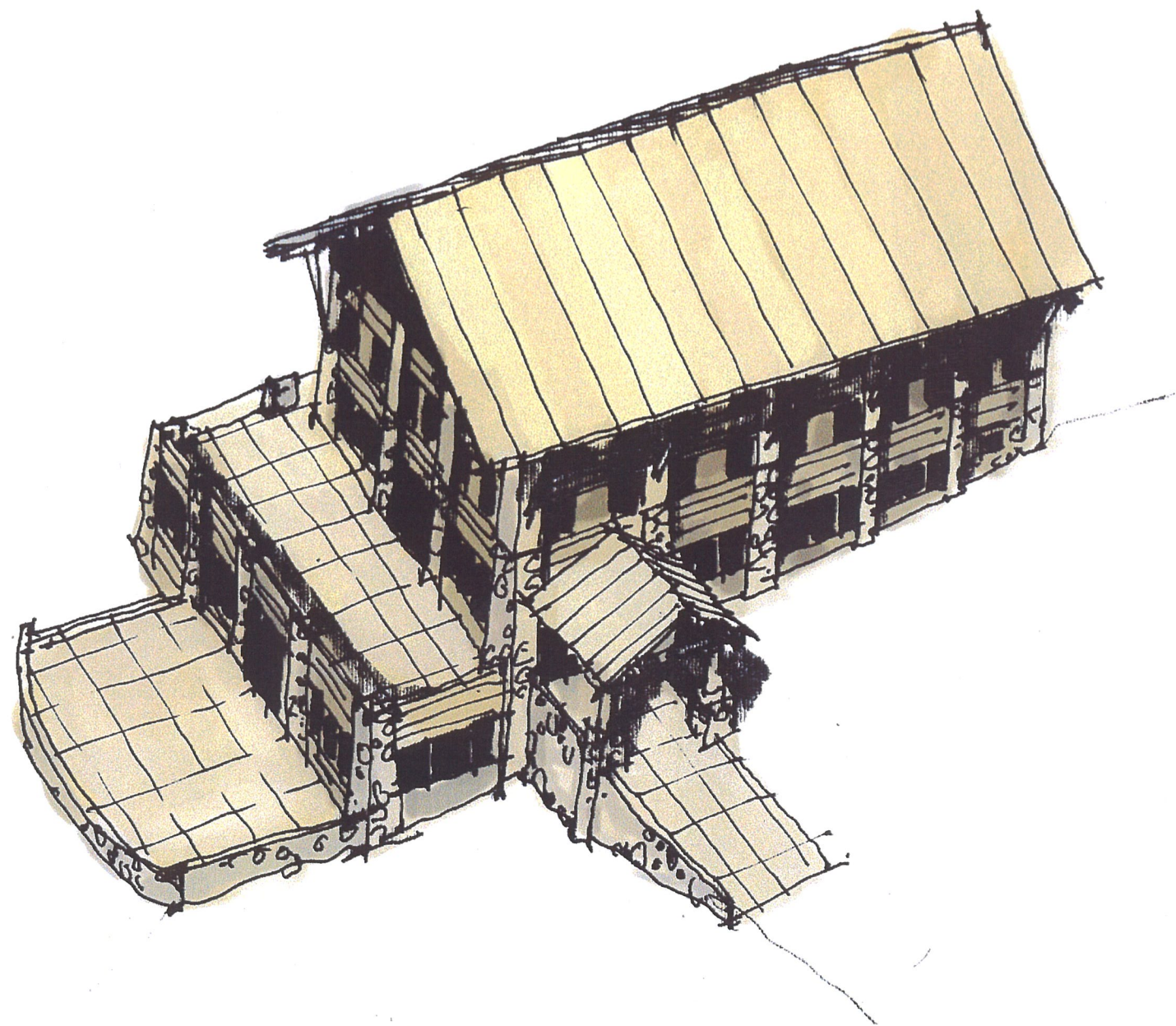
SNOW KING MASTERPLAN - ELEVATION ALONG SNOW KING AV.
27 FEB 01

VI. H. 1

Architect's Supplemental Sketches • KM6 BUILDINGS



VI. H. 2



VI. H. 3

Architect's Supplemental Sketches • MID-MOUNTAIN LODGE



Snow King View of Mid-Mountain Lodge from North of Visitor's Center

VI. I. 1



VI. DIMENSIONAL LIMITATION PLAN

A. Introduction, Definitions and Maximum Scale of Development

This Dimensional Limitation Plan has been prepared in accordance with the requirements of Section 2550.E.:

Dimensional Limitation Plan. *The Planned Resort Master Plan shall have a Dimensional Limitation Plan, which specifies dimensional limitations necessary to achieve the design theme identified by the applicant. The plan shall include floor areas and floor area ratios, densities, landscape ratios, height, setbacks, building envelopes, etcetera, or other lines delineating areas on which restrictions of development are to be imposed and areas in square feet for each lot or building.*

This Master Plan presents a Dimensional Limitations Plan that takes into account the topography of the site and the unique role of the project. As specifically permitted in Section 2550.B, these dimensional standards differ in several respects from standards described in other sections of the Town's Land Development Regulations.

A great deal of care has been given in the performance-based Design Guidelines and this Dimensional Limitation Plan to balancing the various goals of this Master Plan with the visual impacts of the development. The site's topography helps achieve this balance.

It should be noted that two existing buildings on the site are rather large, but fit into the mountain landscape. The existing hotel has over 130,000 square feet and is over 70 feet in height at places, while the Snow King Center has over 53,000 square feet. However, these buildings relate well to their location and are designed in such a manner as to disguise their size. The site's topography is appropriately used in this Master Plan in order to attain the major goals stated in the Statement of Purpose while minimizing impacts.

Many goals and objectives listed in Division 2500 and discussed in the Statement of Purpose necessarily lead towards larger buildings than those alluded to in other sections of the LDR's. Division 2500 recognizes that fact and encourages a different approach to dimensional limitations as necessary to achieve these goals. Creating a sense of arrival, vibrant pedestrian spaces, structure sizes that draw people to the area, concentrating development in order to create meaningful open spaces, reducing walking distances, having a central arrival point, proximity to parking and creating a lively urban environment necessitate a dense development pattern for some areas of the resort. Some buildings are necessarily large in order to accommodate the desired size of the conference center as well as to have lodging within a reasonable, and preferably indoors, walking distance to the conference facilities.

Other goals, such as creating porous edges and blending into existing neighborhoods are also taken into account. The topography of the site assists in achieving the stated goals of this Master Plan in a successful mixed-use development. When combined and taken as a whole, the performance guidelines of this Dimensional Limitation Plan, the Design Guidelines, Land Use Plan and Site Plans are balanced to achieve the stated goals.

The Snow King Dimensional Limitation Plan is based on a method of three-dimensional building envelopes and is presented in a mostly graphic format. This method, when combined with the

performance based Design Guidelines, the Land Use Plan and the Site Plans, achieve the goals and objectives of this Master Plan while allowing flexibility and controlling bulk and scale within the integral pedestrian fabric of the Resort. This Plan adapts, and is well suited, to the site's topography as well as other site-specific considerations such as soils, vegetation coverage, solar and wind factors and proximity to common amenities.

This Chapter also includes photographs of a model used to demonstrate the 3-dimensional building envelope concept used throughout this Master Plan.

Since the lands comprising this Master Plan are unplanted and are not yet subdivided, setbacks are drawn and based only on the perimeter property lines. Setbacks at specific perimeter locations vary according to the relationship to adjacent areas.

Building envelopes defined in this Master Plan are intended to suggest approximate locations only and shall be allowed to be adjusted while keeping within the overall theme and rationale of this Dimensional Limitation Plan and the Design Guidelines. Final Development Plan applications and the approval process defined in Section 2530. B will finalize the details of each phase of development. Minor deviations on the locations and sizes of building envelopes can be approved by the Town's staff.

Sub-Areas 3 ~~is~~ controlled under separate procedures:

Sub-Area 3:

Lots 1 through 10 are to remain as previously approved, for the development of 40 condominiums. Lots 11 and 12 will be used for recreational and residential development, respectively, as previously approved. (Love Ridge Plat # 941). These 2 lots are exempt from the Schedule of Dimensional Limitations and floor area parameters. Lot 12 will be developed as a residential lot. Lot 11 will comply with the Recreational Land Use Zone parameters of this Master Plan.

Building area developed, and guest (APO) allocated within Sub-Area 3, will be deducted from the total building area and guest (APO) allowed within this Master Plan. The 10 condominium buildings within Lots 1 through 10 of Love Ridge are estimated to contain approximately 77,000 SF of Building Floor Area. Therefore, the Maximum Building Floor Area left over for Sub-Areas 1, 2, 4, and 5 ~~is~~ (915,000 SF-77,000 SF= 838,000 SF) 838,000 SF. The 40 condominiums in lots 1 through 10 equal 160 guests (APO) leaving (2,208 - 160 = 2,048) 2,048 remaining guests (APO) for Sub-Areas 1, 2, 4, and 5.

As previously mentioned, development within ~~the existing condominium area~~ will be controlled in accordance with the "Statement Regarding Existing Condominiums".

Building Envelopes.

The three-dimensional Building Envelopes for Sub-Areas 1, 2, 4, and 5 are shown in the attached Sub-Area maps. The location and dimensions of Building Envelopes are a result of their relationship to the natural topography and landscape, the vicinity areas, pedestrian circulation, visual impacts, proximity to open spaces, desired vistas from interior spaces (both public and private), accessibility to common parking and underground services and other design considerations. The best locations have been chosen to create meaningful open spaces and interior/exterior circulation areas. Higher

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levels of intensity are allocated near these areas. A computerized three-dimensional model was also used in preparing this Dimensional Limitations Plan.

Special consideration has been given to blend the development into existing neighborhoods. At the East end of Snow King Avenue, the buildings facing the street have been kept at a lower level than those behind the pedestrian plaza. Only some higher points are interjected to assist in creating a sense of arrival. A transitional space is created at the Willow Street corner. The [One Town Hill](#) defines the western edge of the resort and frames the access point to the mountain.

The mountain's presence and dense vegetation act as a background to Sub-Areas 1 and 2. Consideration is given to the location of higher buildings in relation to this background and the appearance of these buildings from different angles, especially the approach to the resort and the views from adjacent neighborhoods.

Building envelopes describe and define the approximate three-dimensional parameters for building height and building ground coverage as well as the buildable scale of non-recreational development including building height within specific areas. These envelopes provide predictability regarding the scale of maximum potential development. Modifications of building envelopes are allowed, provided that the overall theme of the Resort as defined in this Master Plans remain in place.

The envelopes are defined in the Sub-Area plans in a plan view with the maximum top elevation of the roofs within the envelopes specified in the elevation number for each envelope. This elevation number refers to the Town of Jackson elevation datum. Chimneys, vents and roof top mechanical equipment shall be allowed to penetrate the top plane by no more than 4 feet. Decks, awnings, roof overhangs, exterior stairs, railings, parapets and other outdoor spaces will be allowed to penetrate building envelopes. Location of roads, walks, patios and other impervious surfaces is not restricted to building envelopes.

The height of Building envelopes located within Sub-Areas 4 and 5 are not indicated in the graphic format. Buildings within Sub-Area 4 envelopes will be limited to buildings in a scale similar to those already approved for lots 1 through 10 of the Love Ridge Plat.

Recreational buildings, and buildings/structures directly related or ancillary to recreational activities and functions are included in calculations of buildable square footage but are not restricted or defined by the building envelopes and coverage system. Buildings such as ski lifts, recreational improvements such as climbing walls, alpine slides, snowmaking, etc., require more flexibility in their location and site design. These structures are to comply with the Recreational Land Use Zone parameters.

Example Development.

This Master Plan and the Sub-Area Plan, indicate an Example Development. This Example Development has been used to calculate requirements for parking, employee housing, storm water run-off, traffic generation, employment, impervious surfaces, building coverage and utilities. This Example Development also responds to the estimated present day needs to support the conference center's size and other recreational and commercial infrastructure necessary to invigorate the resort and make it economically viable. As years pass the relative allocation of various land uses will adjust and vary according to market conditions while keeping within the specific Limits of Development stated herein.

Deleted: Pine Lodge

Deleted: The scale of the mid-mountain building in Sub-area 5 is graphically depicted in the Design Guidelines Section.

The Example Development has also been weighted towards land uses producing larger impacts than others. For instance, most of the Lodging Capacity of 2,048 guests has been allocated to hotel rooms as opposed to condominiums, since hotel rooms have greater impacts per square foot, and per guest, on traffic, parking and housing than condominiums. In reality, however, it is expected that lodging uses will mostly take the form of condominiums.

Areas shown in the Sub-Area tables for Roads and Parking, OSR/LSR and total Impervious Surfaces are provided for informational purposes only and are not to be construed as maximum levels of development within Sub-Areas. References to Building Coverage equate to building footprints and have been used for calculations of storm water run-off. Final determination of actual development within each Sub-Area will be ascertained at the Final Development Plan stage. However, overall maximum development must comply with the Setbacks, Open Space Ratios, Maximum Building Floor Area, Floor Area Ratio (FAR) and Lodging Capacity limits set in the Sections that follow.

Recreational Land Use Zone.

The areas located outside the graphically defined building envelopes are designated as Recreational Land Use Zone.

Deleted: Love Ridge 's Lot 11 is also located within this Recreational Land Use Zone.

Specific Considerations Related to Sub-Area 2

Certain specific parameters are part of Sub-Area 2's Limitations. The Pedestrian Mall Overlay Zone is graphically depicted in this Chapter (page VII. H) and further discussed in the Design Guidelines Chapter 4 of this Master Plan. This Overlay Zone restricts the height of buildings bordering the Primary Pedestrian Circulation Connection and establishes parameters for Primary and Secondary pedestrian connections.

Two areas (designated T-1 and T-2 in page VII. D) have special parameters. Within Building Envelopes T-1 a tower feature not exceeding 25% of its surface area can penetrate beyond the envelope ceiling (6310 and 6290) to a maximum height of 6330. The remaining 75% of these envelopes are restricted to the 6310 and 6290 limits. The Building Envelope designated as T-2 is excluded from the "Pedestrian Mall Overlay Zone" height guidelines, but restricted to the 6350-maximum height of the envelope as depicted in VII.D.

At the corner of Willow and Snow King a Plaza/Entry feature is intended. Pages VII. I and VII. J depict a conceptual image of the intended use of the corner envelope.

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Specific Considerations Related to Sub-Area 3

The remaining developable lots within Sub-Area 3 consisting of Lots 53, 57, and 58 located to the South of the existing Grand View Condominiums will be developed to fit in with the bulk, scale, and character of the existing Grand View Condominiums. These buildings can be up to three stories in height with a basement and with massing, articulation, openings, and step backs used to reduce bulk and mass. Buildings on these lots may consist of one single building complex or multiple buildings in order to best create a design that fits well with the topography and neighboring condominiums. Parking is to be primarily provided on-site and generally consistent with neighboring development. Active uses, such as retail and services, are permitted on the lower two levels, with lodging, residential or office on upper floors. The minimum landscape surface ratio for these lots is 10%.

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Specific Considerations Related to Sub-Area 4

Sub-Area 4 includes property owned and operated by Snow King Mountain for the purposes of summer and winter recreational facilities. Included in this sub-area is a parcel of land located on Vine Street where a maintenance facility for the ski area has been located. The original version of this master plan called for expansion of this maintenance facility. The 2018 amendment to this master plan envisions redevelopment of the site, with a similar building mass to the originally approved maintenance facility, for use as employee housing and storage facilities for mountain operations. Employee housing on this site would be designed as a dormitory complex for seasonal work and travel student employees with no requirement for on-site parking due to the fact that these

employees do not have vehicles. This building is envisioned to include enclosed storage facilities for mountain operations on the ground level. The existing mountain maintenance facility is proposed to be relocated to Sub-Area 5 to the South of the existing ice rink. This building would have a maximum height of 42 feet with a flat roof or 46 feet with a pitched roof. A flat roof may be desirable for this location to better integrate with the neighborhood and adjacent Snow King Loop road.

Specific Considerations Related to Sub-Area 5

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Sub Area-5 primarily serves as the West Base area for Snow King Mountain ski area operations and contains the One Town Hill development. Proposed future development in this sub-area consists of an on-mountain maintenance facility for Snow King Mountain that would sit to the South of the ice rink and service grooming and snowmaking equipment as well as house a pump house for snowmaking should the existing snowmaking pump house be moved for a proposed future gondola. The building would be a maximum of two stories with the second level providing office space for mountain operations. Roof design for this building may be either flat or pitched to accommodate the usage and best integrate with the existing building and hillside. In addition, a mountain sports training facility is proposed as a new indoor recreational facility on the West side of the existing ice rink. The maximum height of this building, or addition to the ice rink structure would be the same height as the existing peak of the ice rink roof. The roof of this structure may be flat or pitched to best accommodate the recreational use and design of the building.

Specific Limits of Development.

The following Setbacks, Open Space Ratios (OSR), Building Floor Area, Floor Area Ratio (FAR) and Lodging Capacity will be the specific limits of development within the area of this Master Plan.

Setbacks.

Setbacks are graphically shown in the attached maps for Sub-areas 1,2, and 5.

Open Space Ratio (OSR).

Open Space Area defined a land surface not covered by buildings, structures or impervious surfaces. Ski trails and other open space recreational spaces as well as hardscape surfaces comprising pedestrian plazas, patios and outdoor function areas are also considered Open Space Areas.

Open Space Ratio (OSR) means the proportion of a development that is provided and maintained as Open Space Area.

Landscape Surface Area and Landscape Surface Ratio (LSR)

Landscape surface area means a land surface not covered by buildings, structures or impervious surface, except facilities and/or impervious surfaces specifically permitted in Section 4150, Standard Plant Unit. Once landscaped, according to division 4100, Landscaping Standards, the landscape surface area shall be left undisturbed and maintained to support plant life. Hardscape surfaces composing pedestrian plazas, patios and outdoor function areas are also considered Landscape surfaces.

Section 2550. M,3.d. specifies that:

Landscape surface area. Within areas of the Planned Resort to be developed as lodging, conference, commercial and related facilities, the minimum landscape surface ratio shall be .25. exclusive of the already permitted residential development that exists upon the enactment of this Division (Clark's Knoll, Pitchfork Townhomes, Love Ridge, and Love Ridge Addition.) Notwithstanding, the Town Council may reduce the minimum landscape surface area to no less than twenty (20) percent upon demonstration by the applicant that the following objectives are achieved with a reduced landscape surface area. The primary purposes of the landscaped areas within Snow King are to:

- (1) Create visually strong and attractive streetscapes.*
- (2) Create a porous edge to the Planned Resort such that residents and visitors in the surrounding areas are invited to enter the resort through attractive pedestrian ways.*
- (3) Support high quality urban design, including integral public spaces for interaction and public events.*

This Master Plan complies with 1, 2 and 3 above.

The following minimum Landscape Surface Ratios (LSR) are established for this Master Plan:

- For the total area of Sub-Areas 1, 2, 4, 5 and 6, the minimum LSR shall be .50
- Within the total area of Sub-Areas 1, 2, and 4 the minimum LSR shall be .25
- Within Sub-Area 5, the minimum LSR shall be .75
- Within Sub-Area 6 the minimum LSR shall be .90

Building Floor Area.

Building Floor Area is defined in Division 8300 as:

Floor Area. Floor area means the sum of the gross habitable floor area for each of a building's stories as measured from the exterior limits of the faces of the structure. The floor area of a building excludes attics, basements, cellars, unenclosed porches, or any floor space in an accessory building or in the principal building which is designed for the parking of motor vehicles in order to meet the parking requirements of these Land Development Regulations.

The key to Table 2400 of the Land Development Regulations defines basements as spaces where 50 percent or more of the perimeter is below ground level. Spaces defined as basements dedicated to various functions such as services, storage, meeting, support, loading and unloading are not included in computations of Building Floor Area, but are included when considering other impacts such as housing, parking and transportation.

Building Floor Areas Exclude:

- Areas dedicated to Employee Housing as per the Housing Mitigation Plan
- Temporary Buildings, such as Tents.

In accordance with these definitions the Total Maximum Building Floor Area for Sub-Areas 1, 2, 4, and 5 will be limited to 838,000 square feet.

Floor Area Ratio (FAR).

Floor Area Ratio (FAR) is defined in Division 8300 as:

Floor Area Ratio (FAR). Floor area ratio means the intensity of building, measured as a ratio derived by dividing the total floor area of a building or structure by the lot or sub-area.

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- The Maximum Floor Area Ratio (FAR) for the total of Sub-Areas 1, 2, 3, 4, and 5 shall not exceed .40
- The Maximum Floor Area Ratio (FAR) for the total of Sub-Areas 1, 2 and 4 shall not exceed .60

Lodging Capacity.

Lodging Capacity within Sub-Areas 1, 2, 4, 5 and 6 shall not exceed 2,048 guests (APO) as defined in Section 2550.M.2:

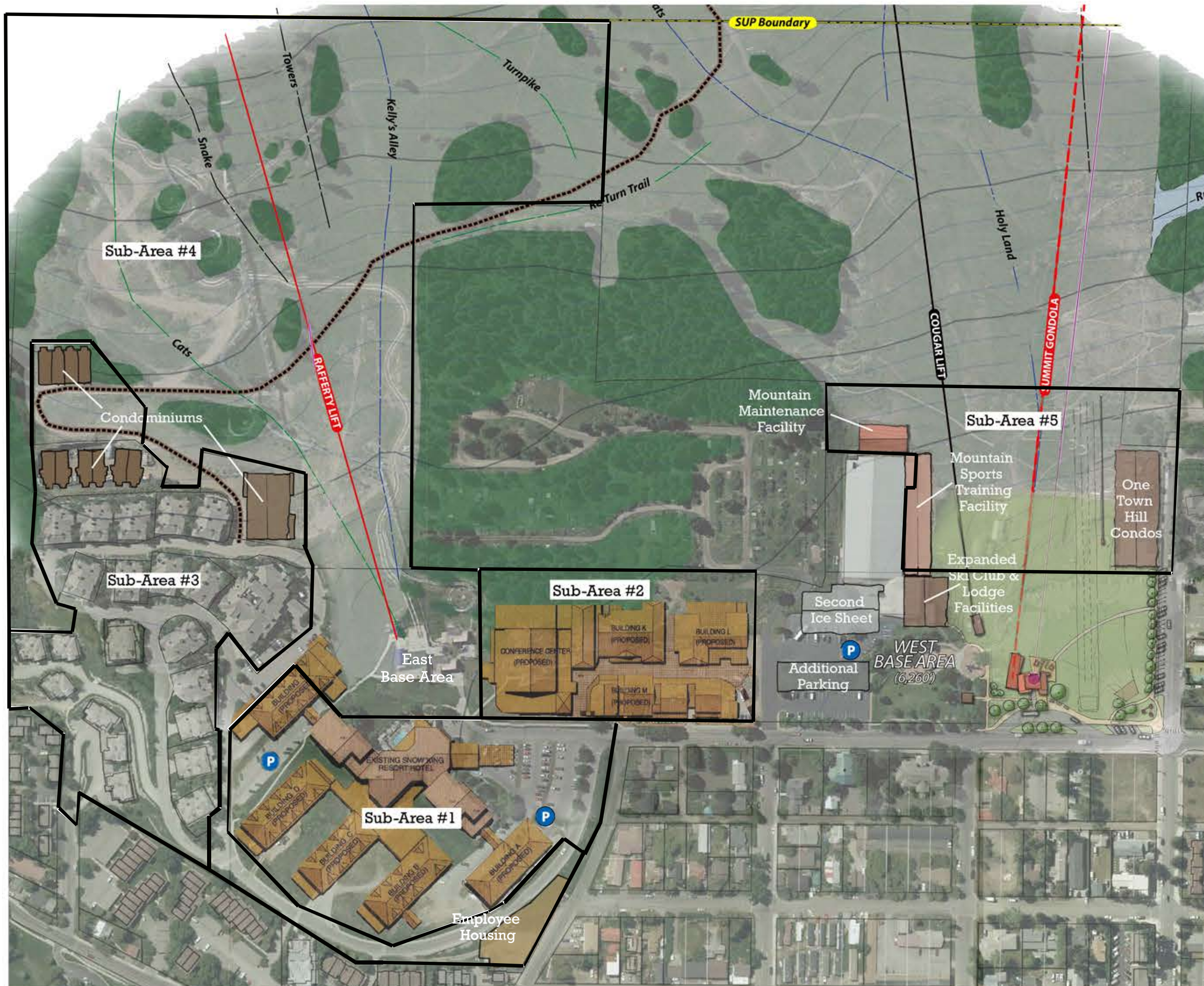
- Guest. A guest is a person who is accommodated in overnight lodging facilities within the Planned Resort. The number of guests is calculated by the "average peak occupancy" of the lodging accommodations.*
- Average peak occupancy. For the purposes of this Section, the following average peak occupancies (APOs) shall be used in calculating the capacity of guest accommodations:*
 - Hotel, motel, or similar lodging unit. A hotel, motel, or similar lodging unit that exists as sleeping quarters and does not contain other types of living spaces such as a living room or kitchen, shall be assigned an APO of two (2).*
 - Dwelling unit. A dwelling unit, used for short-term rental, shall be assigned an APO of four (4).*

Other. Other lodging facilities that do not meet the definitions above shall have an APO assigned that is the sum of the number of bedrooms the lodging facility contains multiplied by two (2).

EXAMPLE DEVELOPMENT

Land Use by Sub-Area	Sub -Area 1 Hotel	Sub-Area 2 KM6	Sub-Area 3 Love Ridge	Sub-Area 4 Love Ridge Vicinity	Sub-Area 5 One Town Hill	Sub -Area 6 Mid- Mountain	TOTAL For All Sub -Areas
Condominium Units (Number)	10	15	40	28			93
1 Hotel Room (Number)	698	100		32	60	28	918
Total Units	708	115	40	60	60	28	1,011
Statistics: Lodging SF/Guest Total	234	330	481	398	225	255	276
Guests (Number)	1,430	260	160	176	120	56	2,208
Above-Ground Uses (Square Feet)							
Lodging	336,000	86,000	77,000	70,000	27,000	14,000	610,000
Lobby / Reception	12,000	6,000			1,000	2,000	21,000
Conference / Meeting	9,000	40,000			2,000	3,000	54,000
Assembly	1,000	23,000					24,000
Commercial : F&B	27,300	11,000				3,000	41,300
Commercial : Unassigned	11,200	42,000	4,000		10,000		67,200
Commercial: Theaters		9,000					9,000
Health Club, Daycare, Ski School, etc.	17,000						17,000
Services: Back of House & Storage		17,000					17,000
Services and Circulation	8,500				5,000	1,000	14,500
Support & Mech.	2,000						1,000
Services - Office	3,000						3,000
Support - Public		6,000					6,000
Office		4,000					4,000
Outdoor Recreational Uses	25,000						25,000
Total Above -Ground Building Area	452,000	244,000	81,000	70,000	45,000	23,000	915,000
Underground Uses (Square Feet)							
Back of House		18,000					18,000
Support, Mechanical, Maintenance	18,000	28,000					46,000
Services--Loading / Circulation	84,000						84,000
Loading Dock Area	6,000	22,000					28,000
Kitchen Storage Services					4,000	7,000	11,000
Maintenance / Services	20,000	-					20,000
Storage and Misc.				5,000			5,000
Support Services - Public		2,000					2,000
Underground Conference		22,000					22,000
Underground Assembly		9,000					9,000
Lockers -- Health Club	20,000						20,000
Total Underground Building Area	148,000	101,000	0	5,000	4,000	7,000	265,000
Ground Surface Area (SF)	551,000	284,000	217,000	611,600	282,900	770,000	2,716,500
Floor Area Ratio (FAR)	0.82	0.86	0.38	0.12	0.16	0.03	0.34

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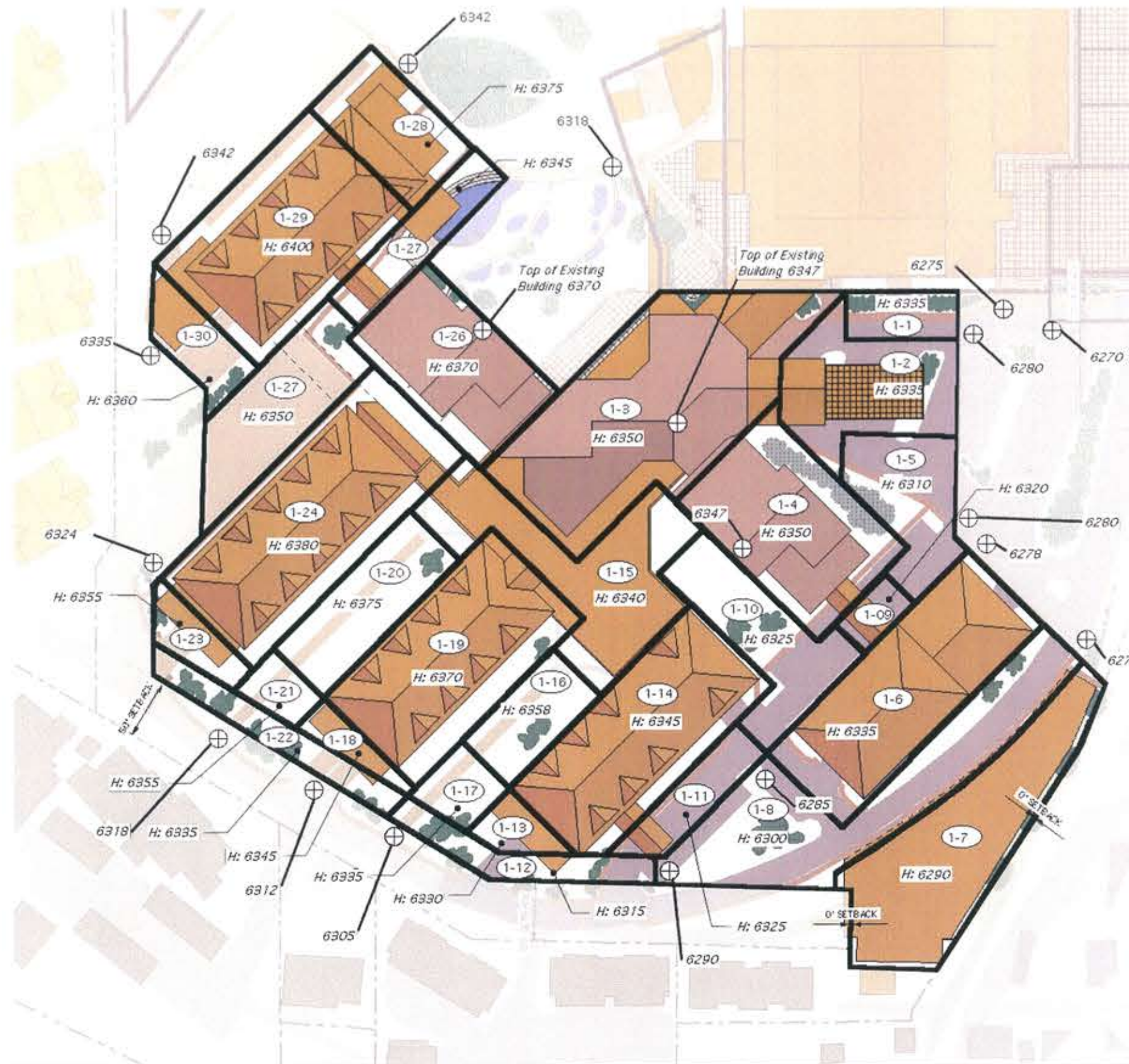


B./D. Sub-Area Plan

For planning purposes the land in the Snow King Planned Resort District has been reconfigured as follows:

- Sub-Area #1: Existing Hotel and Hotel Additions
- Sub-Area #2: KM6 Area-between Hotel and Snow King Center
- Sub-Area #3: Existing and proposed Condominiums
- Sub-Area #4: Snow King Mountain recreation area and proposed employee housing
- Sub-Area #5: Snow King Mountain West Base Area and One Town Hill

*Includes original proposed plans for Hotel and KM6 properties
Snow King Resort Master Plan



C. Sub-Area #1

Sub-Area 1 Hotel Area and Hotel / Condominium Expansion

Ground Surface Coverage

Buildings	183,000
Pavement: Roads & Parking	142,940
Walks, Pathway, Plaza, Patio	25,350
LSR	0.32
Other Impervious (Bike/Foot Paths, Tennis Courts, Etc.)	24,920

Total Impervious Coverage	376,210
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D. Sub-Area #2

Sub-Area 2 KM6 Area	
Ground Surface Coverage (Example)	
Buildings	133,000
Pavement: Roads & Parking	N/A
Walks, Pathway, Plaza, Patio	17,330
LSR	0.44
Other Impervious (Bike/Foot Paths, Tennis Courts, Etc.)	7,730
Total Impervious Coverage	150,330



Sub Area #3
Existing and Proposed Condominiums

Sub-Area 3 consists of the Grand View, Love Ridge, and Simpson Patent condominium developments and the Grand View Lodge. Lots 53, 57, and 58 are the remaining lots platted for condominium development within the sub-area. These lots are proposed to be developed in a similar style to neighboring condominium developments. Buildings on these lots are proposed to be up to three stories in height with a basement. Buildings may be designed as one single complex on each lot or broken into multiple structures to best meet design needs and to take advantage of the topography.

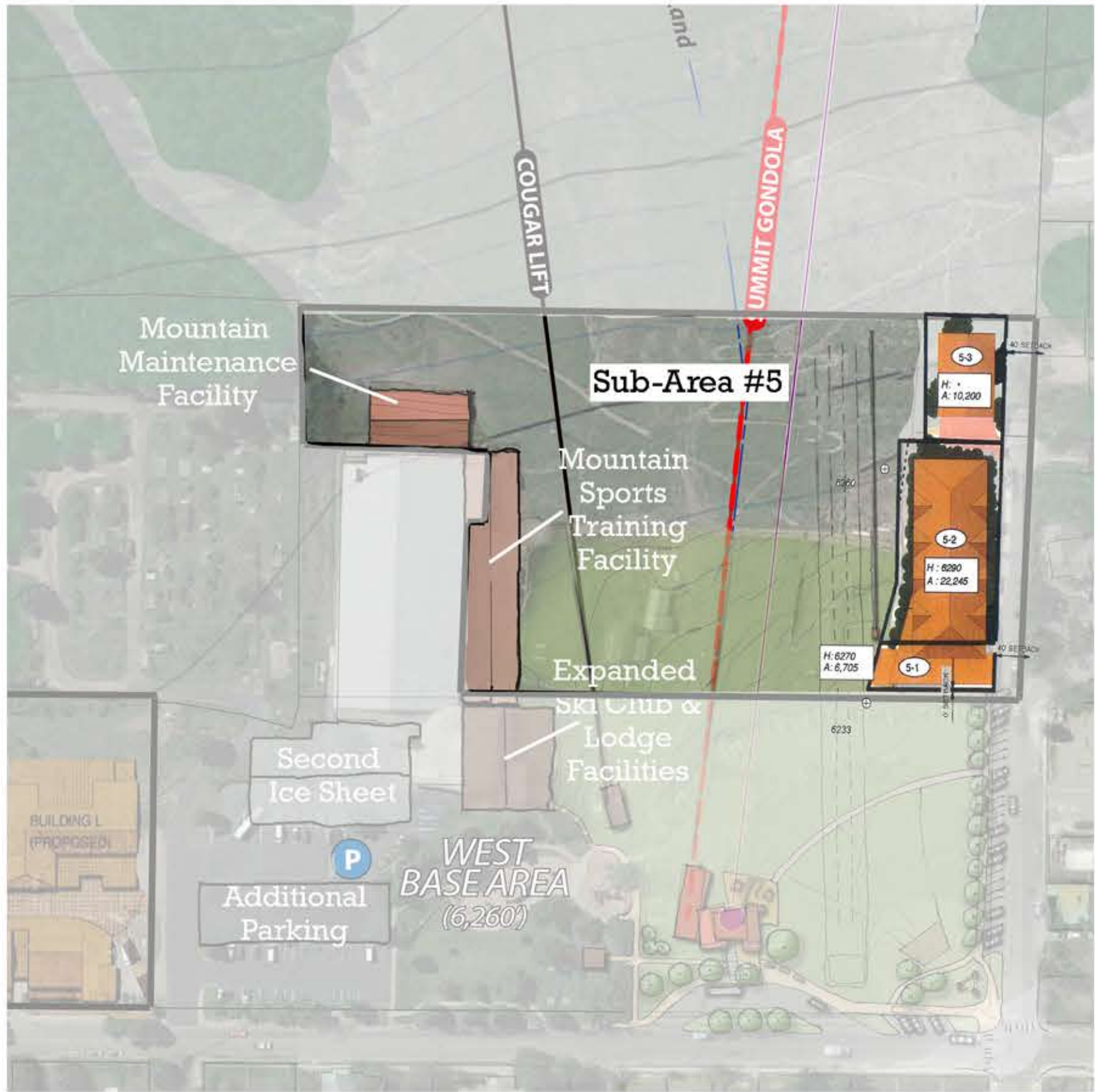


G. Sub Area #4

Sub Area #4 Snow King Mountain Recreation Area & Proposed Employee Housing

Sub-Area 4 primarily consists of Snow King Mountain recreation use area and supporting structures. In addition, this sub-area includes a proposed site for employee housing and mountain operations storage facilities on Vine Street. This building complex is proposed to house enclosed storage facilities on the street level and employee housing on upper levels.

Building Envelope Dimensions • SUB-AREA #4



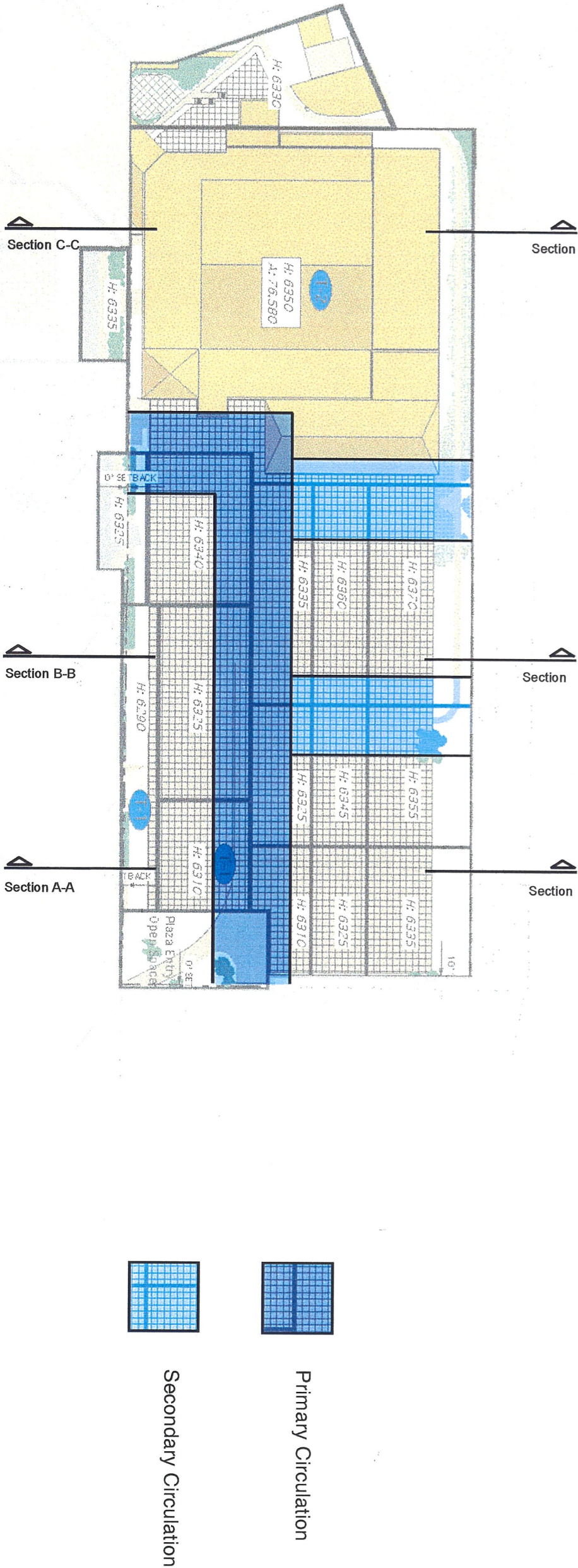
F. Sub-Area 5

**Sub-Area #5 - Snow King Mountain
West Base Area & One Town Hill**

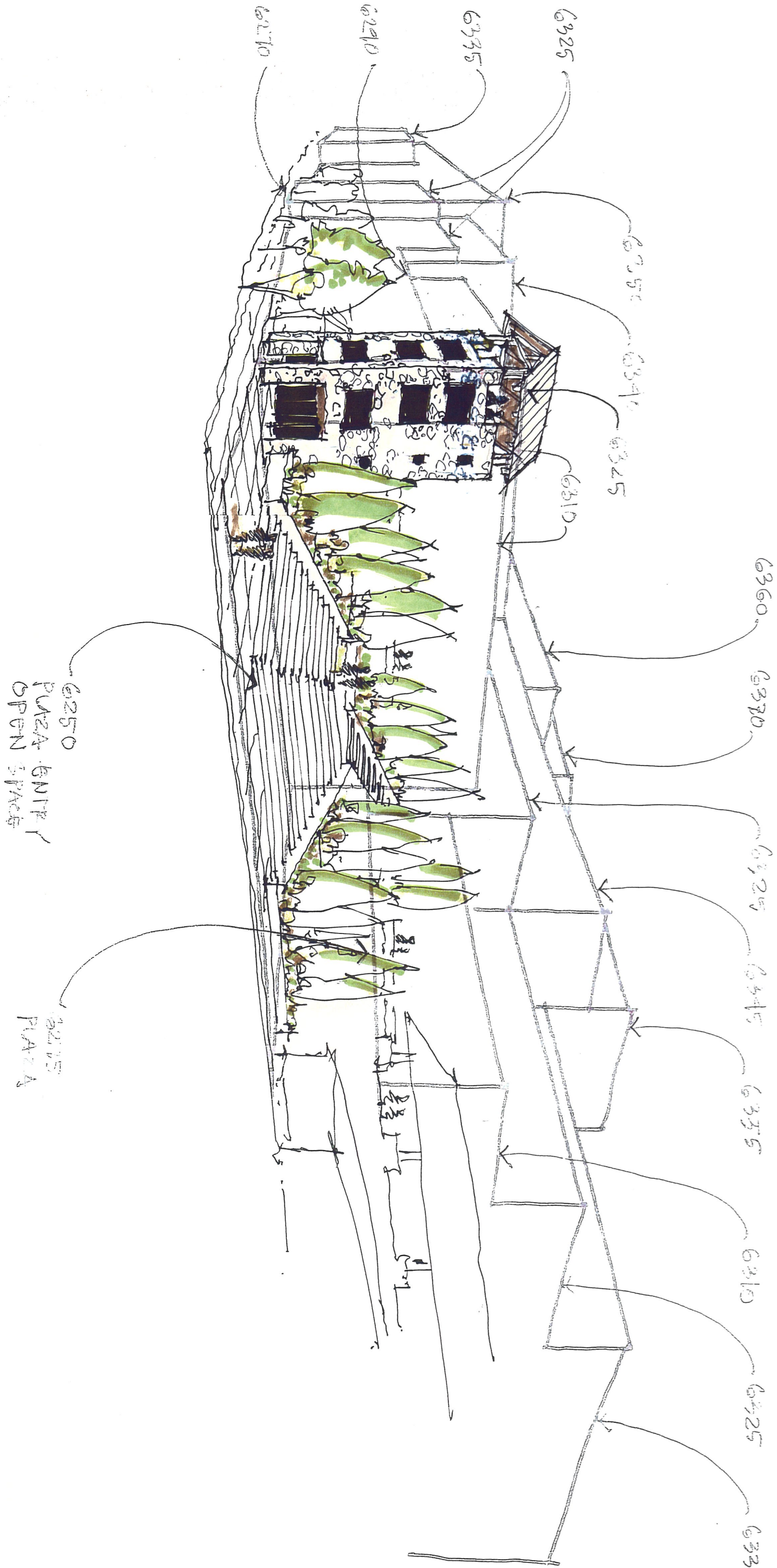
Sub-area 5 contains the West base area for Snow King Mountain ski area operations and the One Town Hill condominium complex. Future development proposed for this sub-area includes a maintenance facility and office spaces for mountain operations, snowmaking pump house, and a mountain sports training complex. These additional buildings would be attached or constructed adjacent to the existing Snow King Sports and Event Center ice rink. While not directly within this sub-area, a gondola and other recreational activities are also proposed to be located in the parking lot of the existing Phil Baux park to replace the existing Summit lift located within sub-area 5. The location of the gondola in the parking lot allows for more open space at the base of the mountain and the potential for additional green space in Phil Baux park.

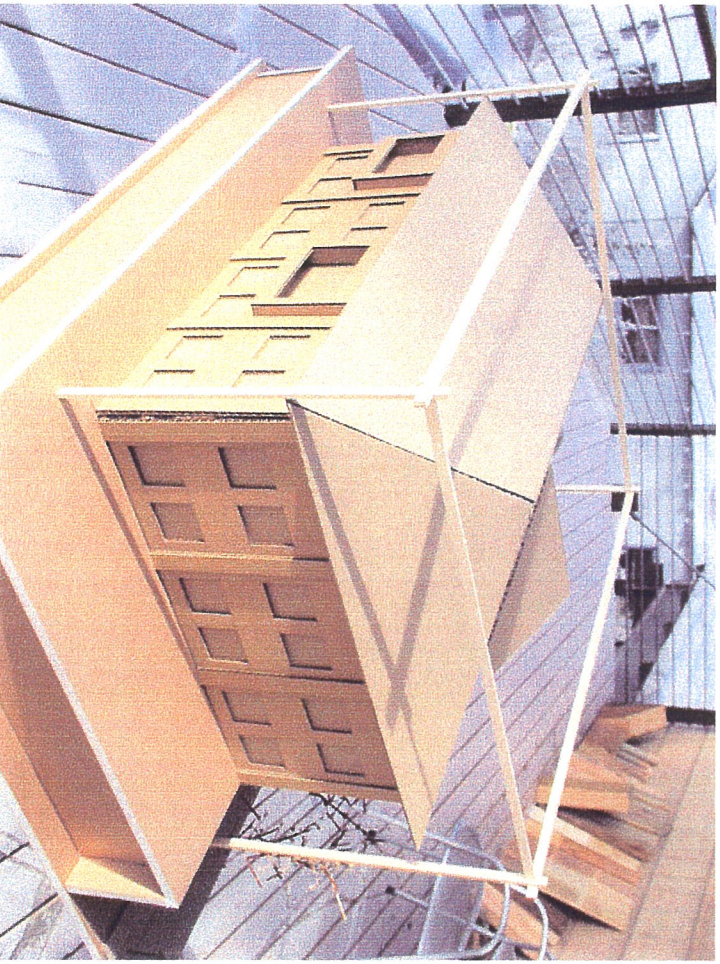
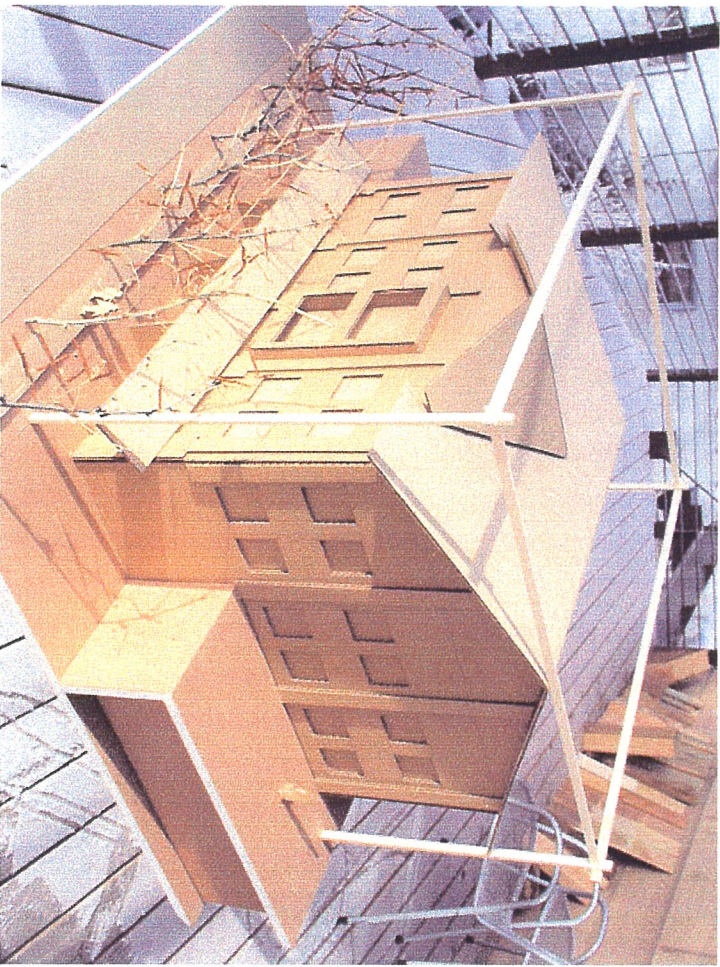
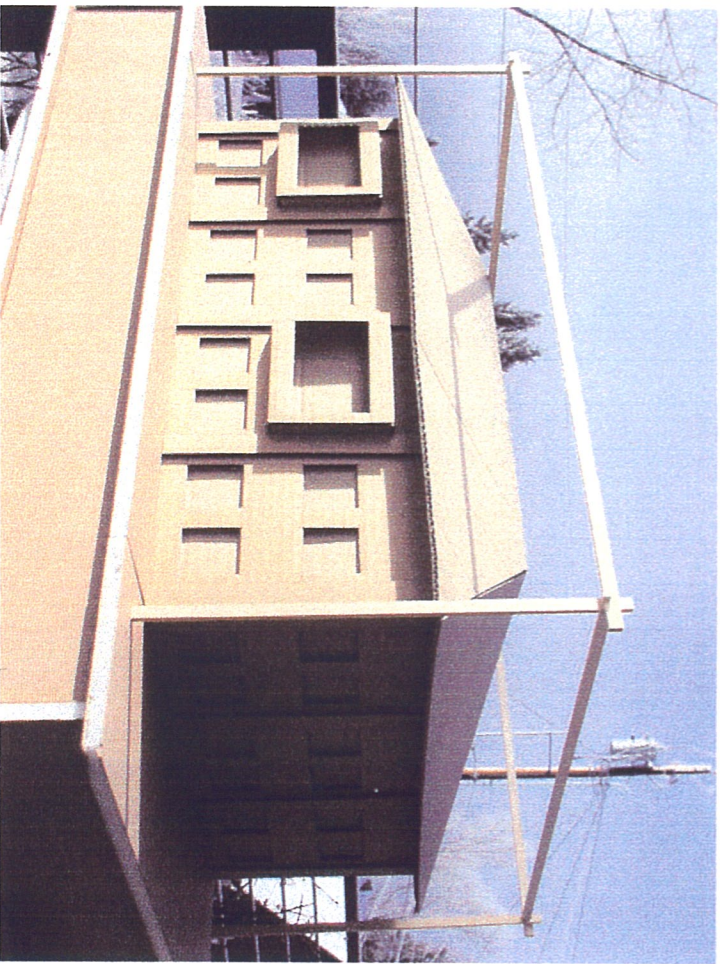
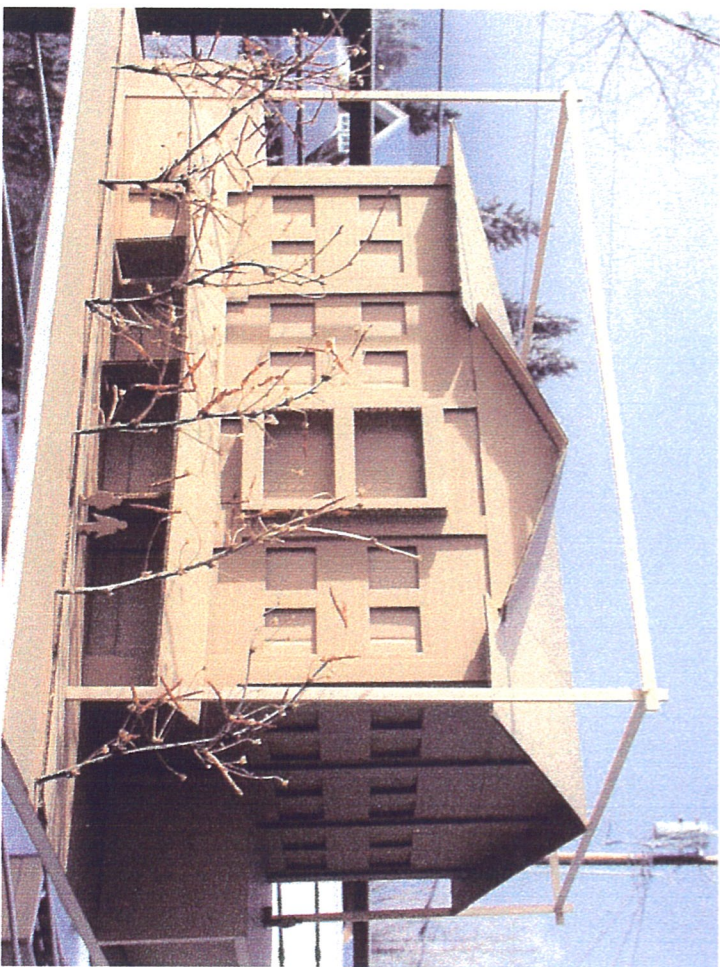
VII. H

CIRCULATION OVERLAY ZONE

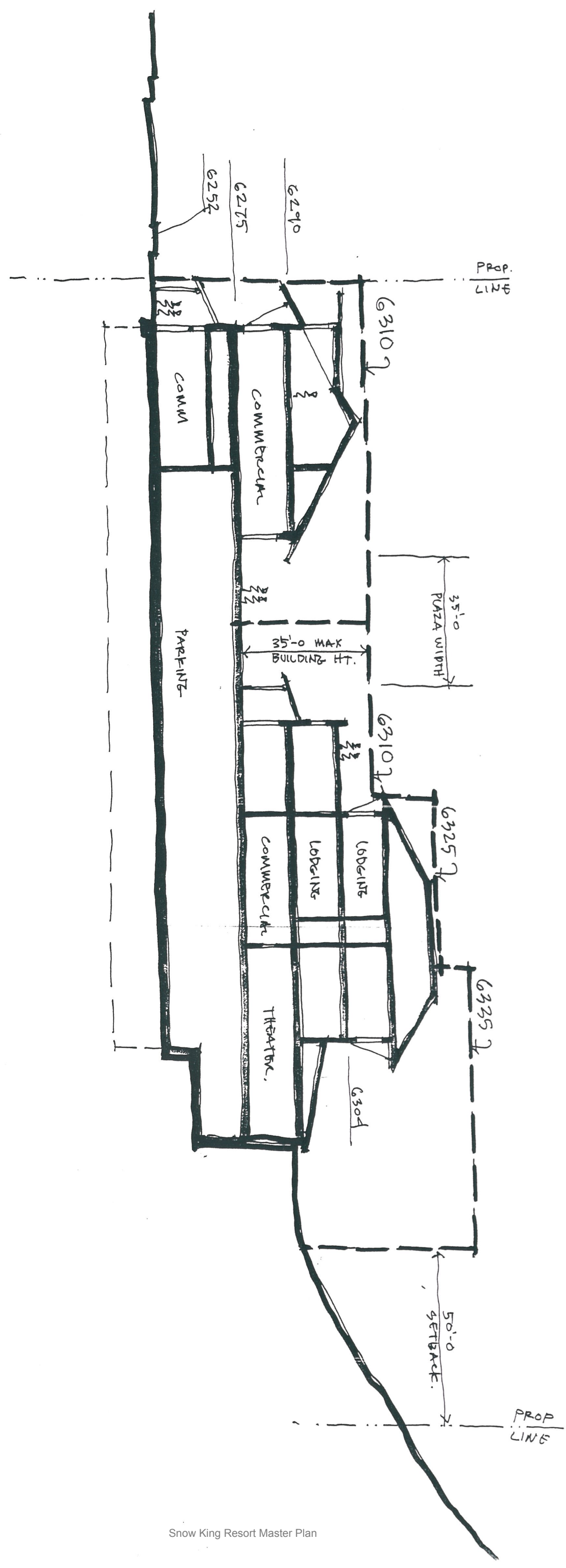


Hand-drawn site plan of a building complex on a grid. The plan shows a large rectangular building with a central courtyard. The building is divided into several sections, with labels for 'H: 6325', 'H: 6310', 'H: 6345', and 'H: 6335'. A 'BRIDGE' is shown connecting the building to a '10' SETBACK' area. A 'LANDING' area is marked with 'up' arrows. A 'STEPPED LANDSCAPE' is indicated with 'down' arrows. A 'POPE/ELEVATION' is noted near the bottom left. The plan is overlaid on a grid with dimensions like '6250' and '6275'.

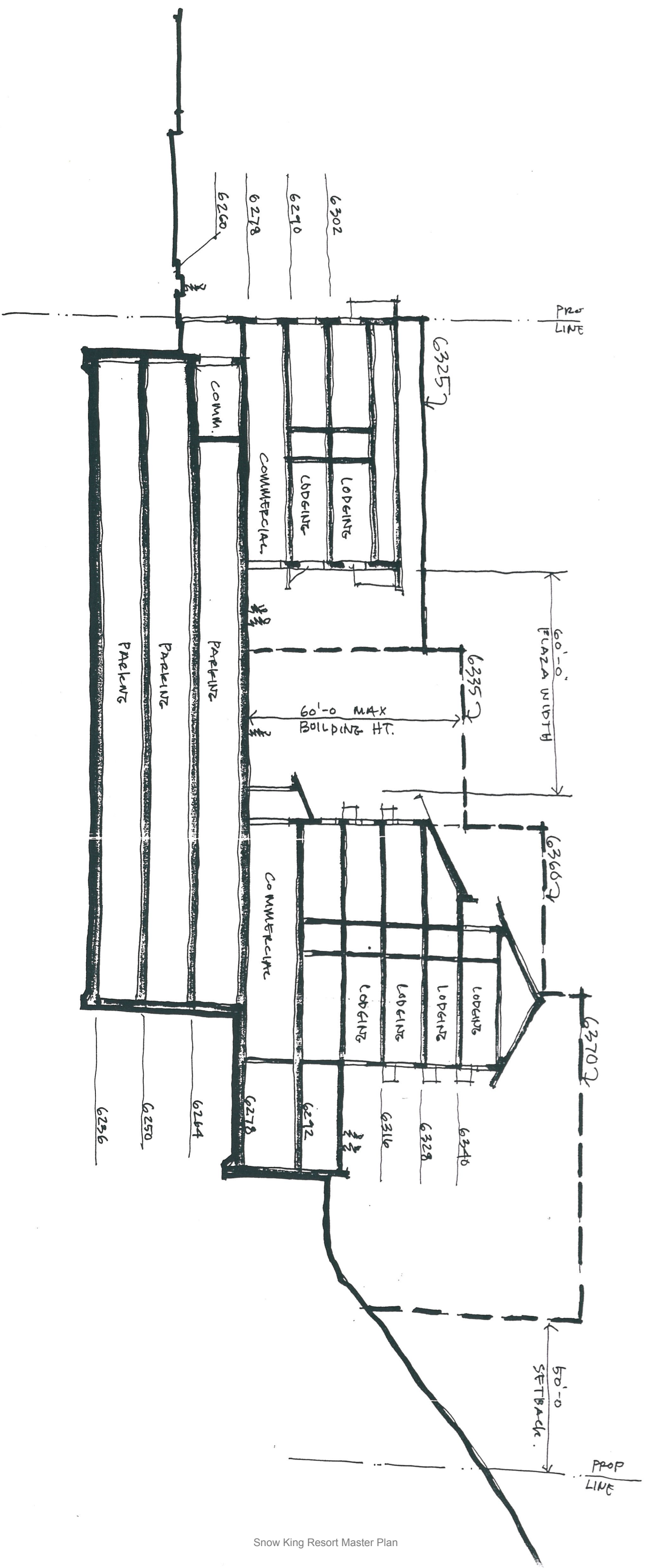


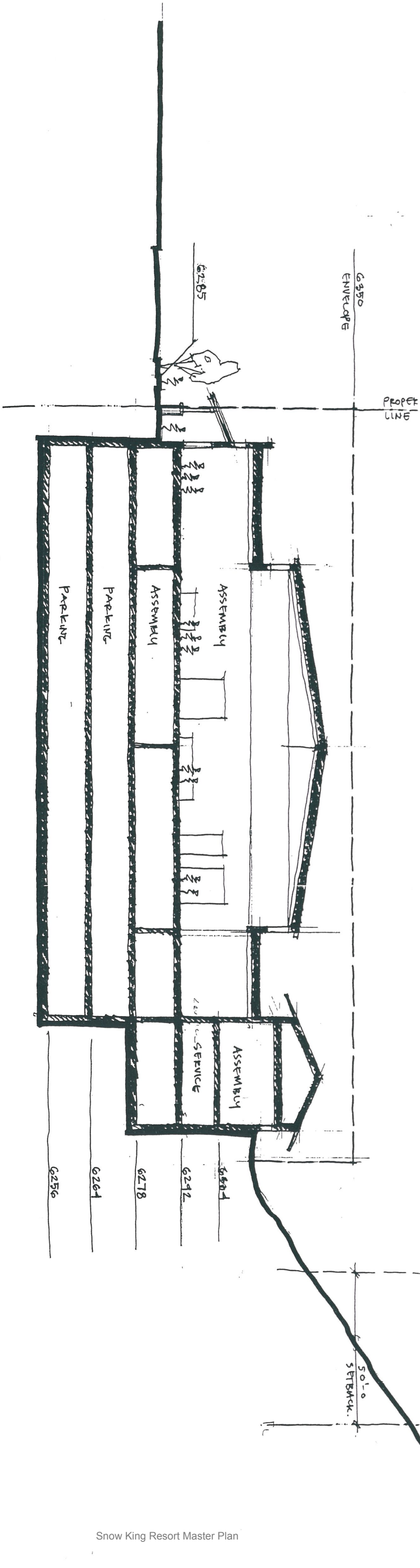


VII.L



SECTION B-B

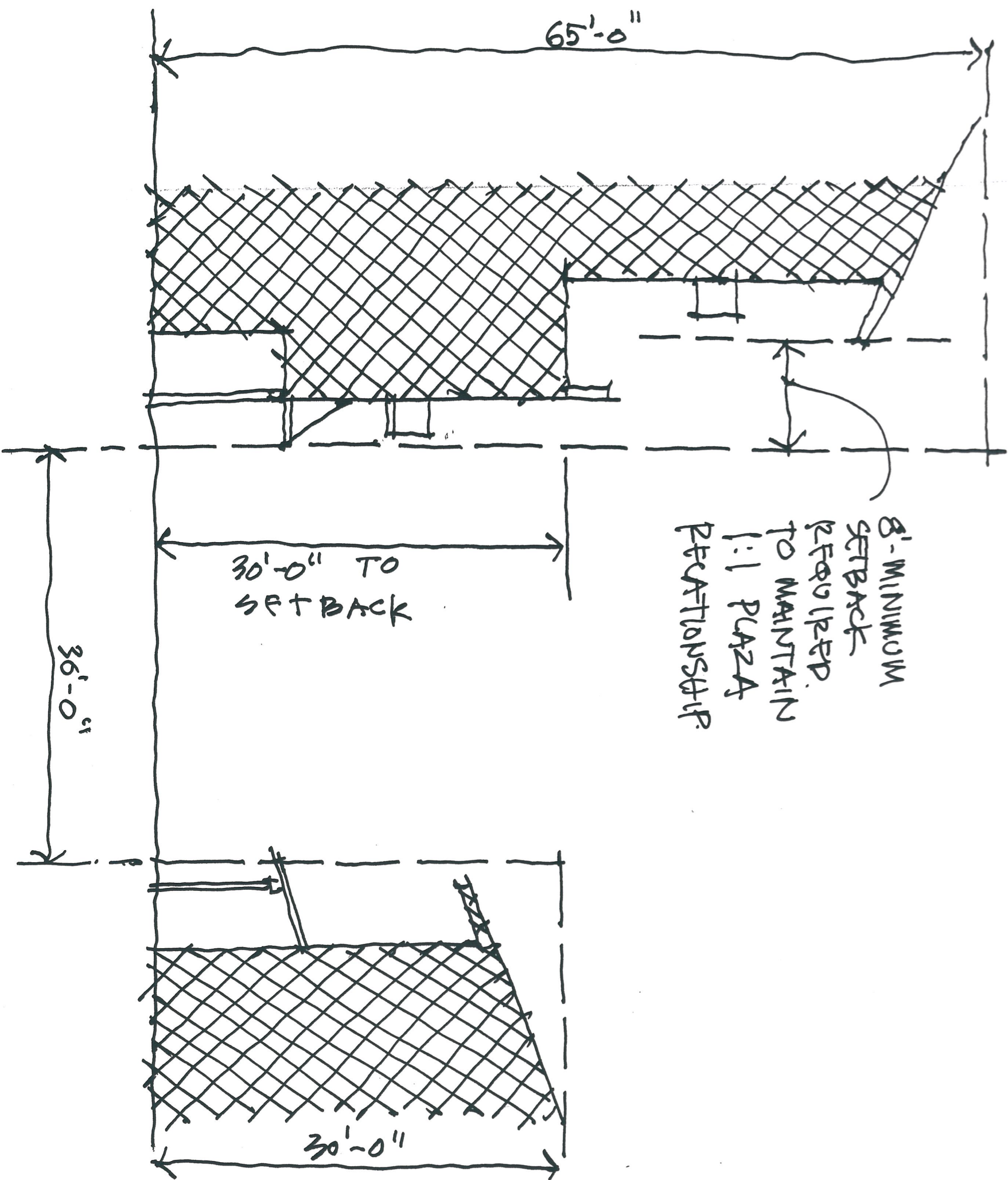




SNOW KING MASTER PLAN . TRANSVERSE SECTION F.M.-6 CONFERENCE CENTER 1/16" = 1'-0"

60 ST. 00

SECTION C-C



8'-MINIMUM
SETBACK
(REQUIRED
TO MAINTAIN
1:1 PLAZA
RETENTIONSHIP)

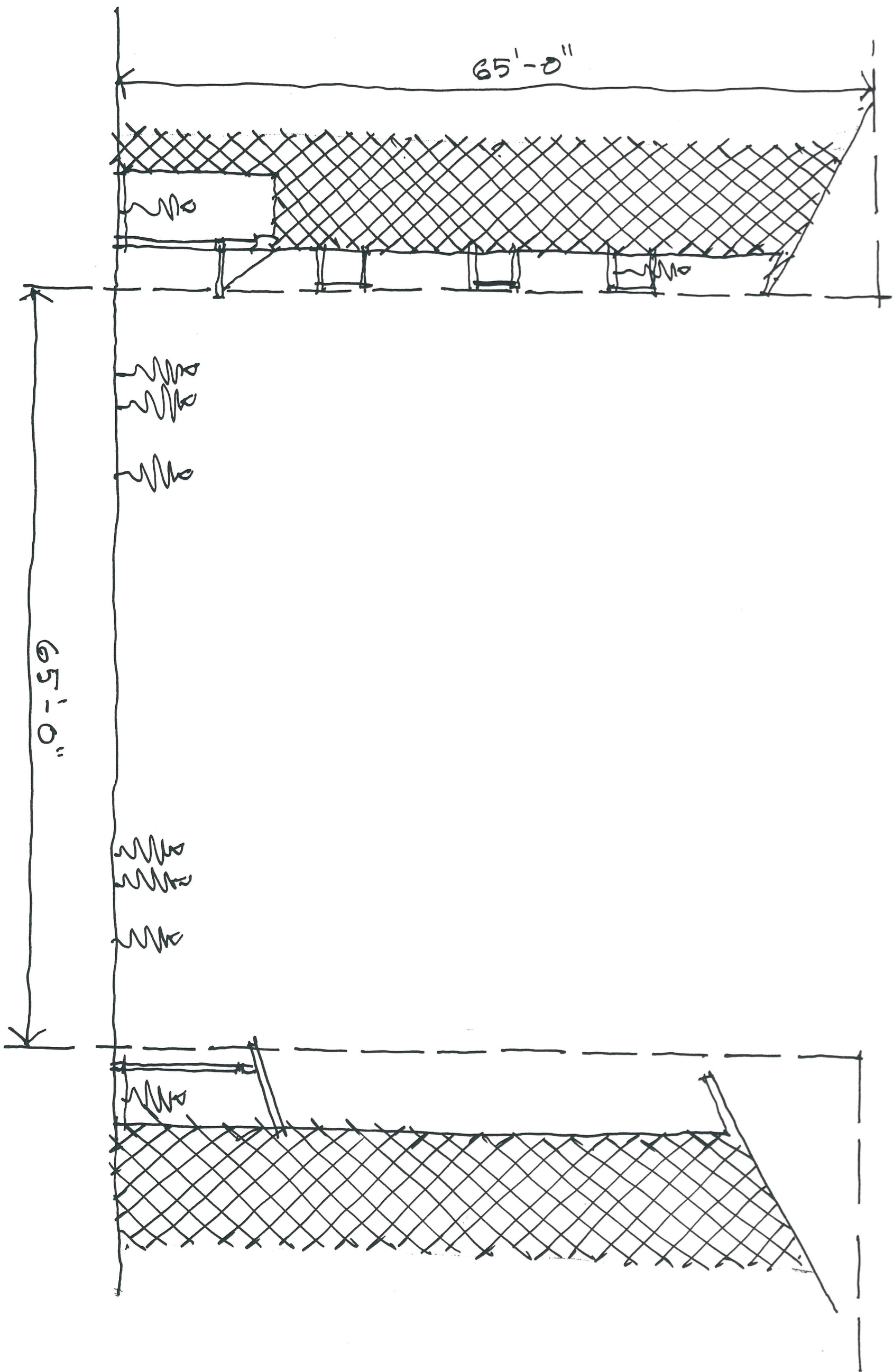
30'-0" TO
SETBACK

30'-0"

36'-0"

65'-0"

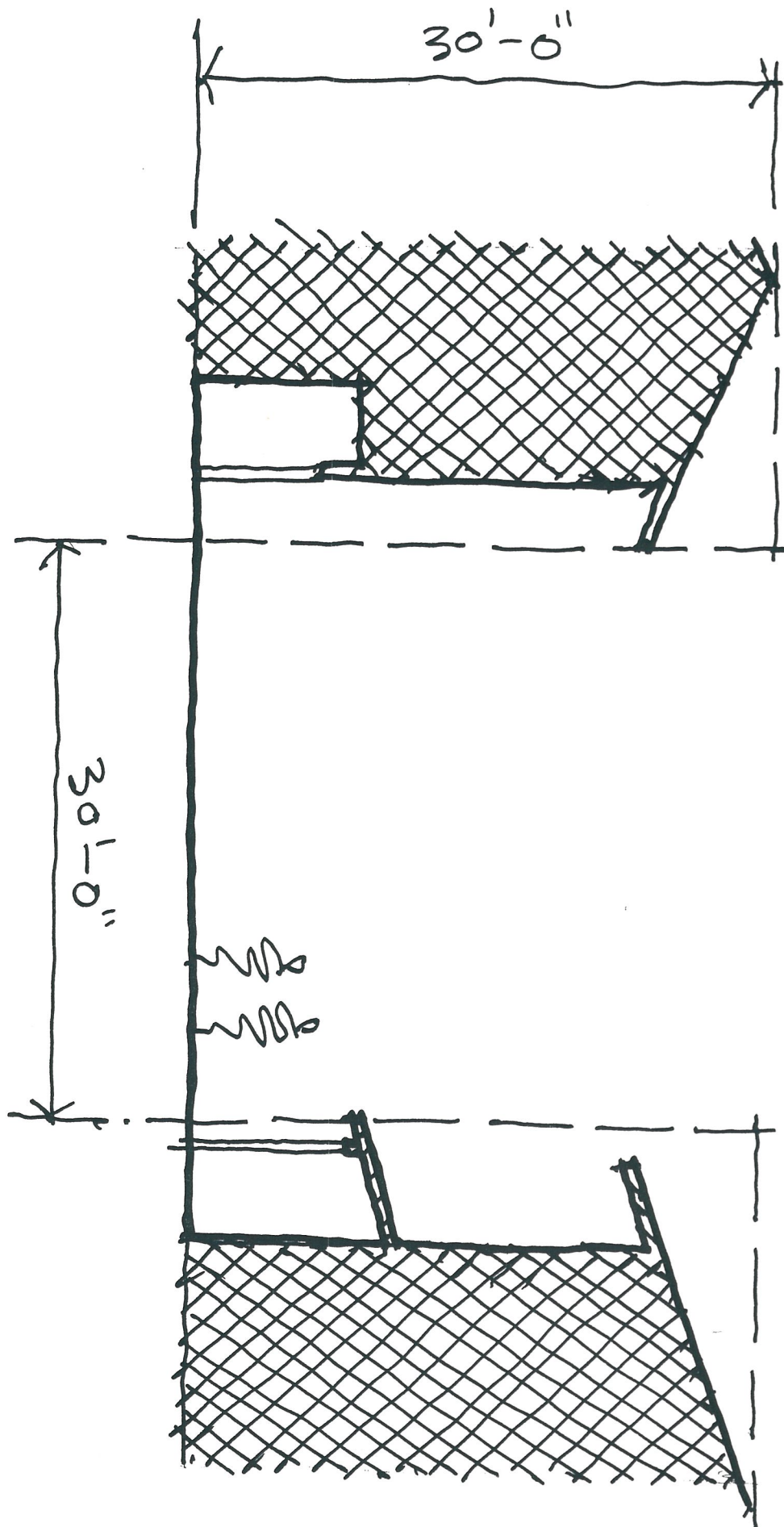
SNOW KING MASTER PLAN - PLAZA 1:1 ASYMMETRIC ENVELOPES EXAMPLE



SNOW KINGS WASTE PLANT - PLAZA 1:1 MAXIMUM.

VII. Q

Page 91



VII. R

VII. HOUSING ELEMENT

A. Housing Mitigation Plan

Employee housing shall be provided in conjunction with all commercial development and redevelopment at the resort in accordance with the Jackson Land Development Regulations. The applicant for each development or redevelopment permit shall submit a housing mitigation plan that demonstrates compliance with the employee housing requirements that are in effect at the time of the application. All development within the Snow King Resort District prior to 2018 has satisfied employee housing requirements under the existing Resort Master Plan and will not require any additional mitigation in the event of changes to Town and County Land Development Regulations. The following housing mitigation plan pertains to all future development within the district from 2018 into the future.

At least twenty percent (30%) of the employee-housing required for each commercial development shall be provided within the Snow King Resort District. In general, employee housing included in each development is intended to satisfy this requirement, however, the employee housing may be provided at other locations within the resort district.

Housing for Snow King Mountain employees associated with mountain operations such as lift operators, ski patrollers or groomers, is exempt from the 30% requirement and may be provided entirely off site. Administration and maintenance facilities constructed on the maintenance parcel shall also be exempt from this 30% requirement if a restriction on the maintenance parcel prohibiting this use is in place. Resort support uses not related to ski area operations and that include a physical development opportunity for creating employee housing on site, shall provide 30 percent of the required employee housing on the development site or within the resort district.

The applicant is responsible for obtaining all necessary development permits from either the Town or County, for the construction of all employee housing. Approval of all Final Development Plans for any development shall be contingent on approval of any necessary development plans to construct employee housing.

The Snow King Resort Master Association (SKRMA) will be responsible for the general implementation and administration of this Housing Element. Individual developers of specific developments or any property within the resort district will be responsible for building the required housing and SKRMA will coordinate and facilitate the locating of employee housing within the resort district when it is not possible to incorporate the housing in the individual development that generates the requirement. The required employee housing will be developed commensurate and concurrently with the free market development that generates the housing requirement.

This Housing Element will cover all the development that occurs within Sub-Areas I through S, and will be managed following these guidelines:

- SKRMA will be responsible for ensuring that developers within the resort district follow the standards set forth herein and the employee housing requirements in the Jackson Land Development Regulations. Calculations will be based on 100% of the required housing being located within the Town of Jackson. A minimum of 30% must be located within the limits of the Snow King Resort PRD District and an additional 10% within 1/4 mile of the PRD district boundaries.
- Location of Employee Housing within the Resort District limits will be in a variety of locations to meet the minimum 30% required to be housed within the district. This Master Plan identifies tentative locations of employee housing units within the Resort District. The intent is to, where possible, locate housing in small nodes. Although sufficient areas have been identified within this resort district to accommodate 100% of the

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Deleted: The primary objective of the Snow King Resort Housing Mitigation Plan is to provide for a reasonable new supply of affordable, attainable, quality housing suitable for the needs of the resort. While Snow King employees will have preferential choice of housing provided under this Plan, it is intended to maintain diversity by renting to others in the community. This housing will be restricted in accordance with the definition in Section 8300: An employee housing unit is a dwelling unit that is restricted to occupation by a person, and that person's family, employed within Teton County, Wyoming, through deed, lease, covenant or other means.

Under this Master Plan, a Master Association,

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required housing, the object would be to locate, as development occurs, up to 70% of the required housing in other locations, to be determined, within the limits of the Town of Jackson.

- SKRMA will ensure that any developers and/or landowners within the district finance, build, own or sell with required restrictions, and manage the units needed to comply with the Snow King Housing Mitigation Plan, or contract with other entities to do so. When units are owned by others, occupancy of the units will be monitored by SKRMA and deed-restricted as described. All required units will be newly built restricted units. Deed restrictions will specify that occupancy of the units required under this plan will be limited to Teton County employees and their immediate family.

- As part of the 2018 amendment to this master plan, an example development plan has been presented on associated maps indicating an employee housing complex within the resort district located on Vine Street. This location was previously indicated as a maintenance shop facility within the original master plan presentation. It is estimated that this complex would house between 50-100 seasonal employees in dorm style units that share common kitchen and living areas.

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• In addition to various forms of housing such as apartments, duplex, dormitories, townhouses, or other types of housing, rental units may be configured in the form of condominiums owned by SKRMA (or its agents). These employee housing condominiums will be managed in accordance with the deed restrictions and other requirements of this Housing Mitigation Plan.

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• Housing will be developed in increments in tune with commercial development phases. Developed housing will meet or exceed the required needs of each phase as computed in accordance with this section. When the developed housing exceeds the required needs, this excess developed housing will be credited towards the requirements of future phases.

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• The pooling of employee housing requirements over time allows housing units that have been previously constructed and existing in the Snow King resort district to be used to satisfy employee housing requirements for up to fifteen (15) years from the time of the initial occupancy of the units. Housing units that have existed in the Snow King resort district for more than fifteen (15) years, and have not already been approved and counted to satisfy employee housing requirements, shall no longer be eligible to satisfy employee housing requirements.

• Any employee housing units that are built in advanced of requirements stated herein can be used to satisfy employee housing requirements into the future associated with development in the district.

• A housing unit in the Snow King resort district may be used to meet an employee housing requirement only one time. Once the unit has been approved, counted and duly restricted for such purpose, the unit shall not be approved or counted again to meet another employee housing requirement.

• At the time a housing unit in the resort district is approved to satisfy an employee housing requirement, said unit shall be encumbered with a deed restriction that is approved by the Jackson/Teton County Affordable Housing Department. This deed restriction shall comply with the requirements for such a restriction that are established by the LDR and/or the Affordable Housing Department, which from time to time may be amended. The deed restriction shall remain in full force and effect for as long as the encumbered housing unit is counted to satisfy the employee housing requirement.

• Irrespective of the size of the employee housing requirement that may be imposed on any one commercial development, and irrespective of the number of bedrooms that may exist in the housing units, only entire housing units consisting of rooms for sleeping, cooking and living shall be counted to satisfy employee housing requirements. Even if an employee housing obligation requires fewer bedrooms than may exist in a housing unit, the entire unit shall be encumbered with a deed restriction and individual bedrooms shall not be counted separately from the remainder of the housing unit to satisfy an employee housing requirement.

• Employees of entities located within the Snow King PRO will have priority for occupancy in the **SKRMA** controlled units. Other available units will be open for any other Teton County employees.

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• All development that existed prior to the adoption of the Snow King Resort Plan is exempt from the requirements of this Housing Mitigation Plan, except for redevelopment or changes of use that would increase the number of required employee housing units. Any future redevelopment or change of use within the "Existing Condominium Parcels" that increase the number of employees within that area, will need to comply with the requirements of this Housing Element at the expense of the development entity.

Deleted: Mitigation Plan

• The type and layout of housing will vary as time goes by. For planning purposes, we have used averages of 150 SF per person for dormitory housing and 370 SF per person for apartment housing.

Deleted: Final determination will be made in accordance with Table 2.

• Habitable spaces built within the Snow King Resort PRD District to comply with the requirements of this Housing Element will be exempt from consideration in any maximum development space and FAR computations.

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• Since all of the resort-wide development within the District is intended to be classified as commercial,

there will not be a need for any exactions. However, all development will need to provide employee housing as per this Section. Since all residential-type development that is contemplated will be available for short-term rentals, this development will all be considered as commercial and will need to comply with this Section. Any non-commercial and non-short-term rental residential development that may be proposed in the future within the District will need to pay exactions as per the current Land Development Regulations at the time of final Development Plan **Approval**.

- Only entities authorized by SKRMA will be allowed to operate any business within the limits of the Snow King PRD District. SKRMA will require all these entities to provide information regarding the number of employees working within the Snow King PRO District and will collect dues and assessments as needed from employers to compensate SKRMA and its agents for any costs associated with this Housing [Element](#) and other requirements of this Snow King Resort **Master Plan**.

- All employee units shall be regularly maintained and kept in a safe, sanitary, livable and rentable **condition**.

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Deleted: Existing Snow King Hotel Conference Service Department experience:
Peak employees = - 7
Average employees = - 4
Average monthly wages: - \$2,600/mo. for 6 months
\$1, 220/mo for 6 months
\$1, 91 *Ol mo!* average

Formula: .69 x (1 - [.3 x \$1,910] / 750) = 0.53 required
* The approximate Conference/Meeting area in the existing hotel is 9,000 SF, there fore, 0.53 7 9,000 SF= 0.06 employees per 1,000 SF.
** To be ascertained in the future when additional indoor or outdoor recreational facilities are built. The following formula will be used to compute the housing needs:

of Employees during peak season

Column Break
750

Square footage used for support, internal services and circulation type areas such as, corridors, loading docks, storage, laundry, kitchen, services, back of the house, mechanical, equipment, maintenance, lockers, employee cafeteria, underground areas, and other support and services facilities not associated with the commercial lodging, hotel and other short term rental uses is to be considered for computing housing needs.

Once the number of employees to be housed is determined by using Table 1, the number of housing units to be built will be calculated in accordance with Table 2.

NUMBER OF PERSONS HOUSED PER UNIT

TABLE 2

J. - Unit Type

Studio
One bedroom Two Bedroom Three Bedroom Four Bedroom Five Bedroom
Each Additional Bedroom Dormitory

Column Break

1.25
1.75
2.25
3.00
3.75
4.50
0.50
1.00 per 150 SF of net habitable area

VIII.B.2

VIII. TRANSPORTATION ELEMENTS

A. Snow King Resort Master Plan - Traffic Analysis and Transportation Plan

Overview

Snow King Resort has been successful at encouraging guests of the Resort to walk or utilize existing public/private transit systems for both on-site and off-site events. With moderate improvements to the street and sidewalk system in the vicinity of Snow King Resort, the addition of a convenient Town shuttle system, and implementation of an aggressive Transportation Demand Management program, the existing street system is sufficient to accommodate the projected buildout traffic.

Definitions

The principal terms used to describe the adequacy of transportation facilities are *Capacity* and *Level of Service*. Briefly, the capacity of a transportation facility reflects its ability to accommodate a stream of people or vehicles. In the Third Edition of the *Highway Capacity Manual* (Updated 1997), capacity is defined as the maximum hourly rate at which persons or vehicles can reasonably be expected to traverse a point or uniform section of a roadway during a given time period under prevailing roadway, traffic, and control conditions. Capacity is typically expressed in terms of persons per hour or vehicles per hour (vph). Person flow is important for defining the roles of pedestrian, transit, and high-occupancy vehicle treatments. As the number of buses or high-occupancy vehicles in a traffic stream increases, the number of vehicles that can pass a given point decreases, but the person flow may actually increase.

Level of Service (LOS) is a measure of the quality of the traffic flow. These qualitative measures characterize the operational conditions within a traffic stream (or intersection) and their perception by motorists and pedestrians. These conditions include speed and travel time, freedom to maneuver, traffic interruptions, and comfort and convenience. Six levels of service are defined for each facility designated by the letters A to F. LOS A represents the best operating conditions (no delays, freedom to maneuver, no conflicts, etc.) while LOS F represents the worst (grid-lock).

A variety of factors influence capacity and level of service including:

- Roadway geometry (horizontal and vertical alignment)
- Lane width
- Design speed
- Lateral clearance
- Queuing areas at intersections
- Passing zones
- Vehicle type (percentage of trucks and buses)
- Weather conditions
- Directional flow
- Signalization
- Access control
- Volume of pedestrians and bicyclists
- Land-use characteristics.

C.1 Existing Conditions

Roadway System

Major streets that serve the Snow King Resort are illustrated on **Figure C-1**. The primary access to the Resort is via Snow King Avenue. This route provides access from the west and connects with South Willow Street and South Cache Street to provide access from the northwest. There are no direct roadway connections to the Resort from the north or the east except via minor residential streets (Vine Street and Cache Creek Drive). Snow King Mountain bars access to the Resort from the south. In general, the "grid" street system provides sufficient access to the Resort. Both Cache Street and Snow King Avenue connect with US Highways 26-89-187 approximately 0.70 miles and 1.75 miles, respectively, from the Resort.

Deleted: CALCULATION OF HOUSING NEEDS AT BUILDOUT TABLE 3

Land Use - Requirement
.....Column Break.....
or Numbers - #Required

Office - 0.03/1,000 SF
Commercial Retail
0.41/1,000 SF Restaurant/Bar - 1.01/1,000 SF
Commercial, Lodging,
Hotel, Motel & Other
Short Term Rentals
0.065/guest
Conference/Meeting
Rooms - 0.06/1,000 SF
Indoor/Outdoor
Recreational
Facilities (to be
..... determined in the
.....Column Break.....
74,200 SF
85,000 SF

1,800 *

119,000 SF

.....Column Break.....
31.16
85.85

117.00

7.14
future) - ..

Total Required - 241.51
1,800 = 2,208 less 408
guests (APO) in the existing hotel (204 rooms)
EMPLOYEE HOUSING
DISTRIBUTION
SUMMARY TABLE 4
Required Employees at Buildout

.....Column Break.....
Snow King
.....Column Break.....
Other Locations in Town

242 - 73 - 169

These calculations of required housing needed at buildout are only preliminary estimates. The final numbers will be determined by applying the required factors and formulas described in this section to the square footage or number of units actually built. As development occurs, the

... [1]

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Snow King Resort Master Plan - Transportation Elements

Roadway System Traffic Volumes

Summer daily traffic volumes along Snow King Avenue, Cache Street, and Willow Streets are shown in **Table C-1**. These volumes are from the traffic count data in the 1996 Jackson Hole Transportation Study and additional traffic counts conducted by O'Malley Engineering & Mapping between August 16 and September 2, 1999. This data has also been checked with traffic counts acquired by Nelson Engineering in August/September 1997. Winter traffic volumes are significantly lower than summer volumes and have not been counted or analyzed. The July 1996 counts reflect peak trip-making while the August 1999 are more indicative of the shoulder season and summer season average that is typically used for roadway planning (30th highest hour).

Current two-way August traffic on Snow King Avenue west of South Cache Street is **4,883** vpd (vehicles per day) and **4,298** vpd immediately east of South Cache. Traffic on Snow King Avenue immediately east of Willow Street is **2,654** vpd. Estimated peak traffic volumes (mid-July equivalents) for these roadway segments along Snow King Avenue are 7,700 vpd, 6,100 vpd, and 3,800 vpd, respectively. August 1999 traffic volume on South Cache immediately north of Snow King Avenue is **2,554** vpd. Traffic volume on South Willow Street north of Snow King Avenue is **1,602** vpd. Estimated peak summer volume on South Cache Street is 3,600 vpd and the estimated peak volume on South Willow Street is 2,300 vpd. The significant increase in traffic on Willow and the apparent decrease in traffic on Cache between 1996 and 1999 is likely due to the installation of stop signs on Willow that make Willow a more attractive route into and around the downtown area. Additional improvements to Willow Street, such as extending it through the Multi Agency Campus to form a downtown bypass, will alter traffic patterns between Cache and Willow.

Table C-1

Street Segment	Location	Mid-July 1996 ADT	August 1999 ADT
Snow King Ave.	West of Cache	7658	4883
Snow King Ave.	East of Cache	6055	4298
Snow King Ave.	East of Willow		2654
S. Cache Street	North of Snow King	4863	2554
S. Willow Street	North of Snow King	1215	1602

ADT = Average Daily Traffic

Traffic volumes can fluctuate significantly in the vicinity of the Resort due to the scheduling of special events such as conferences, Rotary lunches, 4th of July fireworks, speaker series, concerts, weddings, and other factors such as poor weather conditions (bringing more visitors into town) and street maintenance. **Table C-2** shows traffic volumes on Snow King Avenue and South Willow Street compared to hotel occupancy. This table indicates that changes in hotel occupancy and alpine slide ridership do not appear to generate fluctuations in traffic volumes.

Snow King Resort Master Plan - Transportation Elements

Table C-2

Date	Hotel/ Condo	Alpine Slide	Snow King ADT	Willow St. ADT
Mon, 8/16	165 / 39	482	3048	1630
Tues, 8/17	198 / 40	1868	3026	1658
Wed, 8/18	203 / 53	911	2921	1623
Thurs, 8/19	204 / 47	971	2930	1818
Fri, 8/20	204 / 67	980	3013	1731
Sat, 8/21	204 / 65	944	2938	1186
Sun, 8/22	198 / 53	314	2771	1064
Mon, 8/23	184 / 41	1470	2813	1202
Tues, 8/24	145 / 31	744	2341	1626
Wed, 8/25	147 / 18	664	2375	1583
Thurs, 8/26	186 / 22	634	2498	1643
Fri, 8/27	145 / 17	573	2447	1822
Sat, 8/28	171 / 23	646	2112	1397
Sun, 8/29	202 / 61	464	2359	1302
Mon, 8/30	198 / 65	106	2571	1386
Tues, 8/31	205 / 64	299	2415	1988
Wed, 9/1	199 / 63	410	2532	2069
Thurs, 9/2	170 / 40	64	2662	2112

Note: Maximum Occupancy (hotel only) = 204 rooms.

Maximum condominium occupancy = 68 units.

The impact of a Rotary luncheon on traffic volumes can be seen in noontime "spike" in **Figure C-2**. Traffic volume fluctuations for weekday and weekend conditions can be seen in **Figures C-3** through **C-7**. The weekday pattern typically shows a small traffic spike around 8 AM, a larger surge at noon, and the peak traffic occurs around 5 PM. **Figures C-3** and **C-4** compare counts at three locations: Snow King Avenue east of Cache, Snow King Avenue east of Willow, and Willow Street. **Figures C-5** and **C-6** compare typical counts at Snow King Avenue east of Willow and Willow only. **Figure C-7** also includes counts on Snow King Avenue to the west of Cache Street.

Transit Systems

The primary public transportation system operating in Jackson is START (Southern Teton Area Rapid Transit). This transit system (buses and vans) serves the Town of Jackson and limited segments of Teton County (Teton Village). Several private transit and taxi companies also provide service between the Jackson Hole Airport, the Town of Jackson, and Teton Village. In addition, the major resorts and several smaller hotels (Snow King, Jackson Hole Mountain Resort, Grand Targhee Ski & Summer Resort, Spring Creek, Grand Teton Lodge Company, etc.) provide van or bus service for their guests between the airport, Town, and Teton Village.

The typical winter START schedule between Snow King and Teton Village includes round-trip, non-stop bus at 8:20 AM, 9:20 AM, 3:20 PM, and 4:20 PM. The buses pickup and drop-off guests at both the condominiums and the hotel. Other scheduled buses leave the Snow King Resort every 20 to 30 minutes beginning at 7:15 AM and ending at 10:00 PM. These buses travel between the Resort, Town Square: Teton Village and other locations. The Targhee Express bus departs Snow King for Grand Targhee at approximately 7:30 AM and returns at 5:30 PM. During the summer, buses arrive and depart from Snow King Resort every 15 to 30 minutes between 10 AM and 10 PM and at one-hour intervals from 7:30 AM to 9:30 AM. Both the winter and summer schedules will be increased as the Jackson Hole Transportation Plan places more emphasis on public transit.

Snow King Resort Master Plan - Transportation Elements

In both summer and winter, Snow King Resort utilizes their own buses and vans to shuttle guests to and from the Resort, downtown, and the airport. Depending on flight schedules and demand, Snow King runs between six and fifteen round-trip shuttles per day. For special events, the Resort occasionally charts additional buses and/or utilizes concession buses (provided by float trip operators). **Table C-3** shows the system-wide START ridership for late August 1999. Ridership numbers generated specifically by Snow King Resort as well as private taxi and transit services are not available. Conversations with START personnel indicate a high percentage of riders between the Virginian Campground and Snow King Resort. In general, Snow King generates the majority of ridership on START during the summer. **Figure C-8** shows the 1999 transit routes (summer).

Table C-3

Date	Daily Total
Monday, 8/16	351
Tuesday, 8/17	417
Wednesday, 8/18	302
Thursday, 8/19	335
Friday, 8/20	359
Saturday, 8/21	381
Sunday, 8/22	268
Monday, 8/23	304
Tuesday, 8/24	350
Wednesday, 8/25	265
Thursday, 8/26	197
Friday, 8/27	240
Saturday, 8/28	216
Sunday, 8/29	212
Monday, 8/30	270
Tuesday, 8/31	325
Wednesday, 9/1	261
Thursday, 9/2	255

Pedestrian and Other Non-Motorized Facilities

Snow King Resort is served by a series of 5-foot wide detached and 6-foot wide attached concrete sidewalks along Snow King Avenue. A short section of wooden boardwalk is located on the north side of Snow King Avenue at the Brandywine Fund building. A 3-ft. wide sidewalk is located along the east side of South Cache Street and extends from Snow King Avenue to Kelly Avenue. There are no sidewalks along Willow Street. A series of horse trails and hiking trails diverge from the resort and access various parts of Snow King Mountain and the National Forest lands to the south of the Resort. These trails and sidewalks are shown in **Figures C- 9, C-9A, C-9B, C-9C, C-10, and C-11**.

There are no clear pedestrian routes to the Town Square. Most Snow King guests walk in the street, particularly in the winter, to access other parts of the downtown. The Jackson Hole Pathway System does not access the Resort at this time. Bicyclists use the vehicle travel lanes or parking lanes of Snow King Avenue to travel to and from the Resort. A popular mountain bike and hiking route originates in the upper parking lot and follows a ski area work road up the mountain. Another trail leads easterly toward Cache Creek Drive.

Table C-4 lists pedestrian and bicycle trips in the vicinity of Snow King Resort for several days during August 1999. Conferences and other activities at the Resort significantly increase pedestrian traffic. Cold temperatures and/or precipitation significantly reduce bicycle use and, to a lesser extent, pedestrian use. **Figure C-12** shows the pedestrian count locations and typical pedestrian/bicycle use patterns during late- August 1999. **Figure C-13** shows the pedestrian and bicycle volumes for August 26, 1999. These counts

were conducted between 7 AM and 5 PM only and do not show the significant evening use that occurs between the Resort and the Town Square area. The peak non-motorized count during this study was on August 31, 1999 when 1490 pedestrians and 139 bicyclists were recorded traversing Snow King Avenue adjacent to the Resort. This volume represents approximately 40% of all trips (automobile, transit, and non-motorized) on the Vine-Willow street segment. This pattern typically occurs during major conferences when some activities occur at the Snow King Center. On non-conference days (August 26th) the average number of non-motorized trips between 7 AM and 5 PM is approximately 500. An unknown percentage of the bicycle and pedestrian trips are discretionary recreation-oriented rather than transportation-oriented and, as such, generate additional traffic on the roadway rather than remove motorized trips.

Table C-4

Date & Time	Pedestrian	Bicycle
Thursday, August 26		
7am- 9am	86	25
9am-11am	30	14
11am -1pm	77	47
1pm- 3pm	85	30
3pm - 5pm	73	42
Total	351	158
Tuesday, August 31		
7am-9am	273	14
9am-11am	149	13
11am -1pm	340	31
1pm - 3pm	403	51
3pm- 5pm	325	30
Total	1490	139

C.2 Travel Demand Analysis

Travel demand for the Snow King Resort is determined by correlating existing conditions and traffic counts at the resort with future conditions. Additional information developed includes trip generation (based on Resort buildout), estimated modal split, and peak hour calculations.

Trip Generation

Trip generation for Snow King Resort is focused on summer conditions. Trip generation for Resort buildout is calculated from several factors including: total overnight guestrooms (hotel), total condominium units, commercial uses and densities, and number of employees. **Table C-5** lists existing and proposed conditions, projection rates, and traffic projections for Snow King Avenue east of Willow Street. The Institute of Transportation Engineers (ITE) Trip Generation Manual indicates that typical projection rates for resort hotels vary between 10 and 15 trips per day per lodging unit. Removing the Vine Street traffic counts and the Phibbs Law Office counts from the Snow King Avenue counts (East of Willow) and dividing by the number of lodging units yields an average projection rate of 10.1 trips per day per unit (at full occupancy). According to ITE, hotel condominium units generate between 4 and 18 trips per day per unit with an average rate of 9.5 trips. Teton County has historically used a townhouse trip generation factor of 7.2 trips per unit per day. Dividing the number of condominium units into the number of trips accessing the condominiums yields a trip generation factor of 8.0 trips per day. For these projections a hotel rate of 10.2 and a condominium rate of 8.0 are used. The floor area, guest numbers and conference seats are shown for comparison purposes.

Snow King Resort Master Plan - Transportation Elements

Table C-5

Use Description	Existing	Proposed	Gen. Rate	Projected Existing ADT	Final ADT
Hotel Rooms	204 ⁵	654	10.2	2,080	8,752
Condo Units	38 ⁶	95	8.0	304	1,064
Employee Housing		65 ⁶	4		260
Alpine Slide (Rides/day)	900	1,350	*		
Restaurant Seats	47	0	*		
Lounge/Bar Seats	50	0	*		
Total				2,384	10,076
Floor Area	160,000	730,000			
Total Guests	616	1,844			
Conference Seats	250	1,000			

⁵ - Indicates maximum occupancy accessed from the Resort.

⁶ = Indicates 204 employees to be housed on-site in 65 - 3 and 4 bedroom units.

* = Indicates projection included in resort (hotel) rate.

ADT = Average Daily Traffic

In general, the trip generation factor of 10.2 yields traffic volumes consistent with the recorded volumes. Minor differences between the recorded and projected ADTs maybe due to several factors including lower hotel occupancy rates, shared uses, and high pedestrian and transit activity.

The projected final ADTs in **Table C-5** reflect a "worst-case" scenario. The Resort may build more condominiums and fewer hotel rooms resulting in lower projected traffic volumes. Also, as shown in **Table C-2**, changes in room occupancy and alpine slide ridership do not appear to significantly impact traffic volumes. There is a certain amount of "background" traffic along East Snow King Avenue that exists whether the hotel has guests or not. Consequently, the traffic projections in **Table C-5** likely overstate the future traffic volumes.

The traffic volume on Willow Street averages 51% of the volume on Snow King Avenue east of Willow. Assuming no changes to Willow Street (improvements at the MAC campus, installation of one-way pairs, etc.) and no changes in pedestrian, transit, or land uses, the projected traffic volume on Willow Street at Resort buildout is approximately 4,100 ADT. Analysis of **Figures C-2** through **C-7** and on-site observation indicate a significant flow of traffic eastbound on Snow King Avenue and then northbound on Cache and Willow Streets around 8 AM. Between 4 PM and 6 PM there is a similar flow in a southerly direction (on Willow) and a westerly direction (on Snow King).

Modal Split

Lack of data regarding ridership on private bus services, taxis and START at Snow King Resort and incompatible modal counting methodologies make it difficult to accurately determine modal split between automobiles, transit, pedestrians, and bicycles. The available data and conversations with START personnel indicate that Snow King Resort enjoys a high level of transit ridership compared to other areas in Teton County. The best estimate of current transit share is between 1% and 4% of vehicular trips at Snow King Resort. Improvements to summer transit operations (both public and private), emphasis on transportation demand management strategies, improved pedestrian facilities, and the additional of a frequent intra-town shuttle system should increase the transit mode share to 15-20%.

Snow King Resort Master Plan - Transportation Elements

Snow King Resort is favorably located to reduce the percentage of automobile trips and increase percentages of transit and non-motorized trips. Pedestrian and bicycle trips varied from a low of 17% to a high of 40% of all trips on Snow King Avenue between the Resort and Willow Street. A typical modal split for this roadway segment during the summer is 20% ped/bike and 80% motorized. Estimated modal split of non-motorized trips between the Resort and Town Square is 2%-5% of all trips. Improved sidewalk and trail facilities coupled with frequent and convenient transit facilities will increase summer non-motorized mode share to 15% of all trips. At buildout, transit and non-motorized facilities are estimated to account for 35% of all trips for streets immediately adjacent to the Resort and 25% for other segments. **Figure C-14** shows the proposed Transit and Pathways system for the Resort area. **Table C-6** shows the estimated vehicular traffic for adjacent roadways with 25%-35% modal split.

Table C-6

Street Segment	Current ADT	Projected Trips (No Additional Modal Split)	Projected Trips (25%-35% Modal Split)
SKA - East of Willow	2,384	10,076	6,549
SKA - East of Cache	4,672	12,627	9,470
SKA - West of Cache	5,046	13,637	10,228
Willow	1,627	4,091	2864
Cache	2,991	8,083	6062

Peak Hour Forecasts

Peak hour and 30th highest hour is often a more useful measure of a roadway's capacity than ADT. Roadway planning efforts utilize the projected 30th highest hour to determine whether a roadway segment needs improvement. The 30th highest hour is typically between 70% and 80% of the peak hour(s) and reflects a break in the curve below which the majority of the hours in a year fall. Designing for the 30 highest hour provides the best balance between cost and function. The peak hour in Jackson is likely to occur around the July 4th holiday weekend. The 30th highest hour for Jackson would typically represent the highest daily hour in June or August. It is reasonable to assume that the peak hours identified in the traffic counts conducted at Snow King Resort during August 1999 reflect the 30th highest hour.

The peak hour averages 9.1% of the 24-hour total for the streets in the study area. The directional flow split at peak hour can be as great as 65/35. This directional split occurs during the AM and PM peaks when people are going to or from work. The projected peak hour counts for the study area are shown in **Table C-7**. These peak hours are based on the 25%-35% modal split projections listed in Table C-6.

Table C-7

Street Segment	Current Peak-Hour Traffic Per Lane	Projected Peak-Hour Traffic Per Lane
SKA - East of Willow	141	387
SKA- East of Cache	276	560
SKA - West of Cache	298	605
Willow	96	169
Cache	177	359

Snow King Resort Master Plan - Transportation Elements

C.3 Level of Service

Street and Intersection Level of Service (LOS)

This analysis utilizes the *Highway Capacity Manual* prepared by the Transportation Research Board for two-way and four-way, stop-controlled, non-signalized intersections. Steps required to determine intersection capacity include:

- Define existing geometry and traffic conditions for the intersection.
- Determine the conflicting traffic through which each minor road movement and major road left turn movement must cross.
- Determine the size of the gap in the conflicting traffic stream needed by vehicles in each movement crossing a conflicting traffic stream.
- Determine the capacity of the gaps in the major road traffic stream to accommodate each of the subject movements that will use these gaps.
- Adjust the calculated capacities to account for impedance and the use of shared lanes.
- Estimate the average total delay for each of the subject movements and determine the level of service for each movement and for the intersection.

Specific information required for the calculations include:

- Volumes by movement for the hour of interest.
- Vehicle classification for the hour of interest.
- Peak Hour Factor.
- Number of lanes for minor and major streets.
- Grade of all approaches.
- Other geometric features of interest.

The methodology outlined in the *Highway Capacity Manual* utilizes gap acceptance modeling to determine the interaction of minor street and major street drivers. This modeling technique assumes that Two-way, Stop-Controlled intersections (TWSC) give no positive indication or control to the driver on the minor road as to when it is safe to leave the stop line and enter the major traffic stream. This modeling is based on three elements: the size and availability of gaps, the value of these gaps, and the relative priority of the various traffic streams.

The level of service criteria is given in **Table C-8**. Total delay is defined as the total elapsed time from when a vehicle stops at the end of the queue until the vehicle departs from the stop line. The average total delay for any particular minor movement is a function of the service rate or capacity of the approach and the degree of saturation.

Table C-8

Level of Service	Average Total Delay (seconds/vehicle)
A	<5
B	> 5 and <10
C	>10 and <20
D	> 20 and < 30
E	> 30 and < 45
F	> 45

The *Highway Capacity Manual* does not include a methodology for determining level of service for urban streets that are stop-controlled rather than signalized. Extrapolating from the methodologies for arterial streets, it appears that all streets in the vicinity of Snow King Resort are functioning at a level of service of NB. During peak hour congestion, the intersections at Willow - Snow King Avenue (for the Willow Street southbound leg) and Cache - Snow King Avenue degrade briefly to LOS C. The conditions on Cache Street will be influenced more by land use decisions for the downtown core than by the Snow King Resort.

Snow King Resort Master Plan - Transportation Elements

Estimates of level of service for this street and Snow King Avenue to the west of Cache are based on the traffic projections in the Jackson Hole Transportation Plan. At Resort build-out, Snow King Avenue west of Cache will reach LOS *C/D* for several hours during the day and the intersection at Cache will also function at LOS *D* during peak hours. The intersection at Willow will reach LOS *D* at peak hour. Presumably, the Willow - Snow King Avenue intersection will be converted from two-way stop-controlled intersection to four-way stop controlled intersection - improving the level of service to *B/C*.

Sidewalk/Pathway Level of Service

Methodologies for determining LOS for sidewalks and pathways are poorly developed at this time. Until the fall of 2000, lack of sidewalks along Snow King Avenue and Willow Streets forced pedestrians to share the roadway with automobiles, buses, and trucks - for a LOS of *D-F*. The addition of sidewalks to these streets has raised the pedestrian LOS to *A/B*. (See **Figures 9, 9A, 9B, and 10**)

C.4 Transportation Demand Management Program.

Transportation Demand Management Strategies

The purpose of a Transportation Demand Management program is to establish strategies that influence travel mode choice and minimize the use of single-occupant automobiles. These strategies are typically a combination of incentives (to transit and non-motorized modes) and disincentives (to single-occupancy automobiles). These TOM strategies are often financially based but can also utilize other management techniques such as marketing and housing. The primary goals are to reduce traffic congestion by reducing vehicular trips, reduce air pollution, and increase mode choice. Snow King Resort has already adopted some of these strategies, in particular the Resort provides free shuttle service for its guests to the airport, Teton Village, and downtown. The following list outlines some of the strategies necessary to influence mode choice and reduce automobile trips.

- Provide free or reduced-rate bus passes to employees and hotel guests (as part of the room package). Inform guests of the availability of transit and non-motorized modes prior to arrival.
- Continue (and increase frequency of) shuttle to Teton Village and Airport to encourage guests to use transit rather than renting automobiles.
- Provide employee ride-share incentives. Provide free parking for multi-occupancy vehicles and paid parking for single-occupancy vehicles.
- Continue to have groups as a large percentage of the lodging business.
- Construct the majority of development in a dense pattern near the shared parking area.
- Support and participate in community wide mass transportation invitations.
- Promote alternative travel modes through advertising and marketing.
- Provide "town" bikes at a nominal rate for guests.
- Coordinate with Town to provide a frequent and convenient Town Square - MAC Campus - Snow King shuttle system.
- Coordinate with the Town to provide improved sidewalk and pathway systems along Willow, King, and Cache.
- Provide information and reservation services and staging areas for float trips, snowmobile operators, and other tour operations.
- Develop parking district with combination of free and fee parking.
- Provide on-site and nearby employee housing.

A combination of two or more of the above strategies is essential if the modal-split assumptions listed in **Table C-6** are to be realized.

Another strategy to reduce vehicle trips in the downtown (although not necessarily along Snow King Avenue) is to provide additional parking at the Resort to be used for downtown employee parking. In combination with a convenient in-town shuttle system, capturing employees at Snow King will help reduce traffic along West Broadway, Pearl Avenue, and Cache Street. Employees will be less likely to use their vehicles during the day for errands and more likely to walk or use the shuttle. An employee parking lot at the Resort is likely to generate only two trips per day per parking space (incoming and outgoing) rather than the more typical six to

Snow King Resort Master Plan - Transportation Elements

ten trips per day. During the winter, this extra parking could also be used as an in-town Teton Village parking lot. In combination with a non-stop bus to the Jackson Hole Mountain Resort, this parking area will be more convenient for Town residents than the Stilson lot and will minimize trips along West Broadway, Highway 22, and Highway 390.

Travel Demand Management Monitoring system

A TOM monitoring program helps insure that the TOM program meets the goals of reducing single-occupancy vehicle trips and increasing the use of alternative travel modes. The following items should be considered as part of the monitoring program:

- Prior to issuance of a building permit for the first approved Final Development Plan, conduct baseline traffic counts for all modes.
- Every three years, conduct 24-hour traffic counts, pedestrian counts, bicycle counts, [parking counts](#), and transit counts. These counts shall begin two years following completion of the first Final Development Plan project.
- Conduct guest and employee surveys to determine mode choice, success of alternative traffic modes, and satisfaction with transportation options.
- Conduct parking surveys to determine parking utilization by employees, guests, locals, and other visitors.
- Correlate hotel occupancy with traffic counts and available transportation options.
- Survey transit providers (public and private) to determine utilization during peak travel periods. Maintain a database of transit ridership.

The primary gauge of the effectiveness of the TOM program will be whether or not there is a relative reduction in the peak hour traffic counts. The goal of the TOM program is to reduce the projected build out trips by 25%- 35%. Other measures of effectiveness will include the number of transit riders vs. hotel occupancy and/or traffic counts, parking counts vs. hotel occupancy, and ped/bike volumes vs. traffic counts.

C.5 Recommendations and Proposed System Improvements

Figure C shows proposed street parking, sidewalks, and bicycle lanes on Snow King Avenue associated with conceptual changes to the parking and pick-up/drop off area associated with Phil Baux Park. The goal of these changes is to continue providing accessible parking for Phil Baux Park while increasing the green space of the park. With the growth of bike use on Snow King Avenue, a clearly delineated bike lane is an important addition for improving safety and increasing the use of alternative modes of transportation to and from the resort. The Snow King Mountain Resort expects to participate with the Town in funding the street improvements on Snow King Ave adjacent to Phil Baux Park and on South Cache adjacent to the park.

Snow King Resort will participate with the Town in developing the most effective transportation network for the Snow King area and the downtown. The Resort looks forward helping formulate the best routes between the Resort and the MAC/Town Square area as well as determining an equitable cost-sharing arrangement for transit, streets, and sidewalks.

C.6 Phasing Plan

Snow King Resort anticipates coordinating sidewalk and street improvements with the Jackson Transportation Improvement Projects (JTIP). The final sidewalk and landscaping along the south side of Snow King Avenue will be constructed with the parking and plaza facilities. Depending on funding for Jackson sidewalks in the Capital Improvement Fund, intersection improvements at Willow Street will be constructed prior to major reconstruction at the Resort. Sidewalk improvements to South Cache Street, South King Street, and South Willow Street will also depend on the Jackson Capital Improvement Fund. Snow King Resort anticipates cost-sharing some of the improvements at Willow-Snow King intersection.

Actual timing of improvements will be influenced by the results of the Transportation Demand Management Monitoring Program. However, it must be recognized that the success of both the pedestrian and transit

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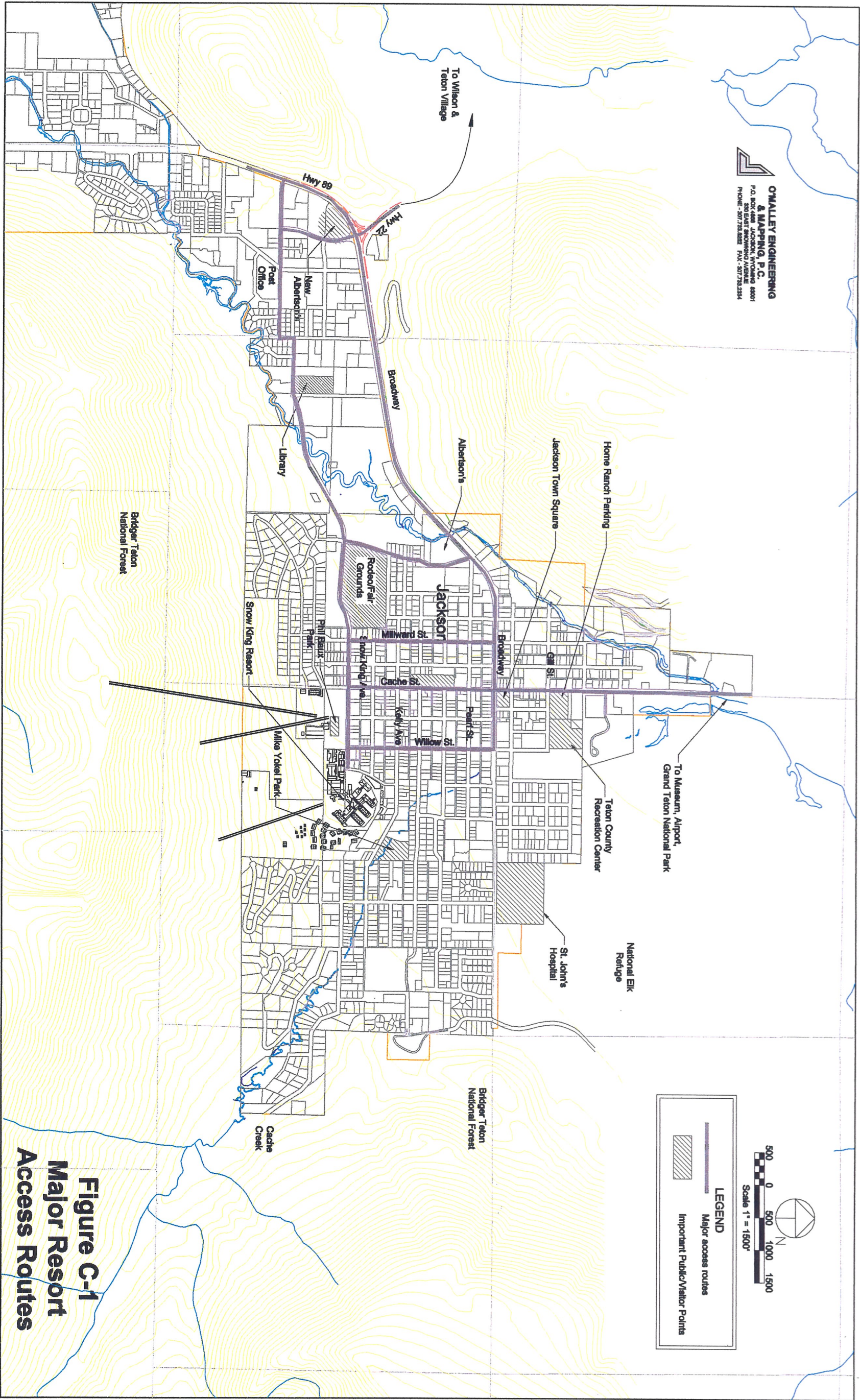
Deleted: shows the proposed improvements to the Snow King Avenue and Willow Street corridor. These improvements include the addition of 5-foot or 6-foot wide detached sidewalks with planting strips along Snow King Avenue (completed Fall 2000) and 6-foot attached sidewalks along Willow Street. Other improvements include the addition of "curb bulbs" to facilitate pedestrian crossing movements at the intersection. Similar improvements are proposed for the entire length of Snow King Avenue, King Street, Cache Street, and associated intersections.

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Deleted: while other elements are expected to be funded by the Capital Facilities Tax or other sources.

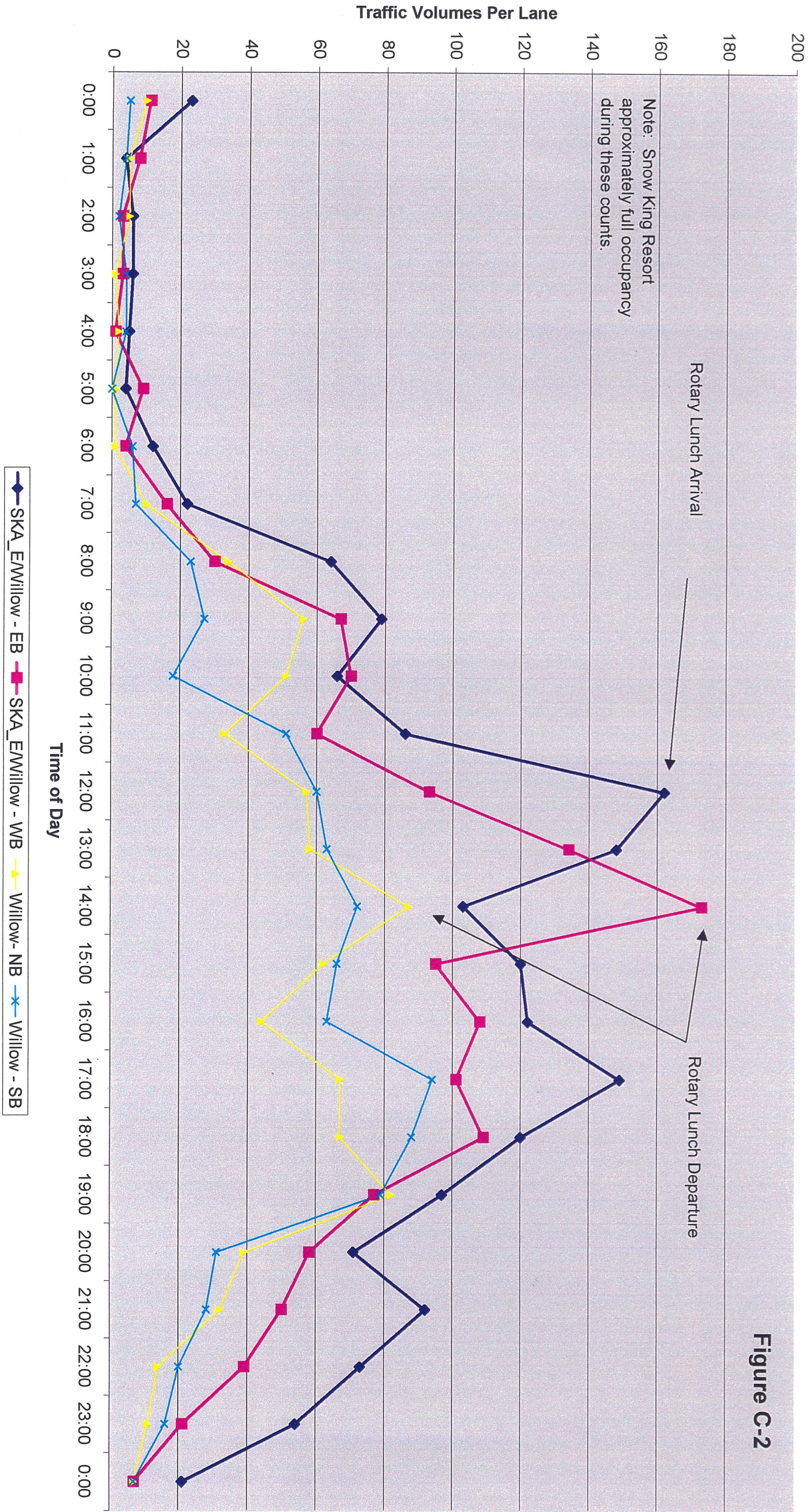
systems are interrelated. It is unlikely that shuttle and transit ridership will increase without improvement to pedestrian and bicycle facilities. People are more willing to walk if they have the option to ride (on a shuttle) some of their route. Studies indicate that most people are unwilling to leave their vehicles and walk or use transit unless these facilities are convenient, safe, go to the desired destinations (Town Square, Teton Village, Airport, etc.), and function (in the case of transit) in a timely manner. Town land use patterns and the Town Parking Masterplan also influence the transit program. Aggressive efforts to minimize employee parking in the downtown core will only succeed with convenient satellite parking (including Snow King Resort), safe and well-maintained sidewalks, and efficient transit facilities.

As part of the Resort Transportation Demand Management Program and in cooperation with the Town of Jackson, a town shuttle system should be begun as soon as possible. Construction of sidewalks (South Cache, South King, and South Willow) and intersection improvements adjacent to the resort should be completed prior to the traffic volumes along Snow King Avenue reaching 1.5 times current volumes - and sooner if possible.

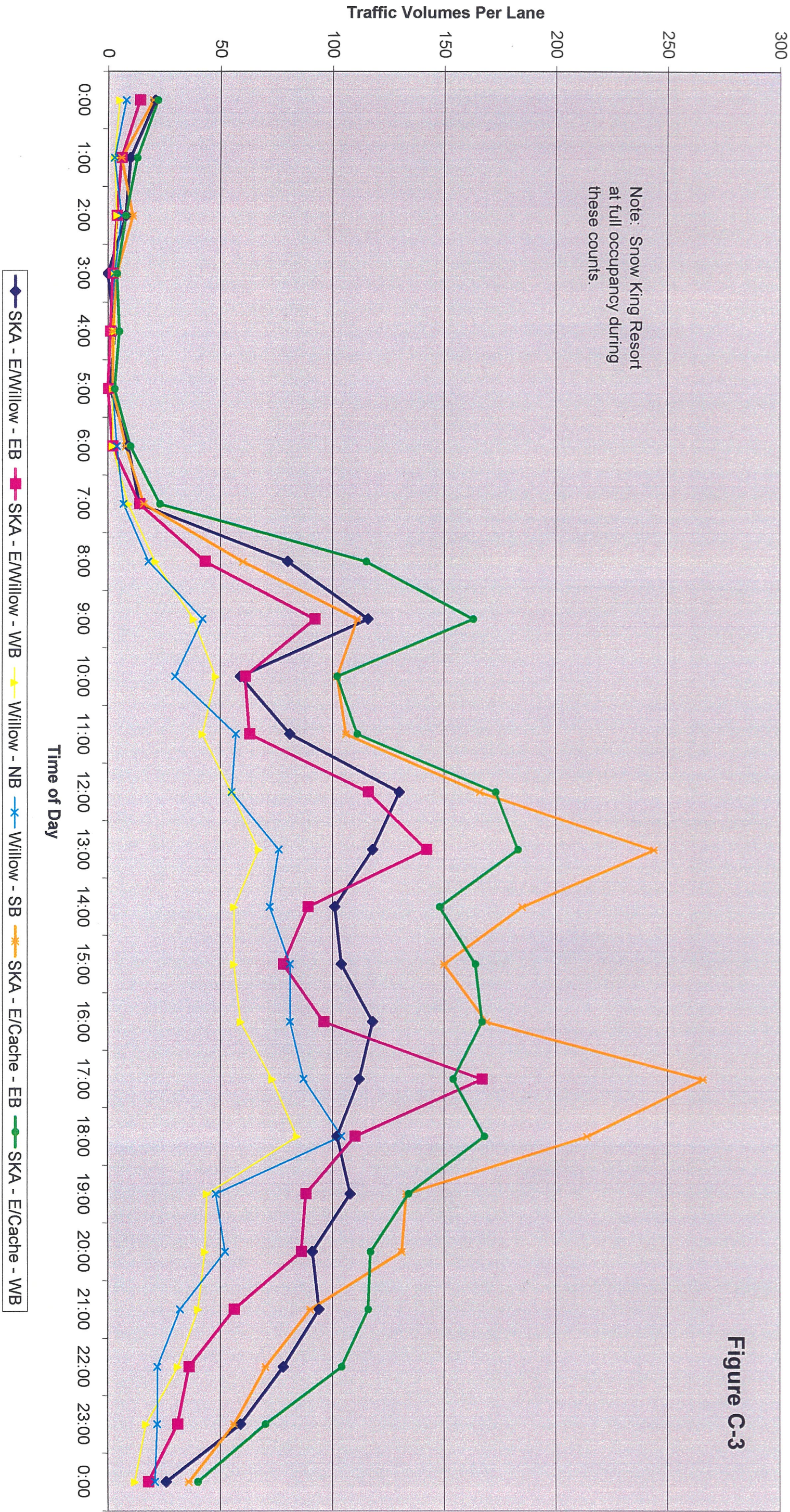


**Figure C-1
Major Resort
Access Routes**

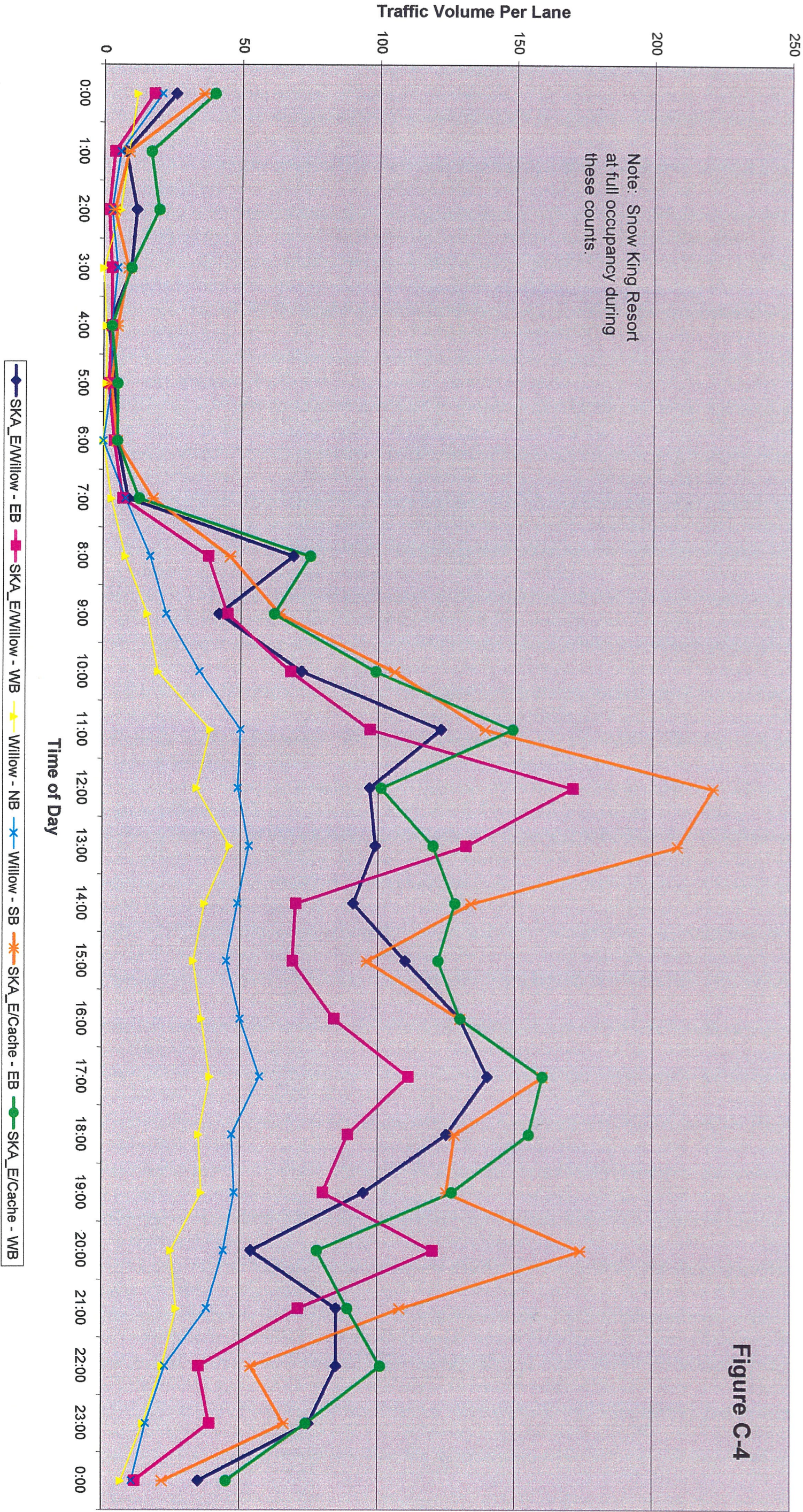
Snow King Avenue Hourly Traffic Volumes - Tuesday, August 17, 1999



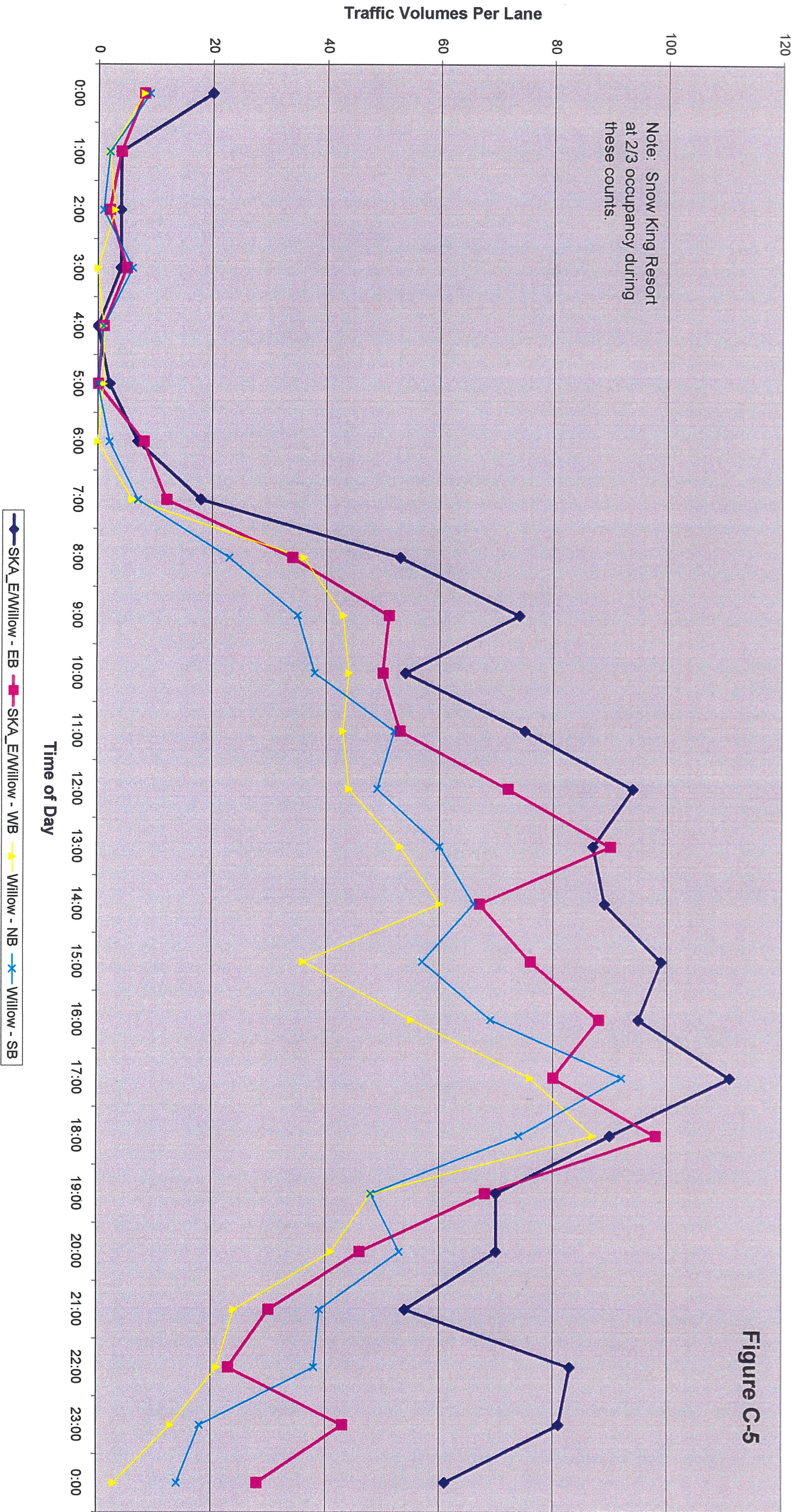
Snow King Avenue Hourly Traffic Volumes - Friday, August 20, 1999



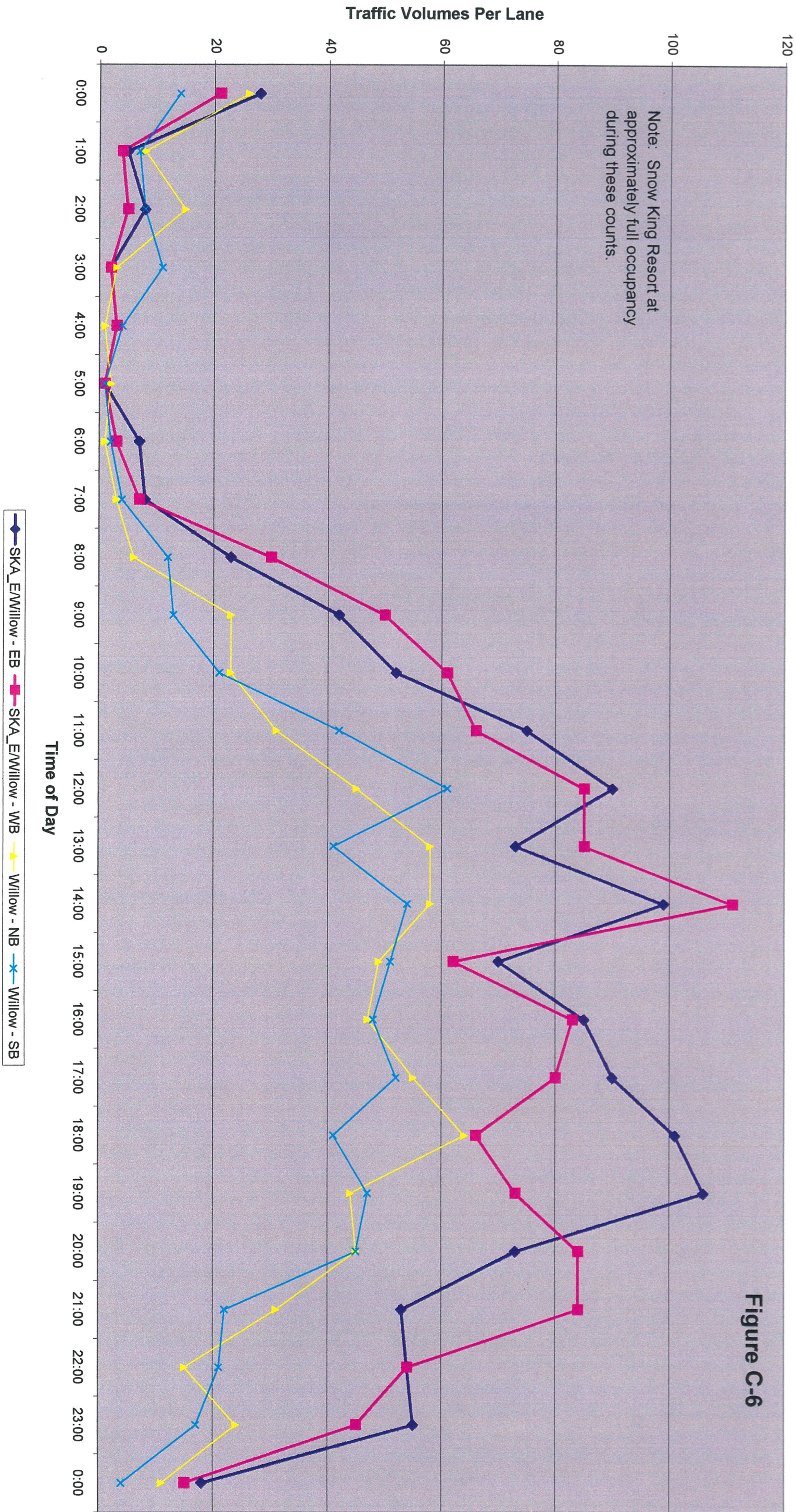
Snow King Avenue Hourly Traffic Volumes - Saturday, August 21, 1999



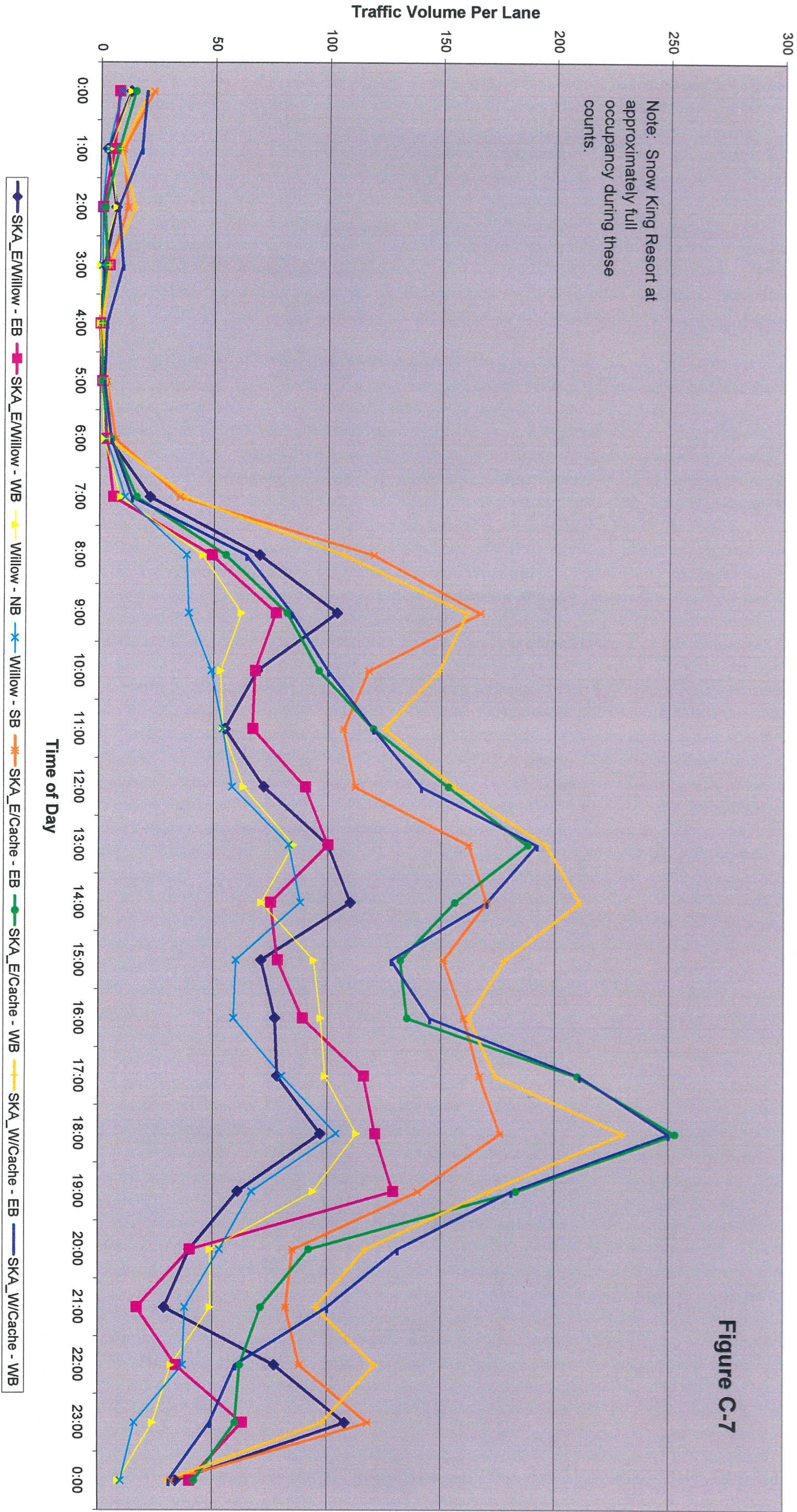
Snow King Avenue Hourly Traffic Volumes - Wednesday, August 25, 1999

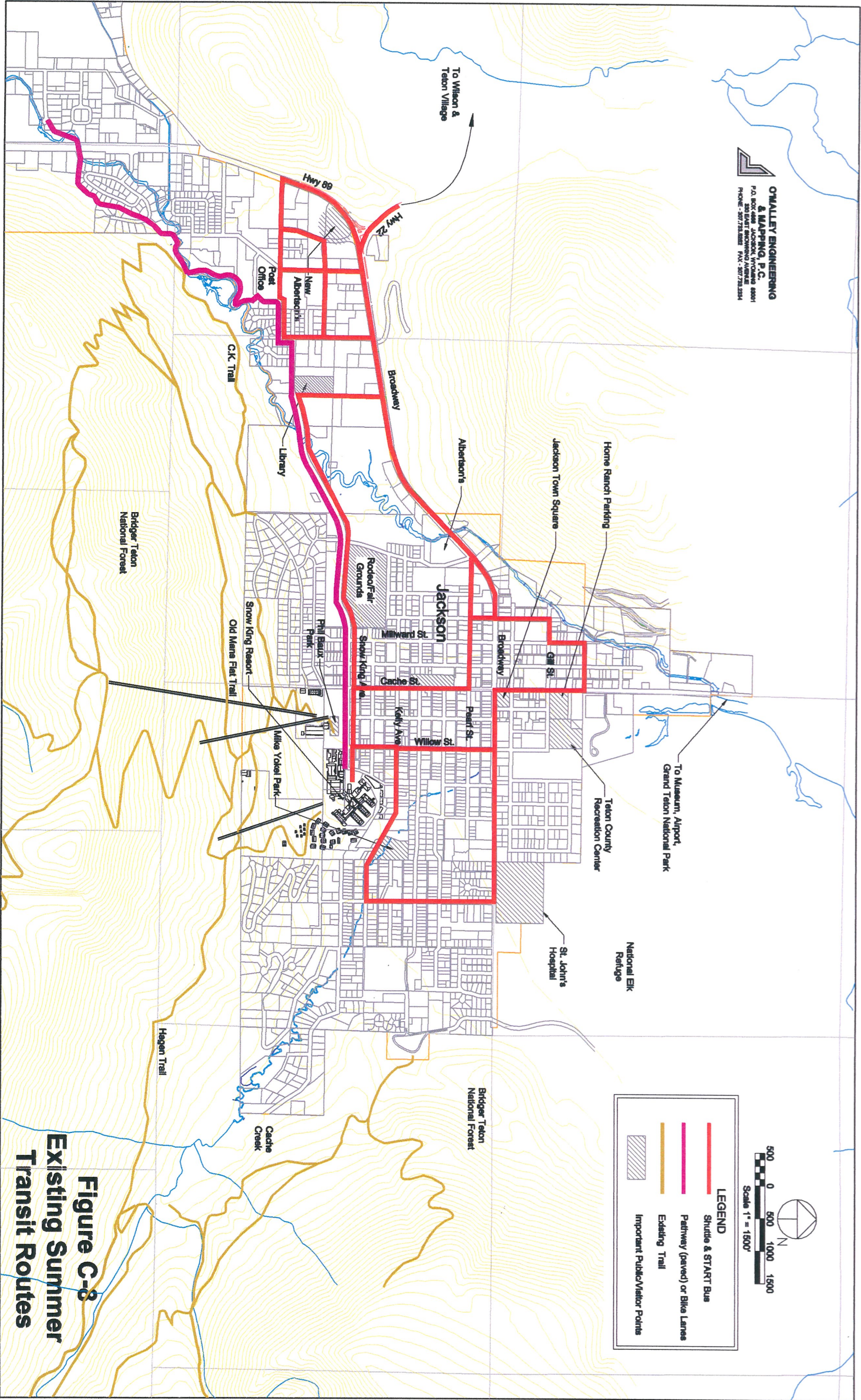


Snow King Avenue Hourly Traffic Volumes - Sunday, August 29, 1999

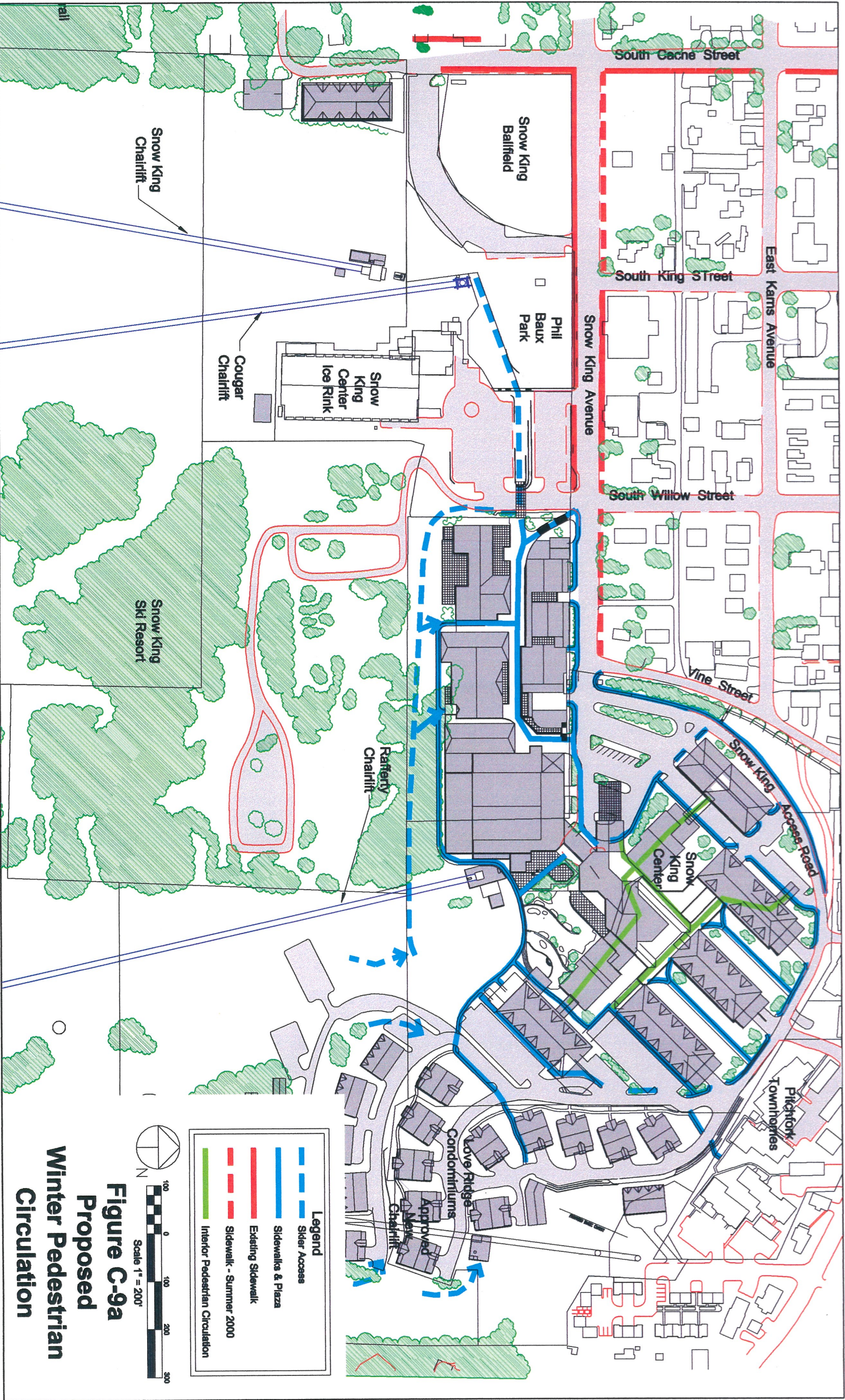


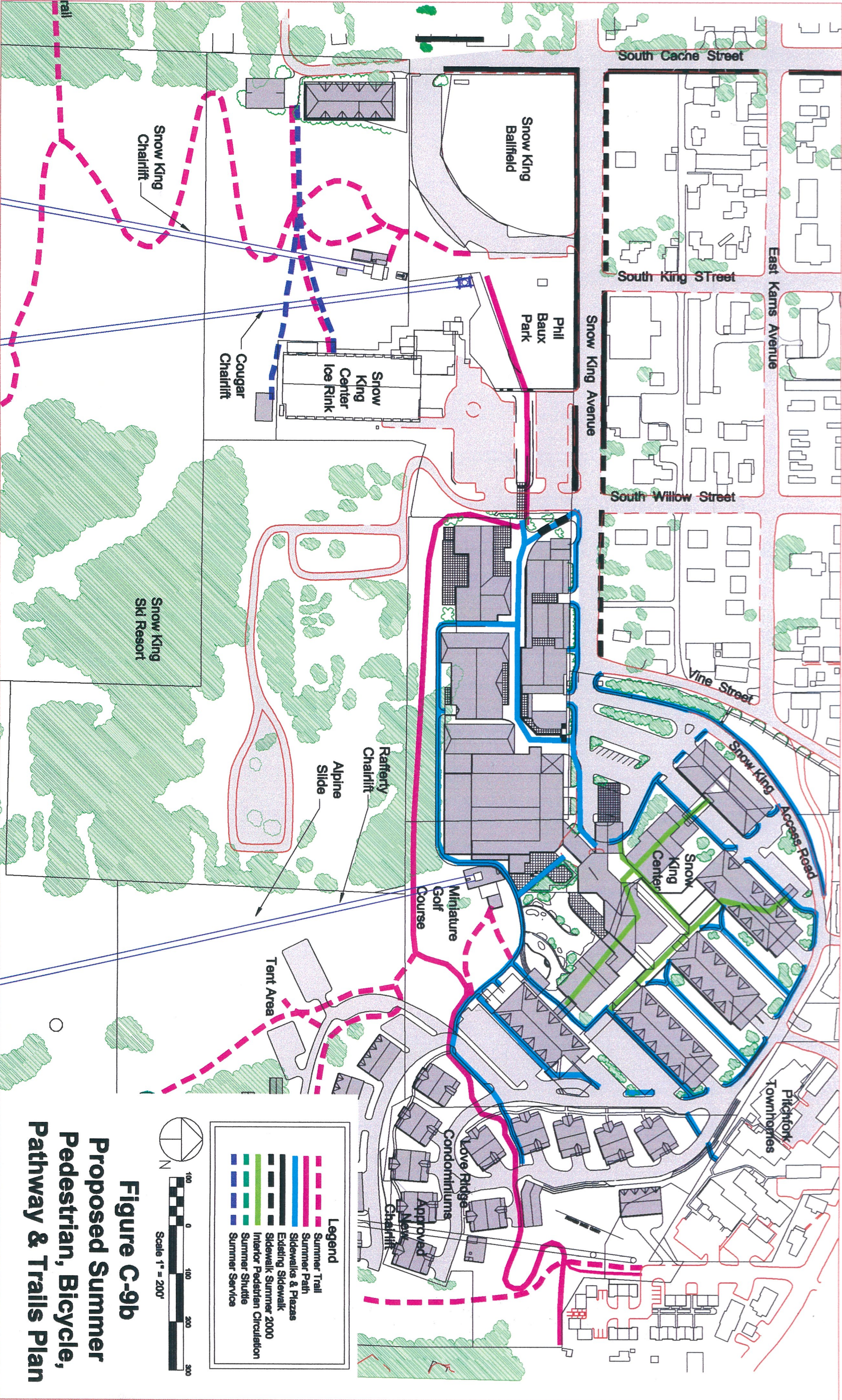
Snow King Avenue Hourly Traffic Volumes - Wednesday, September 1, 1999











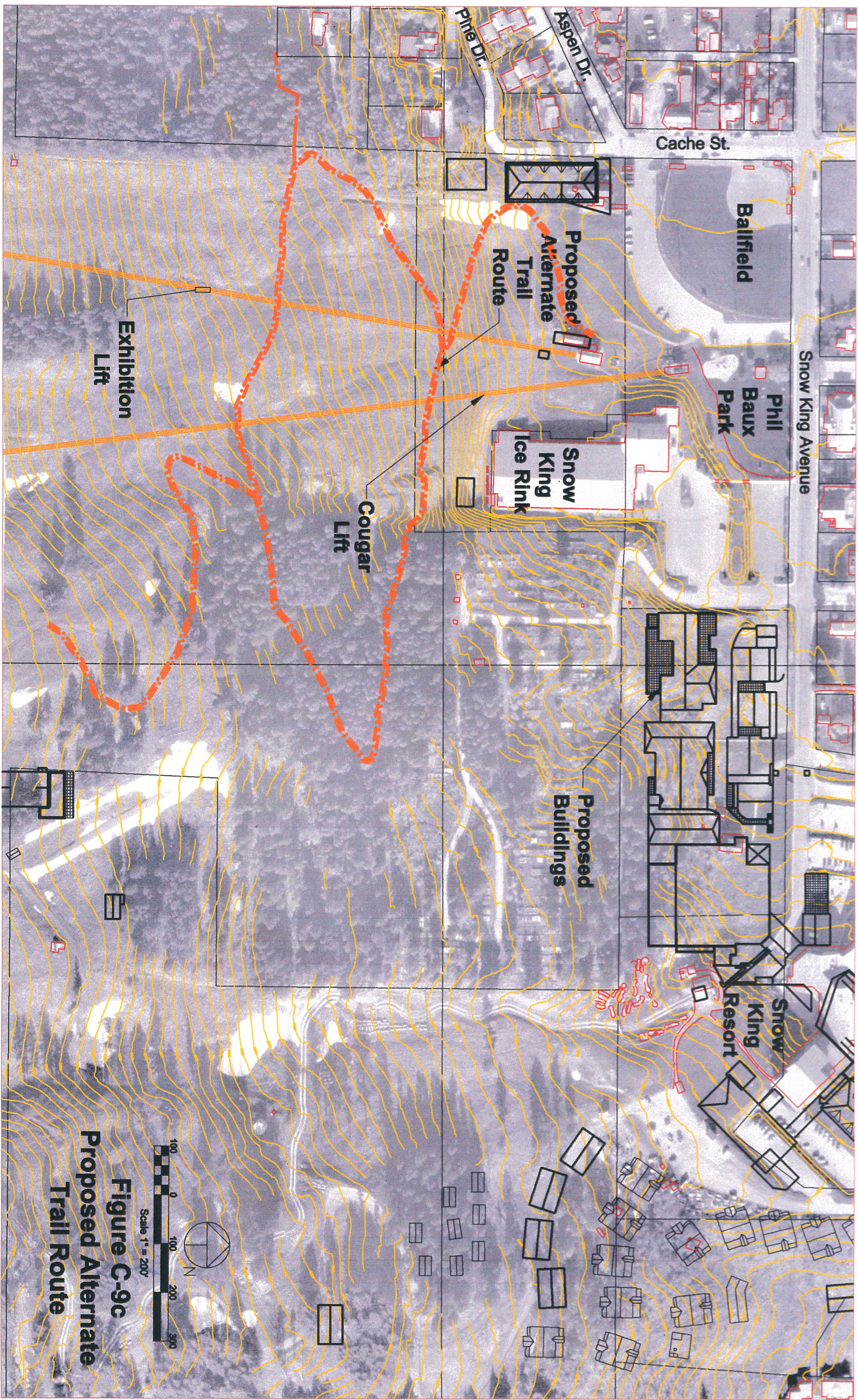
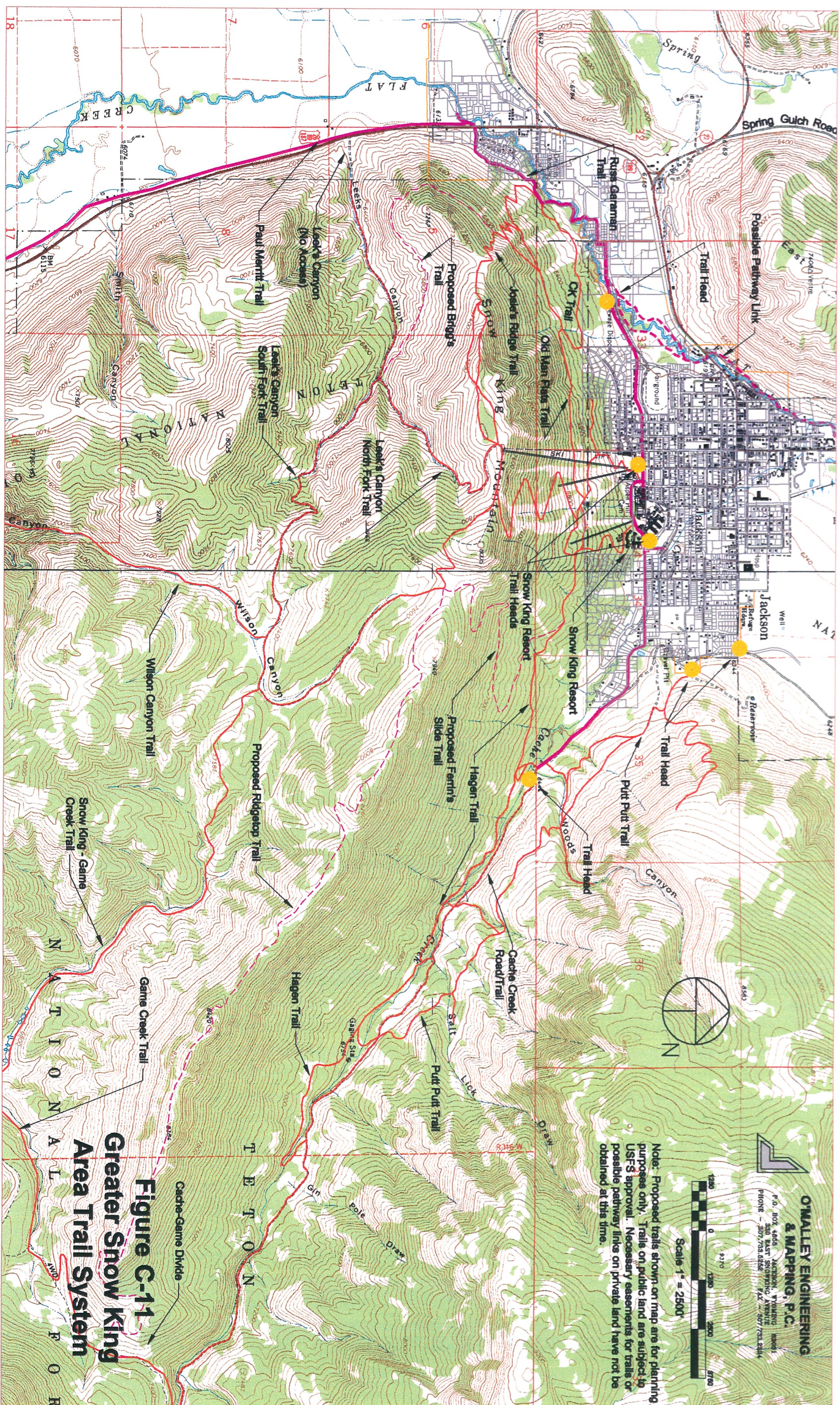


Figure C-9c
Proposed Alternate
Trail Route



Snow King Resort Master Plan - Parking Elements

Snow King Resort Master Plan - C. Parking Elements

P.1 Parking Summary

Snow King Resort's parking plan provides a surplus of daytime and evening parking for both summer and winter. During both seasons, a larger parking surplus is available during the day. The Town of Jackson and/or Teton Village could use these extra spaces for downtown employee parking or a transit hub parking area. There will be 1,783 summer spaces and 1,643 winter spaces. Of these spaces, 1,415 summer spaces and 1,275 winter spaces will be available for shared parking. The peak shared parking demand on Snow King facilities will be 947 in the summer and 720 in the winter. The smallest surplus of spaces in the summer and winter evenings is 468 and 555 respectively. A significantly larger surplus exists during the daytime. **Table P-1** shows the estimated proposed parking at Resort build-out.

	Summer Number of Spaces	Winter Number of Spaces
AREAS AVAILABLE FOR SHARED PARKING		
New Hotel and Condominium Wings - Underground	240	240
- Surface	215	150
KM6 Area - Underground	640	640
KM6 Area (Add. Alternate) - Underground	105	105
Ice Rink & Ballfield - Surface	169	140
Periphery Buildings - Surface	46	0
Shared Parking Subtotal	1415	1275
AREAS NOT AVAILABLE FOR SHARED PARKING		
Periphery Buildings - Underground	88	88
- Covered	40	40
Love Ridge - Underground	106	106
- Covered	5	5
Existing Condominiums	126	126
Maintenance Building	3	3
Non-shared Parking Subtotal	368	368
Total Proposed Parking Available	1783	1643

Summary of Proposed Parking to be Provided
Table P-1

Summary of Proposed Parking to be Provided
Table P-1

Using the Town of Jackson parking ratios as a guide, the Urban Land institute’s shared parking model was used to generate the hourly parking demand for weekdays and weekends during the summer and winter seasons. **Tables P-2 & P-3** summarize the hourly and peak hour parking demands generated by the shared parking model. Additionally, these tables indicate the peak parking demand occurs on weekday evenings. Summer parking demands are higher than winter. According to the shared parking model, a parking surplus exists both summer and winter. These surplus spaces will be available for other shared uses. Due to improved *efficiency*, the proposed shared parking will provide an adequate number of parking spaces while reducing the amount of land dedicated to parking.

Snow King Resort Master Plan - Parking Elements

Summer Weekday				Summer Weekend			
	Shared Guest Parking Spaces	Shared Employee Parking Spaces	Total Shared Parking Spaces		Shared Guest Parking Spaces	Shared Employee Parking Spaces	Total Shared Parking Spaces
6:00 AM	569	156	725	6:00 AM	567	156	723
7:00 AM	551	156	707	7:00 AM	448	156	604
8:00 AM	545	156	701	8:00 AM	483	156	639
9:00 AM	550	140	691	9:00 AM	474	140	615
10:00 AM	530	125	655	10:00 AM	441	125	565
11:00 AM	523	125	648	11:00 AM	439	125	564
12:00 PM	568	125	693	12:00 PM	508	125	633
1:00 PM	566	125	691	1:00 PM	553	125	678
2:00 PM	556	125	681	2:00 PM	563	125	688
3:00 PM	503	140	644	3:00 PM	545	140	686
4:00 PM	557	140	698	4:00 PM	563	140	703
5:00 PM	642	140	782	5:00 PM	615	140	756
6:00 PM	763	140	904	6:00 PM	710	140	850
7:00 PM	807	125	932	7:00 PM	782	125	906
8:00 PM	837	109	947	8:00 PM	799	109	908
9:00 PM	810	109	920	9:00 PM	776	109	886
10:00 PM	764	140	904	10:00 PM	752	140	892
11:00 PM	630	156	786	11:00 PM	656	156	812
12:00 AM	590	156	746	12:00 AM	629	156	785
^a Max Shared Parking Space Demand = 947 ^{a,b} Shared Parking Space Supply = 1415 ^c Parking Surplus at Peak Hour = 468				^a Max Shared Parking Space Demand = 908 ^{a, b} Shared Parking Space Supply = 1415 ^c Parking Surplus at Peak Hour = 507			

^a Does not include condominium parking because of its low ability to function as shared parking

^b Shared parking supply from table P-1

^c Represents minimum parking surplus

**Summer Shared Parking Summary
Table P-2**

Snow King Resort Master Plan - Parking Elements

Winter Weekday				Winter Weekend			
	Shared Guest Parking Spaces	Shared Employee Parking Spaces	Total Shared Parking Spaces		Shared Guest Parking Spaces	Shared Employee Parking Spaces	Total Shared Parking Spaces
6:00 AM	371	156	527	6:00AM	344	156	500
7:00 AM	390	156	546	7:00 AM	372	156	528
8:00 AM	403	156	559	8:00 AM	385	156	541
9:00 AM	386	140	526	9:00 AM	376	140	517
10:00 AM	339	125	464	10:00 AM	330	125	455
11:00 AM	334	125	459	11:00 AM	301	125	426
12:00 PM	396	125	520	12:00 PM	406	125	531
1:00 PM	408	125	532	1:00 PM	414	125	538
2:00 PM	360	125	484	2:00 PM	391	125	516
3:00 PM	318	140	458	3:00 PM	347	140	488
4:00 PM	387	140	527	4:00 PM	385	140	526
5:00 PM	463	140	603	5:00 PM	447	140	587
6:00 PM	575	125	700	6:00 PM	551	140	692
7:00 PM	595	125	720	7:00 PM	559	125	683
8:00 PM	595	109	704	8:00 PM	579	109	688
9:00 PM	548	109	657	9:00 PM	538	109	647
10:00 PM	484	140	624	10:00 PM	503	140	644
11:00 PM	401	156	557	11:00 PM	449	156	605
12:00 AM	372	156	528	12:00 AM	426	156	582
^a Max Shared Parking Space Demand = 720 ^{a, b, d} Shared Parking Space Supply = 1275 Parking Surplus at Peak Hour = 555				^a Max Shared Parking Space Demand = 692 ^{a, b, d} Shared Parking Space Supply = 1275 Parking Surplus at Peak Hour = 583			

^a Does not include condominium parking because of its low ability to function as shared parking

^b Shared parking supply from table P-1

^c Represents minimum parking surplus

^d 82 summer spaces deducted from available parking supply

Winter Shared Parking Summary
Table P-3

Snow King Resort Master Plan - Parking

P.2 Shared Parking Design Process:

A shared parking model, developed by The Urban Land Institute (ULI), was used to determine the parking requirement for Snow King. Snow King is well suited for a shared parking model because of its multiple land uses with varied peak parking times. The proposed large, centralized parking facility also improves the efficiency of shared parking by creating a large number of spaces with high turnover. This will enable the motorist to find parking with minimal effort.

The shared parking model tracks the required parking for various land uses in order to optimize the number of spaces. Shared parking reduces the amount of parking required compared to the standard computational methods which determine parking based on isolated single land use. Shared parking can improve the accuracy of the parking estimates and improve the efficiency of parking facilities. The ULI shared parking model follows four distinct steps as shown in **Figure P-4**. A more detailed illustration of the shared parking methodology is shown in **Figure P-5**. The first step evaluates the existing and proposed land uses. Each use will have its own set of parking requirements that will affect the amount of parking.

The second step involves compiling data on the land uses and parking. During this step, parking ratios are determined (**Table P-6**, Column D) for each land use using the Town of Jackson standards as a guide. These ratios are then applied to the size or number of units (**Table P-6**, Column A) proposed for each use resulting in the required number of parking spaces (**Table P-6**, Columns E and K). Although this parking space number represents the minimum number of spaces required by the town, in effect, this number will represent the maximum. This is because a combined use parking lot allows multiple uses during a single trip which, in turn, allows the parking lot to function more efficiently.

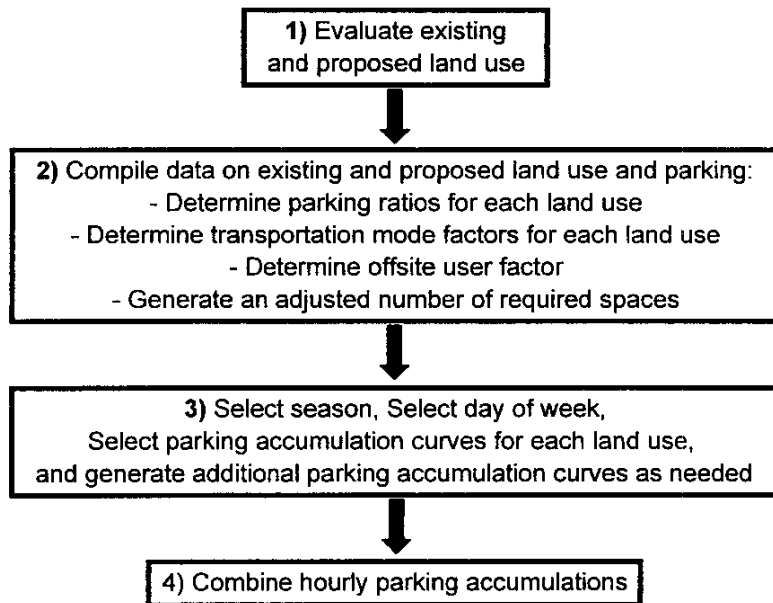
To more accurately predict the parking demand, the model needs to be adjusted to compensate for factors such as multiple use and businesses that are compatible with non-automobile use. This adjustment is made by using two factors, a "transportation mode factor" (TMF) and an "offsite user factor" (OUF). The TMF (**Table P-6**, Columns H & N) adjusts the required number of spaces to compensate for land uses that are compatible with non-auto use. The OUF (**Table P-6**, Columns I & O) adjusts the required number of parking spaces for combined uses within the area and prevents an automobile from being counted more than once for visits involving more than one land use. These factors are included in the calculations on **Table P-6**, which is discussed in **Appendix B**, and applied to the "Number of Spaces Required (Unadjusted)" already discussed. It is important to note that the "Adjusted Number of Spaces Required" (**Table P-6**, Columns J & P) does not yet represent any shared parking for varied hourly peaks. Thus, the "adjusted number of spaces required" is the parking required after adjusting for the mode of transportation used and if guests use more than one facility. The "adjusted number of spaces required" represents the peak parking which is a single value that cannot vary.

Snow King Resort Master Plan - Parking

The third step requires the determination of parking accumulation curves for each land use, which are shown and discussed in Appendix A. These curves are a function of how busy a given facility is each hour. The values for the curves indicate parking needs during the day and when a facility needs the most parking. With these curves, it is possible to see how a land use impacts the parking demand at each hour throughout the day. These curves can be used to represent seasonal use, daily use, or monthly use. In this study, weekday versus weekend use and summer versus winter use were examined. For convenience, summer and winter parking accumulation curve data has been compiled in **Table P-7**. The goal of using these curves is to maximize parking efficiency by locating a decline in parking by one land use and allowing the resulting excess parking to be utilized by a different use.

The fourth step uses static peak parking requirements from **Table P-6** with parking accumulation percentages from **Table P-7** to produce the adjusted shared peak parking for summer and winter shown in **Table P-8** and **Table P-9** respectively. These values are the parking spaces required for each land use at each hour of the day. In this fourth step, every hour is examined to determine how many cars will need to be parked for each use based on the parking accumulation curves. Tracking the variation of parking peaks as seen in the accumulation curves, allows for improved parking efficiency by allowing shared use. By generating parking demands for each hour of the day, the peak parking hour and demand are identified. A chart of the shared parking demands is provided with **Graphs 1, 2, 3, & 4**. These charts indicate how shared parking can utilize the peaks and valleys in hourly demand to improve parking efficiency.

When the four steps of the design process are complete comparisons can be made between the proposed parking and the required parking. **Table P-10** summarizes the required at various steps along the design process. The number of the spaces required with and without credit for the TMF and OUF is included in this table as well as the parking requirement with shared parking. These comparisons are made for both the town and the composite parking requirements during the summer and winter season. The required amount of shared parking shows a significant reduction from the unadjusted numbers. The composite requirement, which is slightly higher than the town requirement, would require a maximum of 2,989 winter spaces if numbers were based on separate individual land use. After modeling the hourly shared parking demands, it was calculated that 947 parking spaces would be required for the summer weekday shared parking peak demand. Peak shared parking demands and the corresponding surplus of spaces are shown on **Tables P-2 and P-3**.



Shared Parking Design Process
Figure P-4

Benefits of Shared Parking Discussion

Determining the proper amount of parking for new development requires balancing the needs of the business, the needs of the community, and the community parking standards. Businesses, of course, do not want to "under-park". Under-parking frustrates customers, hurts business, and limits the flexibility of a development. Under-parking can also negatively impact surrounding residential areas because of "spill-over" during peak times. Over-parking generates other problems:

- Not counting land costs, surface parking costs the developer from \$2,500 to \$5,000 per space to construct.
- Structured parking can cost between \$10,000 and \$25,000 per space.
- Land used for parking is unavailable for other activities - including open space.
- Parking lots generate storm water runoff that is laced with pollutants such as oil, radiator coolant, and asbestos from brake linings. The cost to the developer and the community to collect and dispose of this pollution is high. Oil separator storm water units can cost between \$5,000 and \$50,000 depending on the volume of runoff.
- Over-parking encourages automobile use and discourages alternative transportation means such as transit, walking, and bicycling. This automobile use generates additional air pollution.
- Unnecessarily large parking areas are unfriendly, intimidating, and alienating. Pedestrians are forced to maneuver between destinations unless the lots include designated pedestrian facilities.

Blind adherence to national parking standards tends to encourage over-parking. A number of communities in the United States have begun revising their standards and the trend is toward reducing total parking spaces and developing alternative transportation. For example, metropolitan Portland and the State of Oregon are instituting new standards after determining that over-parking results in less efficient land usage and lower floor to area ratios. They have found that in areas where transit is provided and other non-auto modes are convenient, less parking can be provided and yet accessibility and mobility remain high - even for auto traffic. Shared parking helps reduce total parking demand. The key to shared parking is good transit, good pedestrian facilities, and different peak hours between adjacent uses. Minimizing impacts to surrounding neighborhoods can be challenging. Many communities form neighborhood parking districts in which stickers are required to park along residential streets. Successfully protecting adjacent neighborhoods requires increased parking enforcement as well as implementing the items necessary for a successful shared parking system.

Fregonese Calthorpe Associates, regional and urban planning specialists, recently completed a report for the Town of Jackson titled, "Redevelopment Opportunities & Parking Analysis". This report proposes several changes to the Town of Jackson Parking Code and recommends, among other things, reducing the minimum parking requirements for commercial/office and lodging units. Shared parking allows for a net reduction in parking area while still providing adequate parking. **Table P-2** shows the Resort has the ability to provide 1415 shared spaces for a net surplus of 468 shared parking spaces during the peak hour of parking demand. This surplus represents one floor of the proposed structured parking lot in the KM6 area. As mentioned in Section C.4, providing additional parking at Snow King Resort to be used for downtown employee parking may be desirable for the community. In addition, this surplus parking could be used in the winter to provide an in-town transit parking lot for skiers heading to the Jackson Hole Mountain Resort in Teton Village. Snow King Resort looks forward to working with the Town of Jackson to develop effective transportation and parking solutions for the Resort and the community.

Snow King Resort Master Plan - Parking Elements

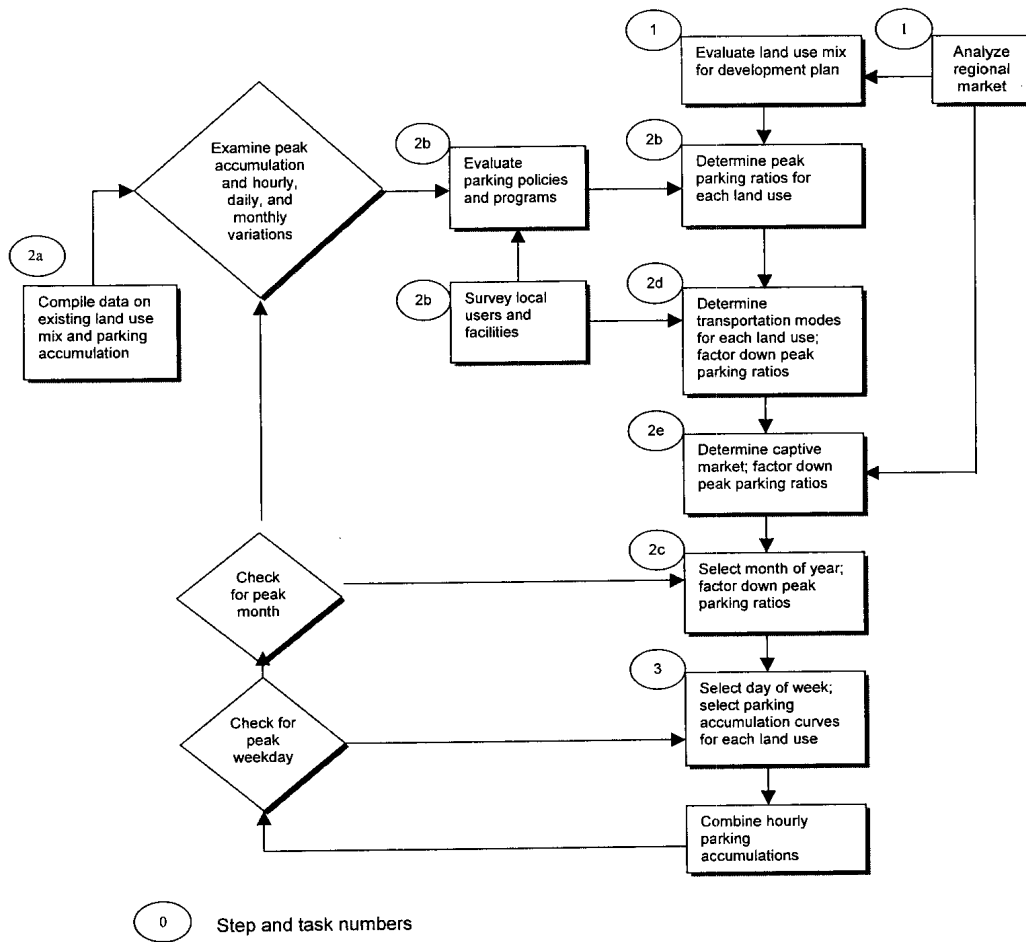
Appendix A **Parking Accumulation Curves**

Parking accumulation represents the percent of peak parking utilized and is a function of how busy a land use is. Parking accumulation curves are based on those available in the ULI Shared Parking handbook. Some curves were modified to more accurately reflect the Jackson community by considering factors such as the hours of operation and pattern of use. Parking accumulation curves were created for the conference facilities, entertainment activities, ski area, health club, and resort staffing since no values for these activities were available in the Urban Land Institute literature.

Hotel:

Parking accumulation for hotel guests is based on the Urban Land Institute parking accumulation curves. These curves represent the scenario that parking accumulation increases as guest's check-in causing a peak in parking after guests have checked-in that remains high during the night until the morning when the accumulation drops due to guests leaving during the day. The summer parking accumulation was taken directly from ULI information. Based on past experience, the winter accumulation represents approximately 75% of the summer figures.

Snow King Resort Master Plan – Parking



Shared Parking Methodology
 (Source: Shared Parking, Urban Land Institute)
Figure P-5

Snow King Resort Master Plan – Parking Elements

	Units or SF (A)	Required Town of Jackson Parking Ratio per unit (B)	Urban Land Institute Parking Ratio per unit (C)	Proposed Composite Parking Ratio per unit (D)	Summer						Winter					
					Max. Parking Spaces Required (Unadjusted) (E)	Parking Demand Eligible for Sharing (F)	Parking Demand Not Eligible for Sharing (G)	Transport. Mode Factor ^a (H)	Offsite User Factor ^b (I)	Adjusted Number of Spaces Required (J)	Max. Parking Spaces Required (Unadjusted) (K)	Parking Demand Eligible for Sharing (L)	Parking Demand Not Eligible for Sharing (M)	Transport. Mode Factor ^a (N)	Offsite User Factor ^b (O)	Adjusted Number of Spaces Required (P)
Condominiums:																
Existing / Approved ^f	103	1.5	2.5	2.0	206	0	206				206	0	206			
Love (3 bedroom) ^f	53	1.5	2.5	2.0	106	0	106	0.80	1.00	0	106	0	106	0.80	1.00	0
Hotel Guest Rooms																
Existing	204	0.75	1.25	1.00	204	204	0	0.60	1.00	122	204	204	0	0.50	1.00	102
New	714	0.75	1.25	1.00	714	714	0	0.60	1.00	428	714	714	0	0.50	1.00	357
Subtotal Guest Units :	1074															
Conference (SF) (1/150)	76000	0.00667	0.5 ^d	0.00667	507	507	0	1.00	0.50	253	507	507	0	1.00	0.50	253
Theaters (Seats)	460	0.33	0.30	0.33	152	152	0	0.95	0.90	130	152	152	0	1.00	0.90	137
Resort Amenities:																
Miniature Golf (holes)	18	n/a	n/a	n/a	13	13	0	1.00	0.70	9	0	0	0	n/a	n/a	0
Horseback Rides (Horses)	20	0.25	n/a	0.25	5	5	0	1.00	0.80	4	0	0	0	n/a	n/a	0
Alpine Slide (person/hr)	143	n/a	n/a	0.33	47	47	0	1.00	0.70	33	0	0	0	n/a	n/a	0
Restaurant (Seats)	850	0.33	10 ^e	0.33	281	281	0	0.90	0.20	50	281	281	0	1.00	0.20	56
Lounge/Bar (Seats)	250	0.5	10 ^e	0.5	125	125	0	0.90	0.40	45	125	125	0	1.00	0.40	50
Commercial (SF) (1/250)	67200	0.002	4 ^e	0.004	269	269	0	0.90	0.50	121	269	269	0	1.00	0.50	134
Health Club		n/a ^h	n/a	100	100	100	0	1.00	0.90	90	100	100	0	1.00	0.90	90
Employees (1.0/#rooms)	1074	n/a	n/a													
With Housing on Site ^c	204	1.0	1.0	1.0	204	156	48	1.00	1.00	156	196	148	48	1.00	1.00	156
Snow King Ski Area		n/a ^g	n/a	130	0	0	0	1.00	1.00		130	130	0	1.00	1.00	130
TOTALS:		n/a ⁱ	n/a ⁱ	n/a ⁱ	2932	2572	360	n/a	n/a	1442	2989	2629	360	n/a	n/a	1465

^a Transportation Mode Factor = % of people driving
^b Offsite User Factor = % of users from offsite (not staying at the resort)
^c During winter 8 dedicated employee spaces will not be available
^d Refers to parking spaces per seat/person
^e Parking spaces per 1,000 sf
^f Parking ratio represents 2 units, assuming condos can be split into 2 separate rental units
^g Ski area parking ratio is broken down between employees, hotel rooms, and skiers
^h Health club parking ratio is based on workout machines, saunas, and square footage of other area
ⁱ See Table P-10 for parking totals using different parking ratios

Snow King Resort - Required Parking Spaces
Table P-6

Summer - Weekend & Weekday

SUMMER	WEEKDAY											WEEKEND										
	Hotel	Conference & Meeting	Theater	Ski Area & Other	Resort Activities	Restaurant /Lounge	Retail & Commercial	Health Club	Office	Employees Offsite Housing	Employees Onsite Housing	Hotel	Conference & Meeting	Theater	Ski Area & Other	Resort Activities	Restaurant /Lounge	Retail & Commercial	Health Club	Office	Employees Offsite Housing	Employees Onsite Housing
6:00 AM	100%	0%	0%	0%	0%	0%	0%	20%	0%	30%	100%	90%	0%	0%	0%	0%	0%	0%	0%	0%	25%	100%
7:00 AM	87%	0%	0%	0%	0%	50%	5%	20%	20%	45%	100%	70%	0%	0%	0%	0%	50%	5%	10%	3%	30%	100%
8:00 AM	66%	25%	0%	0%	0%	85%	16%	20%	60%	70%	100%	60%	15%	0%	0%	0%	85%	16%	15%	10%	60%	100%
9:00 AM	55%	45%	0%	0%	10%	80%	32%	15%	92%	85%	90%	50%	25%	0%	0%	15%	80%	32%	15%	12%	70%	90%
10:00 AM	45%	60%	0%	0%	60%	35%	50%	10%	100%	100%	80%	40%	30%	0%	0%	80%	35%	50%	15%	16%	70%	80%
11:00 AM	35%	70%	0%	0%	80%	20%	65%	20%	98%	100%	80%	35%	35%	0%	0%	100%	20%	65%	15%	18%	70%	80%
12:00 PM	30%	80%	0%	0%	70%	55%	73%	30%	88%	100%	80%	30%	40%	30%	0%	95%	55%	73%	20%	18%	70%	80%
1:00 PM	30%	80%	0%	0%	50%	60%	75%	30%	91%	100%	80%	30%	40%	70%	0%	65%	60%	75%	20%	13%	70%	80%
2:00 PM	35%	70%	0%	0%	70%	50%	73%	20%	97%	100%	80%	35%	35%	70%	0%	90%	50%	73%	15%	10%	70%	80%
3:00 PM	35%	50%	10%	0%	90%	30%	72%	15%	93%	100%	90%	40%	25%	70%	0%	100%	30%	72%	10%	8%	70%	90%
4:00 PM	45%	30%	58%	0%	80%	20%	66%	25%	74%	85%	90%	50%	15%	70%	0%	100%	20%	66%	15%	6%	70%	90%
5:00 PM	60%	30%	58%	0%	60%	25%	60%	40%	48%	85%	90%	60%	15%	70%	0%	80%	25%	60%	25%	3%	70%	90%
6:00 PM	70%	40%	67%	0%	50%	50%	61%	50%	25%	85%	90%	70%	20%	80%	0%	65%	50%	61%	20%	2%	70%	90%
7:00 PM	75%	40%	73%	0%	50%	50%	68%	50%	8%	70%	80%	80%	20%	90%	0%	65%	50%	68%	15%	0%	60%	80%
8:00 PM	90%	30%	83%	0%	0%	50%	65%	35%	5%	60%	70%	90%	15%	100%	0%	0%	50%	65%	10%	0%	45%	70%
9:00 PM	95%	30%	83%	0%	0%	35%	43%	20%	3%	30%	70%	95%	15%	100%	0%	0%	35%	43%	0%	0%	15%	70%
10:00 PM	100%	20%	83%	0%	0%	20%	22%	10%	1%	30%	90%	100%	10%	100%	0%	0%	20%	22%	0%	0%	15%	90%
11:00 PM	100%	0%	50%	0%	0%	15%	0%	0%	0%	15%	100%	100%	0%	70%	0%	0%	15%	0%	0%	0%	10%	100%
12:00 AM	100%	0%	30%	0%	0%	0%	0%	0%	0%	15%	100%	100%	0%	60%	0%	0%	0%	0%	0%	0%	10%	100%

Winter - Weekend & Weekday

WINTER	WEEKDAY											WEEKEND										
	Hotel	Conference & Meeting	Theater	Ski Area & Other	Resort Activities	Restaurant /Lounge	Retail & Commercial	Health Club	Office	Employees Offsite Housing	Employees Onsite Housing	Hotel	Conference & Meeting	Theater	Ski Area & Other	Resort Activities	Restaurant /Lounge	Retail & Commercial	Health Club	Office	Employees Offsite Housing	Employees Onsite Housing
6:00 AM	75%	0%	0%	0%	0%	0%	0%	30%	0%	30%	100%	75%	0%	0%	0%	0%	0%	0%	0%	0%	25%	100%
7:00 AM	65%	0%	0%	0%	0%	50%	5%	35%	20%	45%	100%	65%	0%	0%	0%	0%	50%	5%	15%	3%	30%	100%
8:00 AM	50%	15%	0%	10%	0%	85%	10%	35%	60%	70%	100%	50%	10%	0%	0%	0%	85%	16%	20%	10%	60%	100%
9:00 AM	40%	25%	0%	10%	10%	80%	20%	30%	92%	85%	90%	40%	15%	0%	30%	15%	80%	32%	30%	12%	70%	90%
10:00 AM	35%	30%	0%	30%	60%	35%	35%	20%	100%	100%	80%	35%	15%	0%	50%	80%	35%	50%	30%	16%	70%	80%
11:00 AM	25%	40%	0%	40%	80%	20%	45%	40%	98%	100%	80%	25%	20%	0%	65%	100%	20%	65%	30%	18%	70%	80%
12:00 PM	25%	40%	0%	50%	70%	55%	50%	60%	88%	100%	80%	25%	20%	35%	65%	90%	55%	73%	40%	18%	70%	80%
1:00 PM	25%	40%	0%	50%	50%	60%	55%	60%	91%	100%	80%	25%	20%	35%	65%	70%	60%	75%	40%	13%	70%	80%
2:00 PM	25%	35%	0%	55%	70%	50%	50%	40%	97%	100%	80%	25%	20%	35%	70%	90%	50%	73%	30%	10%	70%	80%
3:00 PM	25%	25%	10%	55%	90%	30%	50%	30%	93%	100%	90%	25%	15%	35%	60%	100%	30%	72%	20%	8%	70%	90%
4:00 PM	35%	15%	45%	50%	80%	20%	45%	50%	74%	85%	90%	35%	5%	55%	50%	100%	20%	66%	30%	6%	70%	90%
5:00 PM	45%	15%	45%	50%	60%	25%	40%	85%	48%	85%	90%	45%	5%	55%	40%	80%	25%	60%	50%	3%	70%	90%
6:00 PM	55%	20%	50%	50%	50%	50%	45%	100%	25%	85%	80%	55%	10%	75%	40%	65%	50%	61%	40%	2%	70%	90%
7:00 PM	55%	20%	60%	50%	50%	50%	50%	100%	8%	70%	80%	55%	10%	80%	40%	65%	50%	68%	30%	0%	60%	80%
8:00 PM	65%	15%	60%	40%	0%	50%	45%	70%	5%	60%	70%	65%	5%	80%	40%	50%	50%	65%	20%	0%	45%	70%
9:00 PM	70%	15%	55%	20%	0%	35%	30%	40%	3%	30%	70%	70%	5%	80%	30%	0%	35%	43%	0%	0%	15%	70%
10:00 PM	75%	10%	40%	5%	0%	20%	15%	20%	1%	30%	90%	75%	5%	70%	10%	0%	20%	22%	0%	0%	15%	90%
11:00 PM	75%	0%	30%	0%	0%	15%	0%	0%	0%	15%	100%	75%	0%	65%	0%	0%	15%	0%	0%	0%	10%	100%
12:00 AM	75%	0%	20%	0%	0%	0%	0%	0%	0%	15%	100%	75%	0%	60%	0%	0%	0%	0%	0%	0%	10%	100%

Parking Accumulation
by Percent of Peak Parking

Table P-7

Summer Weekday																					
Summer Weekday	Condominiums		Hotel Guest Rooms		Lodging Sub-Totals	Conferences, Meetings, & Groups	Theater	Resort Activities				Activity Sub-Totals	Resort Amenities				Amenities Sub-Totals	Total of Guest Spaces	Employees with Onsite Housing	Total Shared Spaces	Max Adjusted Non Shared Spaces Req
	Existing/ Approved	Proposed	Existing	New				Ski Area & Other	Miniature Golf	Horseback Rides	Alpine Slide		Restaurant	Bar	Retail & Commercial	Health Club					
Peak Parking	n/a	n/a	122	428	551	253	130	0	9	4	33	46	50	45	121	90	256	1286	156	n/a	1442
6:00 AM	n/a	n/a	122	428	551	0	0	0	0	0	0	0	0	0	0	18	18	569	156	725	1442
7:00 AM	n/a	n/a	106	373	479	0	0	0	0	0	0	0	25	23	6	18	47	551	156	707	1442
8:00 AM	n/a	n/a	81	283	364	63	0	0	0	0	0	0	43	38	19	18	76	545	156	701	1442
9:00 AM	n/a	n/a	67	236	303	114	0	0	1	0	3	5	40	36	39	14	88	550	140	691	1442
10:00 AM	n/a	n/a	55	193	248	152	0	0	5	2	20	28	18	16	60	9	85	530	125	655	1442
11:00 AM	n/a	n/a	43	150	193	177	0	0	7	3	26	37	10	9	79	18	106	523	125	648	1442
12:00 PM	n/a	n/a	37	129	165	203	0	0	6	3	23	32	28	25	88	27	140	568	125	693	1442
1:00 PM	n/a	n/a	37	129	165	203	0	0	5	2	17	23	30	27	91	27	145	566	125	691	1442
2:00 PM	n/a	n/a	43	150	193	177	0	0	6	3	23	32	25	23	88	18	129	556	125	681	1442
3:00 PM	n/a	n/a	43	150	193	127	13	0	8	4	30	41	15	14	87	14	114	503	140	644	1442
4:00 PM	n/a	n/a	55	193	248	76	75	0	7	3	26	37	10	9	80	23	111	557	140	698	1442
5:00 PM	n/a	n/a	73	257	330	76	75	0	5	2	20	28	13	11	73	36	120	642	140	782	1442
6:00 PM	n/a	n/a	86	300	386	101	87	0	5	2	17	23	25	23	74	45	141	763	140	904	1442
7:00 PM	n/a	n/a	92	321	413	101	95	0	5	2	17	23	25	23	82	45	150	807	125	932	1442
8:00 PM	n/a	n/a	110	386	496	76	108	0	0	0	0	0	25	23	79	32	133	837	109	947	1442
9:00 PM	n/a	n/a	116	407	523	76	108	0	0	0	0	0	18	16	52	18	86	810	109	920	1442
10:00 PM	n/a	n/a	122	428	551	51	108	0	0	0	0	0	10	9	27	9	45	764	140	904	1442
11:00 PM	n/a	n/a	122	428	551	0	65	0	0	0	0	0	8	7	0	0	7	630	156	786	1442
12:00 AM	n/a	n/a	122	428	551	0	39	0	0	0	0	0	0	0	0	0	0	590	156	746	1442

Summer Weekend																					
Summer Weekend	Condominiums		Hotel Guest Rooms		Lodging Totals	Convention	Movie Theater	Resort Activities				Activity Totals	Resort Amenities				Amenities Sub-Totals	Total of Guest Spaces	Employees w/ Onsite Housing	Total Shared Spaces	Max Adjusted Non Shared Spaces Req
	Existing/ Approved	Proposed	Existing	New				Ski Area & Other	Miniature Golf	Horseback Rides	Alpine Slide		Restaurant	Bar	Retail & Commercial	Health Club					
Peak Parking	n/a	n/a	122	428	551	253	130	0	9	4	33	46	50	45	121	90	256	1286	156	n/a	1442
6:00 AM	n/a	n/a	110	386	496	0	71	0	0	0	0	0	0	0	0	0	38	567	156	723	1442
7:00 AM	n/a	n/a	86	300	386	0	0	0	0	0	0	0	25	23	6	9	71	448	156	604	1442
8:00 AM	n/a	n/a	73	257	330	38	0	0	0	0	0	0	43	38	19	14	88	483	156	639	1442
9:00 AM	n/a	n/a	61	214	275	63	0	0	1	1	5	7	40	36	39	14	90	474	140	615	1442
10:00 AM	n/a	n/a	49	171	220	76	0	0	7	3	26	37	18	16	60	14	101	441	125	565	1442
11:00 AM	n/a	n/a	43	150	193	89	0	0	9	4	33	46	10	9	79	14	131	439	125	564	1442
12:00 PM	n/a	n/a	37	129	165	101	39	0	9	4	31	44	28	25	88	18	136	508	125	633	1442
1:00 PM	n/a	n/a	37	129	165	101	91	0	6	3	21	30	30	27	91	18	124	553	125	678	1442
2:00 PM	n/a	n/a	43	150	193	89	91	0	8	4	30	41	25	23	88	14	110	563	125	688	1442
3:00 PM	n/a	n/a	49	171	220	63	91	0	9	4	33	46	15	14	87	9	102	545	140	686	1442
4:00 PM	n/a	n/a	61	214	275	38	91	0	9	4	33	46	10	9	80	14	106	563	140	703	1442
5:00 PM	n/a	n/a	73	257	330	38	91	0	7	3	26	37	13	11	73	23	114	615	140	756	1442
6:00 PM	n/a	n/a	86	300	386	51	104	0	6	3	21	30	25	23	74	18	118	710	140	850	1442
7:00 PM	n/a	n/a	98	343	441	51	117	0	6	3	21	30	25	23	82	14	110	782	125	906	1442
8:00 PM	n/a	n/a	110	386	496	38	130	0	0	0	0	0	25	23	79	9	68	799	109	908	1442
9:00 PM	n/a	n/a	116	407	523	38	130	0	0	0	0	0	18	16	52	0	36	776	109	886	1442
10:00 PM	n/a	n/a	122	428	551	25	130	0	0	0	0	0	10	9	27	0	7	752	140	892	1442
11:00 PM	n/a	n/a	122	428	551	0	91	0	0	0	0	0	8	7	0	0	0	656	156	812	1442
12:00 AM	n/a	n/a	122	428	551	0	78	0	0	0	0	0	0	0	0	0	0	629	156	785	1442

Summer Adjusted & Shared
Hourly Peak Parking

Table P-8

Winter Weekday																					
Winter Weekday	Condominiums		Hotel Guest Rooms		Lodging Totals	Convention	Movie Theater	Resort Activities				Activity Totals	Resort Amenities				Amenities Sub-Totals	Total of Guest Spaces	Employees w/ Onsite Housing	Total Shared Spaces	Max Adjusted Non Shared Spaces Req
	Existing/ Approved	Proposed	Existing	New				Ski Area & Other	Miniature Golf	Horseback Rides	Alpine Slide		Restaurant	Bar	Retail & Commercial	Health Club					
Peak Parking	n/a	n/a	102	357	459	253	137	130	0	0	0	130	56	50	134	90	274	1309	156	n/a	1465
6:00 AM	n/a	n/a	77	268	344	0	0	0	0	0	0	0	0	0	0	27	63	371	156	527	1465
7:00 AM	n/a	n/a	66	232	298	0	0	0	0	0	0	0	28	25	7	32	87	390	156	546	1465
8:00 AM	n/a	n/a	51	179	230	38	0	13	0	0	0	0	48	43	13	32	94	403	156	559	1465
9:00 AM	n/a	n/a	41	143	184	63	0	13	0	0	0	0	45	40	27	27	83	386	140	526	1465
10:00 AM	n/a	n/a	36	125	161	76	0	39	0	0	0	0	20	18	47	18	106	339	125	464	1465
11:00 AM	n/a	n/a	26	89	115	101	0	52	0	0	0	0	11	10	60	36	149	334	125	459	1465
12:00 PM	n/a	n/a	26	89	115	101	0	65	0	0	0	0	31	28	67	54	158	396	125	520	1465
1:00 PM	n/a	n/a	26	89	115	101	0	65	0	0	0	0	34	30	74	54	128	408	125	532	1465
2:00 PM	n/a	n/a	26	89	115	89	0	72	0	0	0	0	28	25	67	36	109	360	125	484	1465
3:00 PM	n/a	n/a	26	89	115	63	14	72	0	0	0	0	17	15	67	27	115	318	140	458	1465
4:00 PM	n/a	n/a	36	125	161	38	61	65	0	0	0	0	11	10	60	45	143	387	140	527	1465
5:00 PM	n/a	n/a	46	161	207	38	61	65	0	0	0	0	14	13	54	77	175	463	140	603	1465
6:00 PM	n/a	n/a	56	196	252	51	68	65	0	0	0	0	28	25	60	90	182	575	125	700	1465
7:00 PM	n/a	n/a	56	196	252	51	82	65	0	0	0	0	28	25	67	90	148	595	125	720	1465
8:00 PM	n/a	n/a	66	232	298	38	82	52	0	0	0	0	28	25	60	63	94	595	109	704	1465
9:00 PM	n/a	n/a	71	250	321	38	75	26	0	0	0	0	20	18	40	36	48	548	109	657	1465
10:00 PM	n/a	n/a	77	268	344	25	55	7	0	0	0	0	11	10	20	18	8	484	140	624	1465
11:00 PM	n/a	n/a	77	268	344	0	41	0	0	0	0	0	8	8	0	0	0	401	156	557	1465
12:00 AM	n/a	n/a	77	268	344	0	27	0	0	0	0	0	0	0	0	0	0	372	156	528	1465

Winter Weekend																					
Winter Weekend	Condominiums		Hotel Guest Rooms		Lodging Totals	Convention	Movie Theater	Resort Activities				Activity Totals	Resort Amenities				Amenities Sub-Totals	Total of Guest Spaces	Employees w/ Onsite Housing	Total Shared Spaces	Max Adjusted Non Shared Spaces Req
	Existing/ Approved	Proposed	Existing	New				Ski Area & Other	Miniature Golf	Horseback Rides	Alpine Slide		Restaurant	Bar	Retail & Commercial	Health Club					
Peak Parking	n/a	n/a	102	357	459	253	137	130	0	0	0	130	56	50	134	90	274	1309	156	n/a	1465
6:00 AM	n/a	n/a	77	268	344	0	0	0	0	0	0	0	0	0	0	0	45	344	156	500	1465
7:00 AM	n/a	n/a	66	232	298	0	0	0	0	0	0	0	28	25	7	14	82	372	156	528	1465
8:00 AM	n/a	n/a	51	179	230	25	0	0	0	0	0	0	48	43	22	18	110	385	156	541	1465
9:00 AM	n/a	n/a	41	143	184	38	0	39	0	0	0	0	45	40	43	27	112	376	140	517	1465
10:00 AM	n/a	n/a	36	125	161	38	0	65	0	0	0	0	20	18	67	27	124	330	125	455	1465
11:00 AM	n/a	n/a	26	89	115	51	0	85	0	0	0	0	11	10	87	27	162	301	125	426	1465
12:00 PM	n/a	n/a	26	89	115	51	48	85	0	0	0	0	31	28	98	36	167	406	125	531	1465
1:00 PM	n/a	n/a	26	89	115	51	48	85	0	0	0	0	34	30	101	36	150	414	125	538	1465
2:00 PM	n/a	n/a	26	89	115	51	48	91	0	0	0	0	28	25	98	27	130	391	125	516	1465
3:00 PM	n/a	n/a	26	89	115	38	48	78	0	0	0	0	17	15	97	18	126	347	140	488	1465
4:00 PM	n/a	n/a	36	125	161	13	75	65	0	0	0	0	11	10	89	27	138	385	140	526	1465
5:00 PM	n/a	n/a	46	161	207	13	75	52	0	0	0	0	14	13	81	45	143	447	140	587	1465
6:00 PM	n/a	n/a	56	196	252	25	102	52	0	0	0	0	28	25	82	36	143	551	140	692	1465
7:00 PM	n/a	n/a	56	196	252	25	109	52	0	0	0	0	28	25	91	27	130	559	125	683	1465
8:00 PM	n/a	n/a	66	232	298	13	109	52	0	0	0	0	28	25	87	18	75	579	109	688	1465
9:00 PM	n/a	n/a	71	250	321	13	109	39	0	0	0	0	20	18	58	0	40	538	109	647	1465
10:00 PM	n/a	n/a	77	268	344	13	96	13	0	0	0	0	11	10	30	0	8	503	140	644	1465
11:00 PM	n/a	n/a	77	268	344	0	89	0	0	0	0	0	8	8	0	0	0	449	156	605	1465
12:00 AM	n/a	n/a	77	268	344	0	82	0	0	0	0	0	0	0	0	0	0	426	156	582	1465

Winter Adjusted & Shared
Hourly Peak Parking

Table P-9

Snow King Resort Master Plan - Parking Elements

Summer	Winter	
2256	2321	Town of Jackson Parking Requirement (Total Parking) ^a
n/a ^c	n/a ^c	Urban Land Institute Parking Requirement (Total Parking) ^a
2932	2989	Composite Parking Requirement (Total Parking) ^a
1292	1376	Town of Jackson Parking Requirement with Transportation Factor and Non-Resort User Factor ^b
n/a ^c	n/a ^c	Urban Land Institute with Transportation Factor and Non-Resort User Factor ^b
1442	1465	Estimated Composite Parking Required with Transportation Factor and Non-Resort User Factor ^b
947	720	Estimated Composite Parking Required with Transportation Factor and Non-Resort User Factor and shared parking
1415	1275	Proposed Shared Parking
1783	1643	Proposed Total Parking

^a Required parking numbers represent the parking required for each use separately with no credit given for combined trips or alternative transportation

^b Parking numbers represent the required parking based on parking ratios with credit given for combined trips and alternative transportation

^c Complete parking demands can not be computed since several land uses exist in Jackson which are not included in the ULI parking ratios

Required Parking Summary
Table P-10

Snow King Resort Master Plan – Parking Elements

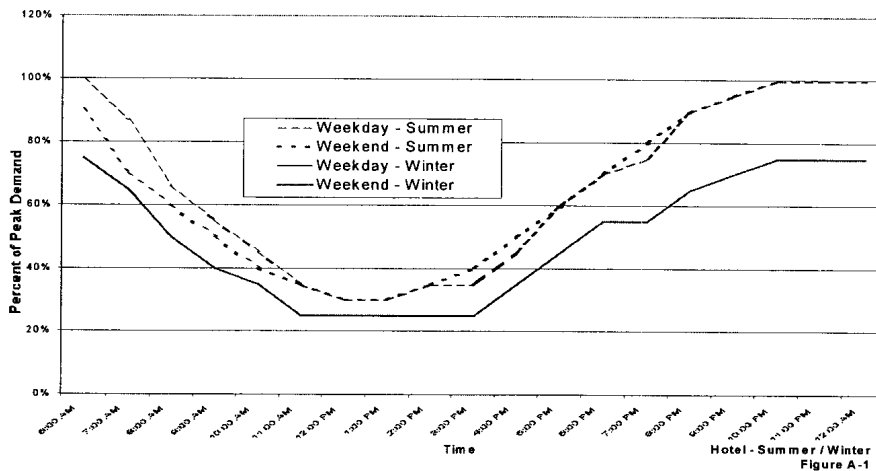
Appendix A

Parking Accumulation Curves

Parking accumulation represents the percent of peak parking utilized and is a function of how busy a land use is. Parking accumulation curves are based on those available in the ULI Shared Parking handbook. Some curves were modified to more accurately reflect the Jackson community by considering factors such as the hours of operation and pattern of use. Parking accumulation curves were created for the conference facilities, entertainment activities, ski area, health club, and resort staffing since no values for these activities were available in the Urban Land Institute literature.

Hotel:

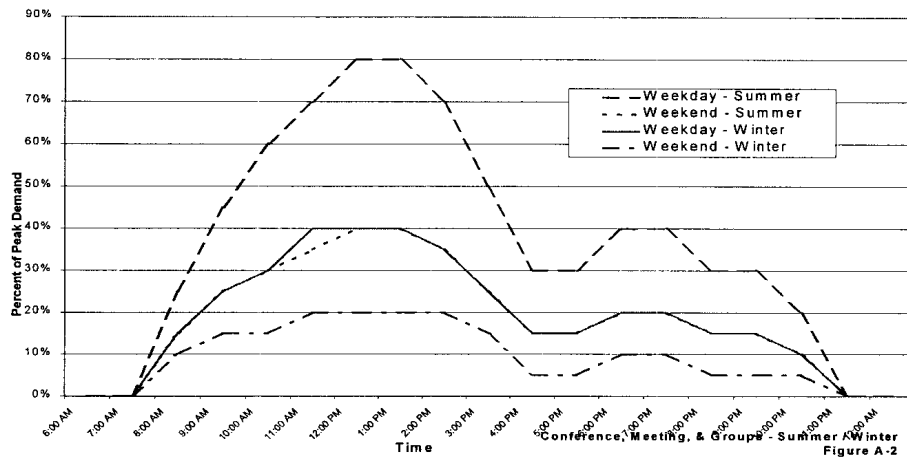
Parking accumulation for hotel guests is based on the Urban Land Institute parking accumulation curves. These curves represent the scenario that parking accumulation increases as guests check-in causing a peak in parking after guests have checked-in that remains high during the night until the morning when the accumulation drops due to guests leaving during the day. The summer parking accumulation was taken directly from ULI information. Based on past experience, the winter accumulation represents approximately 75% of the summer figures.



Snow King Resort Master Plan – Parking

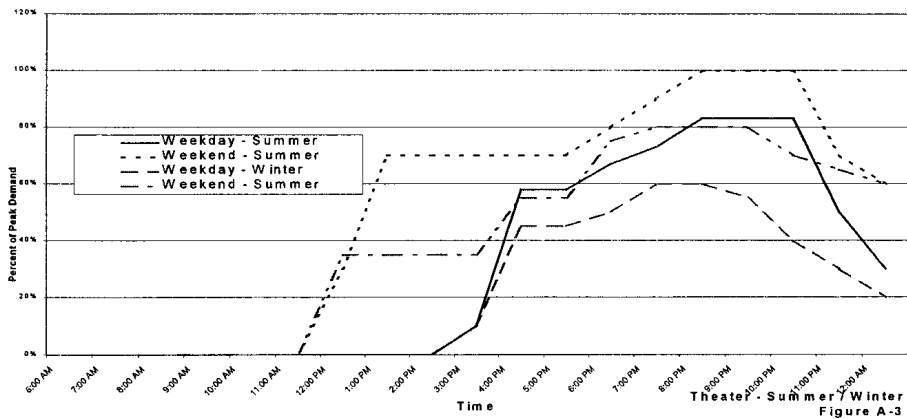
Conference, Meetings, & Groups:

No parking accumulation curves were available from the Urban Land Institute for hotel conference space. Parking accumulation curves were generated based on past and projected use. Summer weekday provided the heaviest use of the facilities peaking between 12:00 p.m. and 1:00 p.m. with an additional peak in the evening hours between 6:00 p.m. and 7:00 p.m. summer weekend use is approximately half of the weekday use. Winter use is approximately half of the summer use.



Theater:

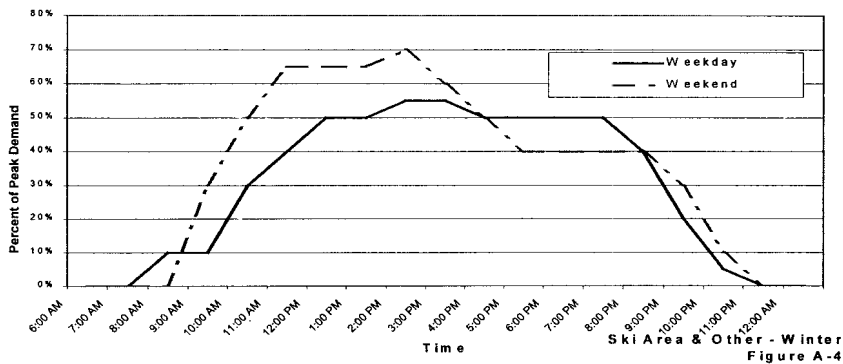
Parking accumulation curves come directly from the ULI recommendations. Summer months represent the busiest season because of the summer releases. Additionally, increased visitor traffic also increases demand on theater parking. Heaviest use occurs during the summer weekend evenings, with summer weekdays having slightly less use. Winter is represented with less use than the summer months.



Snow King Resort Master Plan – Parking

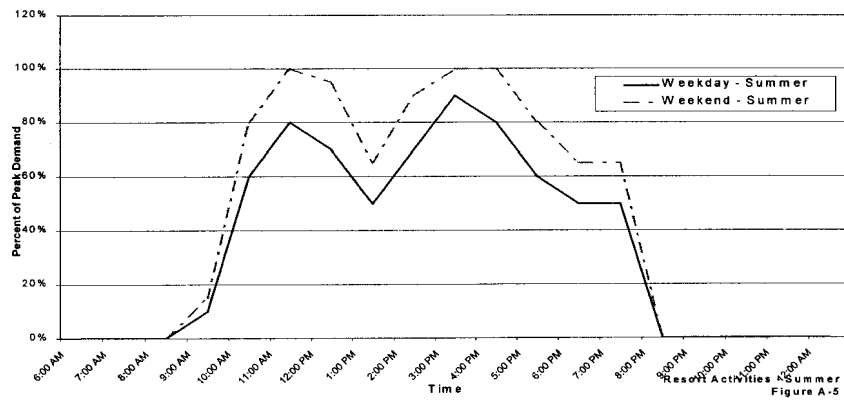
Ski Area & Other:

No parking accumulation curves were available from the ULI to represent demand on ski areas. Parking accumulation curves were generated based on experience with past use. Snow King typically sees two daily peaks corresponding to use during lunch as well as after school. The later peak generally continues into the evening hours. Weekends have a higher peak use with lower use in the evening.



Resort Activities:

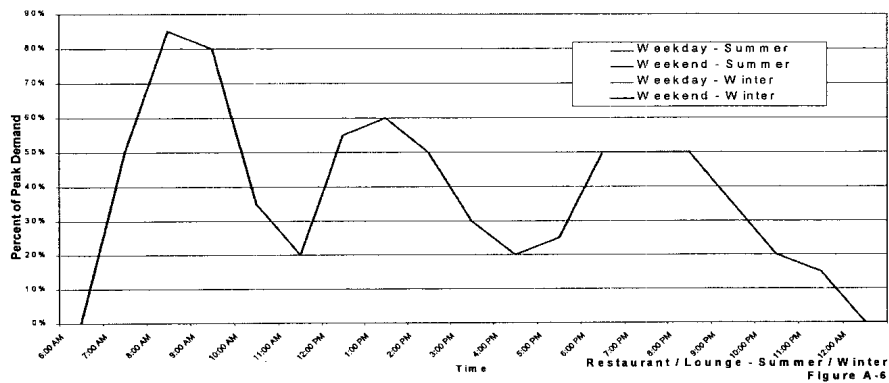
No parking accumulation curves were available from the ULI to represent demand on resort activities. Parking accumulation curves were generated based on experience with past use. The ski area typically sees two daily peaks corresponding to use before lunch as well as before dinner. Weekends have a higher use than weekdays.



Snow King Resort Master Plan – Parking

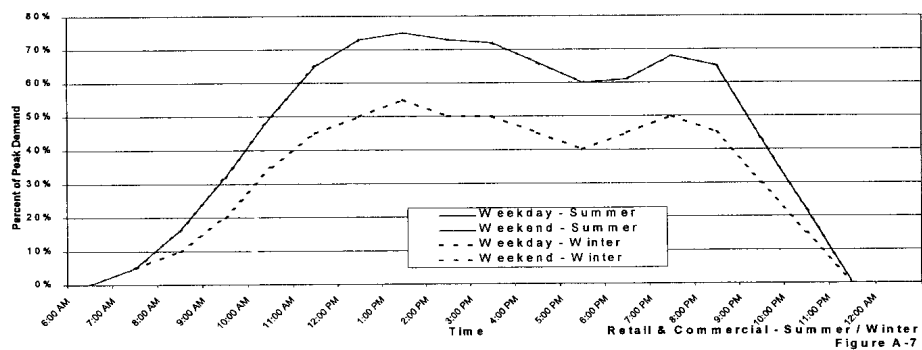
Restaurant & Lounge:

ULI hotel restaurant and lounge parking accumulation curves were consulted, however, the different hours of Snow King's restaurant and lounge required a new curve. The new parking accumulation curve was generated based on past experience and represented composite use of both the restaurant and the bar. The curve shows three peaks corresponding to meal times. Breakfast is the largest of the peaks followed by lunch and dinner. The dinner peak extends until approximately 9:00 p.m. to compensate for evening use of the bar.



Retail & Commercial:

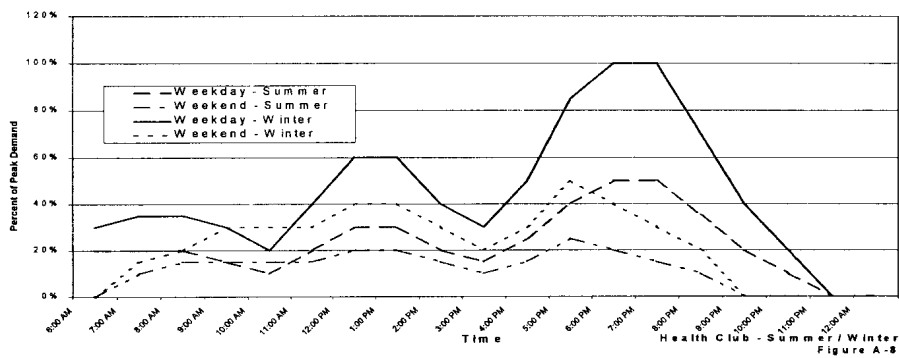
Parking accumulation curves come from the ULI recommendations with an increase in evening use to correspond with visitor shopping patterns. Summer represents the highest demand during the midday with a second peak in the evening. Winter demand is reduced from the summer demand.



Snow King Resort Master Plan – Parking

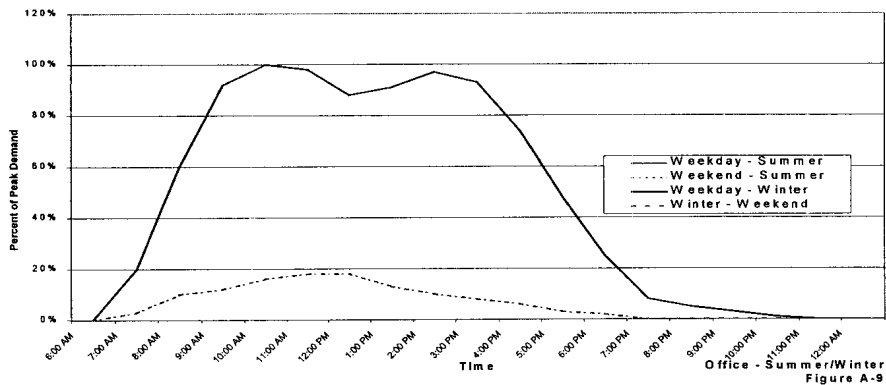
Health Club:

No parking accumulation curves were available from the ULI to represent demand on health clubs. Seasonal demand varied significantly. The largest demand occurs during winter weekdays after work. Weekends and summer weekdays have significantly smaller peaks. Peaks during the weekdays represent times before and after work as well as during lunch.



Office:

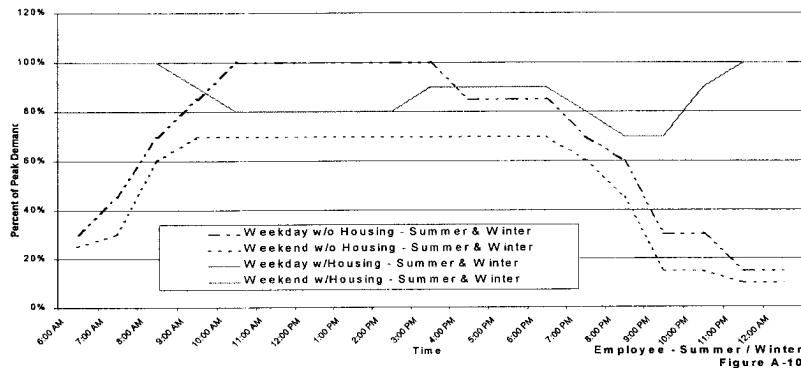
Parking accumulation for office use is based on the Urban Land Institute parking accumulation curves. This category of use has little influence on the overall parking because there are no offices located within the proposed use.



Snow King Resort Master Plan – Parking

Employee:

No parking accumulation curves were available from the ULI to represent parking demand created by hotel employee use. Additionally, there are two types of employees to be considered, those housed on site and those coming from offsite. For the employees housed on site, the parking accumulation was about 80% for most of the day with a slight drop in the evening which increases again starting at 9:00p.m. For the employees with offsite housing, parking accumulation was created using the staffing schedule. Offsite employees parking showed an accumulation of 100% by 10:00a.m. which remained high until about 3:00 p.m. when employees began leaving.



Snow King Resort Master Plan - Parking Elements

Appendix 8

A Discussion of Assumptions in Table P-4: Required Parking Spaces

Each land use and corresponding parking ratio is examined to determine the required number of parking spaces for both the summer and winter season. It is proposed that some of these parking spaces are available for a shared parking system. The parking quantities are split into shared parking and non-shared parking. These quantities are adjusted further to compensate for alternative transportation use and multi-stop auto trips. The computations produce the "adjusted number of spaces required" which represents the number of spaces that would be required if each land had to provide its own separate parking lot.

Parking ratios (Table P-4, Column D):

The parking ratio relates the required number of parking spaces to units of a land use (i.e. the number of hotel rooms or number of theater seats). The parking ratios utilize the Jackson Comprehensive Plan parking standards except as noted.

The exceptions include parking ratios for lodging, miniature golf, and the alpine slide. Other ratios including the Snow King Ski Area and the health club are based on a maximum number of users likely to be using the facilities at a given time.

The lodging ratio was revised upward from 0.75 parking spaces per unit to 1.0 parking spaces per unit to compensate for employees not housed on site. This increase improves parking capacity since the comprehensive plan appears to already include employees in the parking ratio.

The comprehensive plan does not include a miniature golf parking ratio. This analysis utilized 0.7 spaces per miniature golf hole. This ratio assumes that the golf course is frequented by larger groups who typically carpool and that the course can accommodate slightly less than one group per hole.

The alpine slide ratio assumes a similar ratio to a theater, which requires a ratio of 0.33 spaces per user. The number of users is based on revenue from the slide, which is converted to users per hour. The number calculated is likely to be conservative since it cannot account for users who typically ride the slide more than once.

The Snow King Ski Area and skating rink parking spaces are based on past use. The ski area has excess capacity to serve its users, a pattern, which is likely to continue. The anticipated parking requirement is 130 parking spaces. Most large functions such as the fireman's ball and the ski club ball occur during the off- season when excess parking is available.

The health club parking is based on the number of users expected. It is expected that a large percentage of locals will use the club with most driving independently. The health club will require 100 parking spaces.

Number of spaces required (unadjusted) (Table P-4, Columns E & K):

This number represents the parking required for each land use if it were standing alone. The amount of parking is generated by applying the parking ratio to the appropriate number of units. This number is larger than what will ultimately be required since many of the land uses will share the parking area allowing users to park once and use several facilities.

Number of spaces available/not available for sharing (Table P-4, Columns F/G & UM):

A portion of the proposed parking will be available for shared use. In order for shared use to work, it is best if there is a central, easily accessed parking area. Since the periphery buildings have parking lots in various locations and sizes, these will not be included in the available shared parking space number. Furthermore, existing condos or approved condos with their own parking will not be included in any of the shared parking.

Transportation mode factor (Table P-4, Columns H & N):

Snow King Resort's use of shuttle busses and its proximity to the START bus system allow guests travel around the town and county without depending on automobiles. In fact a large percentage of guests do not impact the parking facilities since they fly or are bused to Jackson. The TMF enables the parking to be

Snow King Resort Master Plan - Parking

adjusted for the low use of cars by guests visiting the resort. This factor can also be applied to any land use where alternative transportation modes are used. A factor of 1.0 indicates that every user is driving a car, while the summer lodging factor of 0.60 indicates 60% of the guests drive. A justification of the lodging's transportation mode factor based on existing use is available in **Figure 8-1**.

Typical Summer Day

Number of Rooms Occupied	Type of Guest	Mode of Transport	Percent	Number of Parking Spaces Occupied
30	Bus Tour	Bus	100%	6
145	Convention	Fly & Bus	49%	
		Fly & Drive	21%	30
		Drive	30%	44
25	independent Traveler	Drive	100%	25
200	Total Rooms	Total Spaces =		105

$$\begin{aligned}
 \text{Transportation Mode Factor} &= \frac{\text{total Occupied Car Spaces}}{\text{Total Occupied Rooms}} \\
 &= \frac{105}{200} \\
 &= 52\% \\
 \text{Therefore, } &\mathbf{60\% \text{ appears a reasonable Transportation mode Factor}}
 \end{aligned}$$

Typical Winter Day

Number of Rooms Occupied	Type of Guest	Mode of Transport	Percent	Number of Parking Spaces Occupied
5	Bus Tour	Bus	100%	3
35	Convention	Fly & Van	56%	
		Fly & Drive	24%	8
		Drive	20%	7
60	independent Traveler	Fly & Van	56%	
		Fly & Drive	14%	8
		Drive	30%	18
100	Total Rooms	Total Spaces =		45

$$\begin{aligned}
 \text{Transportation Mode Factor} &= \frac{\text{total Occupied Car Spaces}}{\text{Total Occupied Rooms}} \\
 &= \frac{45}{100} \\
 &= 45\% \\
 \text{Therefore, } &50\% \text{ appears a reasonable Transportation mode Factor}
 \end{aligned}$$

Lodging Transportation Mode Factor
Snow King Resort: Present Situation
Table 8-1

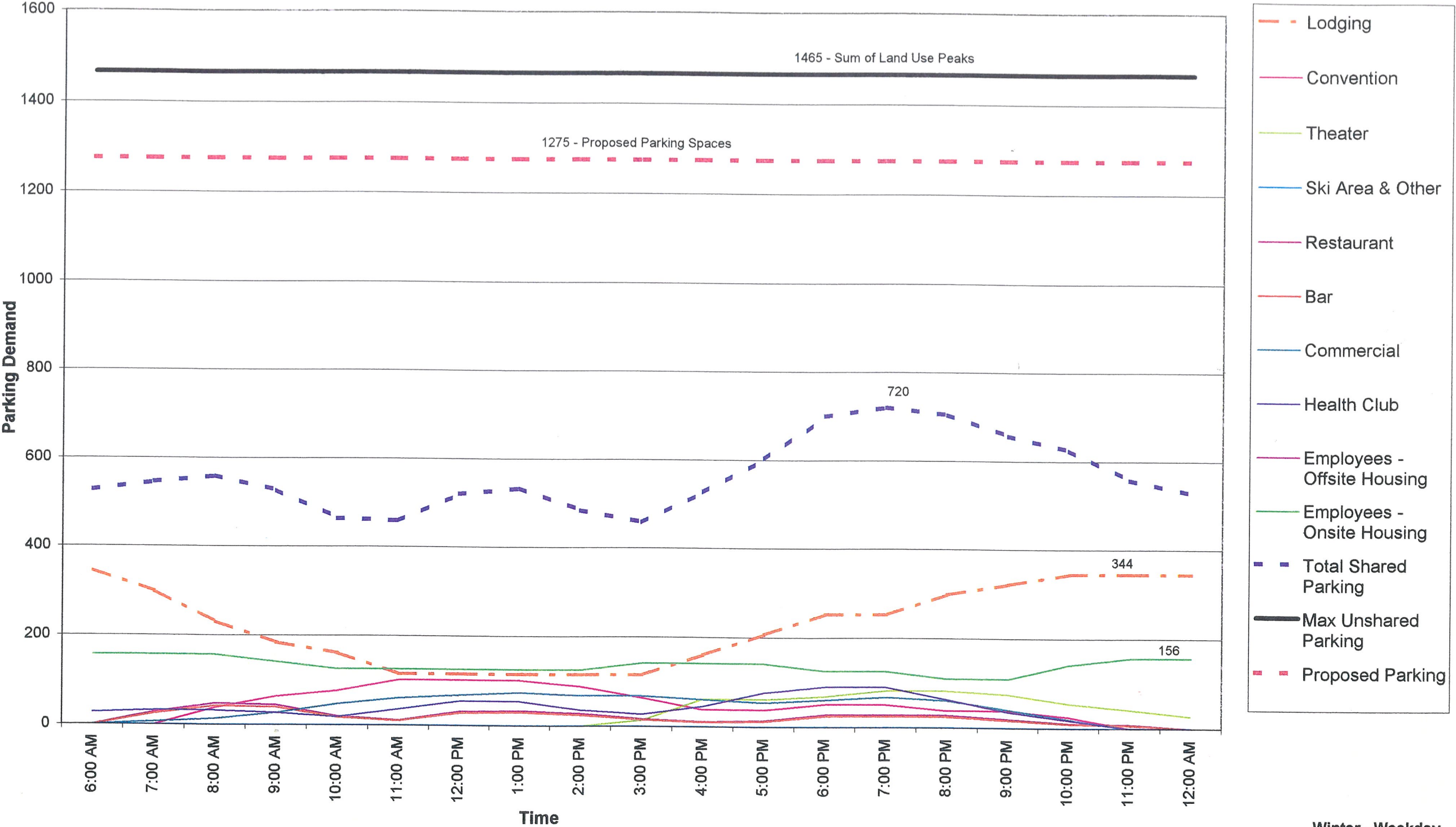
Snow King Resort Master Plan - Parking

Offsite user factor (Table P-4, Columns I & O):

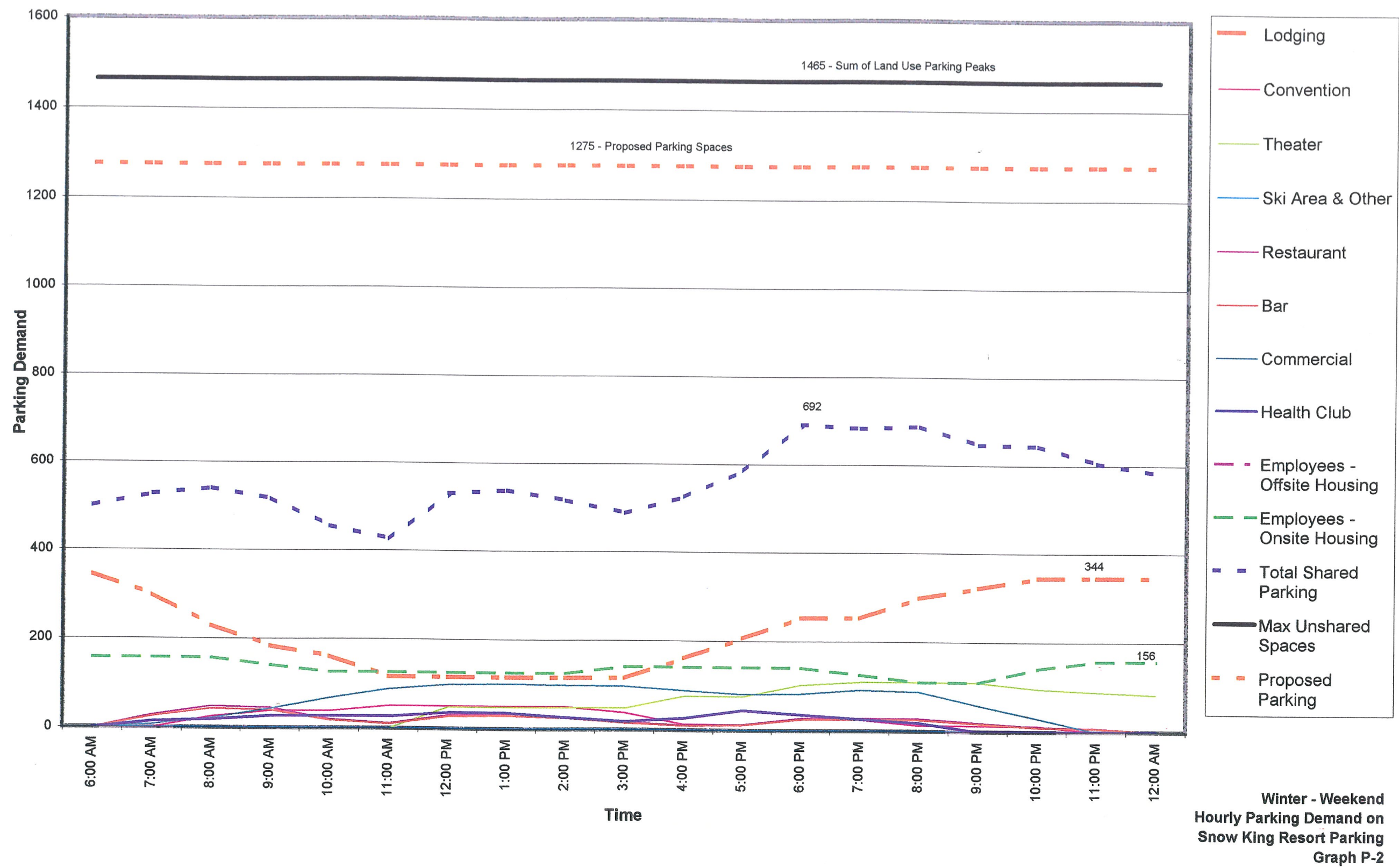
This factor indicates how many users come from offsite to use a facility. It is likely that many of the conference participants or restaurant and bar patrons will also be hotel guests, so the OUF will allow the required parking to be adjusted for this internal trip. An OUF of 1.0 indicates that 100% of the users come from offsite, while the summer conference factor of 0.50 indicates that 50% of conference attendees come from offsite. This factor allows the required parking to be adjusted so that guests are not counted twice in the parking demand.

Adjusted number of spaces (Columns J & P):

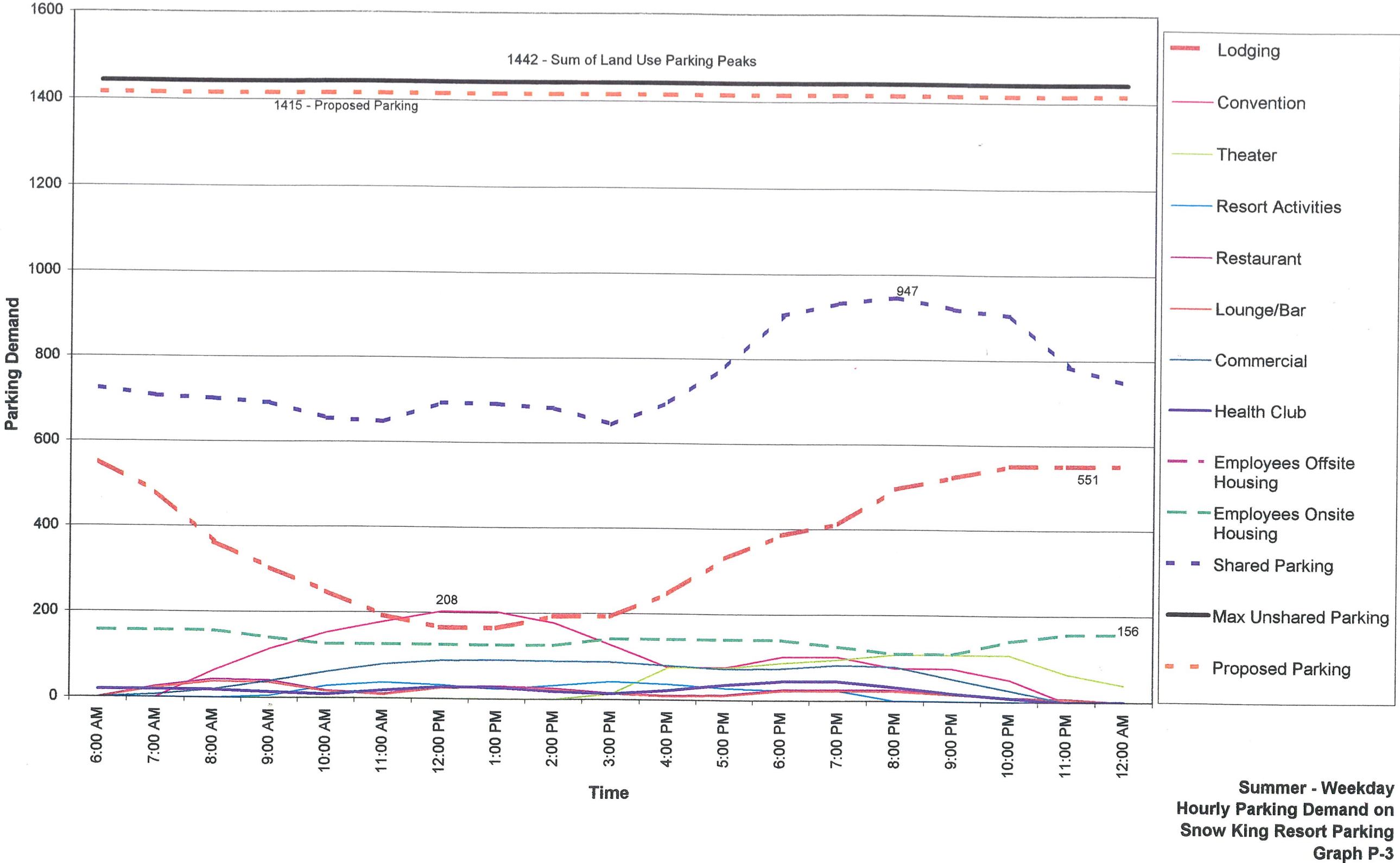
This number represents a reduction in required parking after the TMF and the OUF are applied. This number is a more accurate estimate of the required parking since it avoids counting users more than once and considers users who use alternative transportation. This number does not yet include any sharing of parking spaces

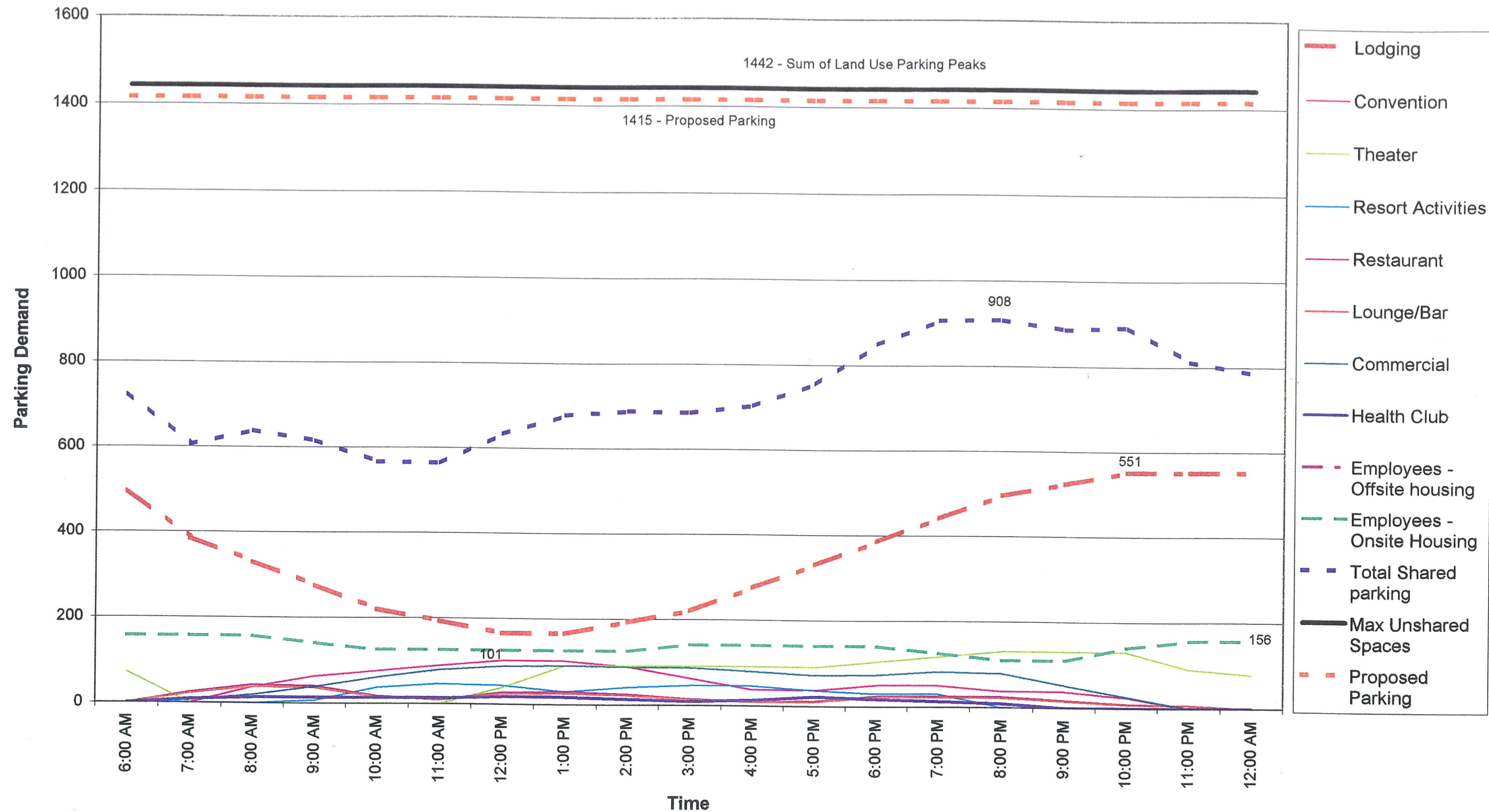


Winter - Weekday
Hourly Parking Demand on
Snow King Resort Parking
Graph P-1



Winter - Weekend
Hourly Parking Demand on
Snow King Resort Parking
Graph P-2





Summer - Weekend
Hourly Parking Demand on
Snow King Resort Parking
Graph P-4

IX. CAPITAL IMPROVEMENTS PLAN

A. Introduction and Summary

The Snow King Water Supply, Wastewater Management and Storm Water Discharge Systems are designed and developed to meet the critical requirements associated with the function of such a vital gathering center. The Snow King Resort Comprehensive Master Plan represents urban planning that incorporates both destination vacationers and local commerce. Due to the difficulty of consistently servicing such a varying utility demand, peak design considerations were used in the design.

In establishing flow characteristics for the Resort, quantities of water consumption and wastewater production were calculated utilizing historical prediction charts for each service type and then applying this rate to the square footage of the service area. The square footage and water volume values have been summarized in the enclosed "Water and Waste Water Usage Table." It is necessary to keep in mind that this table reflects both the amount of water usage and the amount of water discharged, and has no allocation for water consumption use. The additional consumption use refers to the volume of water lost, evaporated, transpired, or otherwise utilized through leakage, washing, lawn irrigation or utility use. This quantity has been accounted for in the water service design considerations.

Total water usage is based on domestic needs, fire sprinkler suppression, (fire sprinkler suppression and fire hydrant demands are based upon minimum regulatory fire flow and flow duration requirements per Uniform Fire Code [UFC]), irrigation needs and fire hydrant flow requirements. The domestic water demand takes into account both the existing probable peak usage in addition to the proposed Master Plan peak flow rate of 223 gpm. Total peak demand is then calculated by uses expected from such resort facilities. This peak demand is 2,300 gpm. It is essential to understand that a flow of 2,300 gpm includes fire suppression of 1750 gpm, which is not a normal daily system demand. Thus, when removing the fire suppression, normal peak-operating demand is found. The resulting normal peak operating demand is approximately 550 gpm.

The existing and future water usage predictions previously noted do not consider water required for snow making. The Town of Jackson has been concerned about utilizing potable supplies for snowmaking. Snow King has additionally been concerned that the Town of Jackson water is warmer than ideal for snowmaking. To address these concerns, snowmaking water capacity will be expanded this summer (2000) in a joint project with the Town of Jackson to bring cooler water from Flat Creek to the Summit Lift pump house.

The wastewater sanitary system considers the existing Town of Jackson infrastructure capacity, potential wastewater produced by the current land use plan, and the potential flow created by this Snow King Master Plan. The current peak flow is 106 gpm. The proposed Master plan creates an additional 305 gpm. Existing upstream land use has the potential to produce an additional peak flow of 35 gpm. These peak flows are calculated from average day flows that are increased based on a peak flow multiplier. This peak flow multiplier has been produced from previous Town of Jackson maximum day vs. average day wastewater studies. The result is a total potential peak wastewater flow of 796 gpm. Maximum development of the Master Plan exceeds the existing Town of Jackson West Karns Avenue infrastructure by 245 gpm. The additional peak hour flows require the existing 8-inch diameter line located on West Karns, north of the rodeo grounds be increased to a 10-inch diameter line. The capacity of the existing 8-inch diameter interceptor is 593 gpm. This Town of

Jackson interceptor should be upgraded when the percentage of wastewater produced by the Master Plan exceeds eighty percent of the 593 gpm, or 475 gpm. Planning for these costs should be a consideration in the Master plan phases of construction. (See supporting water and sewerage design consideration calculations.)

Storm water runoff considerations are calculated in a similar manner. Design considerations give respect to existing Resort usage and Master Plan development.

Runoff calculations are based on the Jackson Rainfall Intensity Duration data for 10-year and 100-year event frequencies. Detention basins of natural appearance have been designed and designated to accommodate the 10-year storm event. Discharge leaving detention areas will not exceed the predevelopment rate for a 10-year storm. Storm water runoff generated from 1-year to 10-year events release the highest concentration of pollutants and settleable solids. These storms will pass through treatment facilities located at the catch basin receptacles. These storm water catch basins will remove the pollutants without possible re-suspension by future runoff events.

The Storm Water Runoff from the developed site will proceed directly to a Town of Jackson collection facility, but shall not discharge at a rate greater than the 10-year and 100-year predevelopment rate. Storm water runoff from the Forest Service property will be naturally diverted around the Resort. The 100-year storm event will bypass the detention areas and be handled by the proposed storm water facilities that connect to the Town of Jackson system.

Consideration has also been given to other utilities. Electricity, gas, cable TV and telephone are all available at the site and will be expanded as needed. Private in-resort telephone and broadband capabilities will also be expanded as needed. Two-way radio, telephone and internet capabilities at our mountain-top (Snow King West) site is also used by the Resort to provide broadband connectivity.

B. Water Supply System Plan

The Snow King Resort Water Supply System Plan was developed to meet the critical requirements associated with public water distribution. The first requirement was to determine the quantity of water need for domestic supply to accommodate the proposed facilities. The second objective is to provide fire flow suppression through fire sprinkler and fire hydrant supply.

Design Consideration - Water Service

1) Potential Flow Required by Master Plan

The practice for predicting water consumption was to develop a system capable of meeting maximum day demand

Existing and Master Plan Combined

$$\begin{array}{rcl} \text{Max Daily Flow} & = & 319,800 \text{ gpd} \\ (\text{See Waste Water Calcs.}) & = & 223 \text{ gpm} * \end{array}$$

* Total pre and post development Max. Day Waste Water Flow

Total peak demand is based upon the demand required for domestic flow, fire sprinkler flow, lawn sprinkler flow, and fire hydrant flow. Fire flow shall provide 1,500 gpm for a minimum to w-hour duration. Fire hydrant flow shall provide a minimum 250 gpm flow.

$$QT = Q_{\text{Domestic}} + Q_{\text{Fire Sprinkler}} + Q_{\text{L Sprinkler}} + Q_{\text{Fire Hydrant}}$$

$$Q_{\text{Domestic}} = 450 \text{ gpm} *$$

$$Q_{\text{Fire Sprinkler}} = \text{Fire Sprinkler Flow} = Q_{\text{FS}}$$

$$Q_{\text{L Sprinkler}} = \text{Lawn Sprinkler Flow} = Q_{\text{LS}}$$

$$Q_{\text{Fire Hydrant}} = \text{Fire Hydrant Flow} = Q_{\text{FH}}$$

* Use Multiplier factor of 2 x Max Day Waste Water flow. Accounts for additional water usage not recorded as Waste Water flow.

UNIFORM FIRE CODE

Classification Group A Occupancy

Division I (UFC-91, Sect. 9117)

Group R Occupancy

Division I & 3

Minimum Reg. Fire Flow & Flow Duration

Table No. A-111 - A-I UFC-91 pg. 496
Type 111 One-hr@ 6,000 gpm

75% Fire Flow Reduction

Assuming FS Installation = 1,500 gpm
For 2-hr duration

QL Sprinkler = QLS 100 gpm (Assumed)

QFire Hydrant = **QF.H.** 250 gpm

QT= 2,300 gpm = Peak Hour Demand

QT = QFS - QFH = 548 gpm = Normal Max Operating Demand

2) Existing Infrastructure Capacity

The fact that maximum day water demand may occur several days consecutively led us to consider checking for a water supply that would provide the maximum day demands, 548 gpm, and a source that could provide the peak hour demand, 2,300 gpm.

The expanded Snow King system will tie into the existing Town of Jackson 6-inch diameter high pressure line that parallels the Resort's northern property boundary. The new Snow King water main would complete a high-pressure water main loop creating a system more efficient than the existing dead-end main. The existing source is a system comprised of six-inch diameter service nourished from a twelve-inch diameter line located in East Kelly Avenue.

The Town of Jackson water system has sufficient water supply and storage to meet the maximum day demands, 548 gpm, and the peak fire and domestic demand of 2,300 gpm. Snow King will need to provide the additional water mains to complete the high-pressure zone and deliver the water to proposed Resort facilities.

Deleted:

Total peak demand requirement for the mid-mountain lodge shall be supplied via a pump station. The fire suppression shall be supplied via a buried storage tank located above the mid-mountain lodge.

C. Sanitary Sewer

Design Consideration

The Snow King Resort Sanitary Sewer Management Plan was developed to meet two crucial objectives. The first, to determine the infrastructure required on-site to handle the capacity of the proposed facilities. The second, to convey sanitary sewer flows away from the Resort and distribute these discharges into the Town of Jackson sanitary system. The following design considerations are incorporated into the design and shall be considered during construction phases of the Master Plan

- 1) Existing Town of Jackson Collector Capacity - Upstream of MH CI 0-16
 - Alley parallel and between E. Kelly and E. Karns MH CI0-30 to MH CI0-16
 - Existing 10" PE pipe / minimum slope downstream = 1.47%
 - Land use currently designated: residential
 - Existing 10" will handle 1,550 gpm maximum
- 2) Existing Collector System and Land Use Flow Potential - Upstream of Resort

The Snow King Collector sewer objective is to collect wastewater from various Resort service lines and carry it by gravity to the Town of Jackson Interceptor Sewers.

Current Snow King Resort Flow Potential

204 Hotel Units at 225 gpd/room	45,900 gpd
40 Condominium Units at 2 Units Each at 225 gpd/unit	18,000 gpd
Motel Restaurant Services - 200 seats at 80 gpd	1 6,000 gpd
Pitchfork Townhomes - 19 units at 450 gpm	13,500 gpd
Clark's Knoll Townhomes - 19 units at 450 gpd	<u>8,550 gpd</u>
Existing Max. Day Waste Water Flow Total (I)	101,950 gpd
Total (I)	71 gpm
Existing Peak Hour Flow	106 gpm

3) Dwelling Units Representing Potential Upstream Flows:

Zone	Area	Max Density	No. of Units	Flow Max Day (gpd)
AR	34.7 Acre	4.6/Acre	160	70,400
NC-2	25 Lots	2/Lot	50	22,000
NC/SF	144 Lots	1/Lot	144	63,360
SR	139.1 Acre	2.9/Acre	403	77,320
R	80 Acre	1/Acre	80	35,200
PRD	Pitchfork	30 Units	30	13,200
PRD	Snow King	See Table		<u>88,450</u>
			867	470,230

Average Day Flow (Max Day/2)	=	235,115 gpd
Max Day Flow	=	470,230
		328 gpm
Peak Hour Flow (Avg Day *3)	=	490 gpm
Potential Upstream Max Day		
Flow Minus Snow King Resort	=	368,280 gpd
Potential Upstream Avg. Day		
Flow minus Snow King Resort	=	184,140 gpd
Potential Upstream Peak Hour		
Flow Minus Snow King Resort	=	552,420 gpd
	=	385 gpm

Existing 10" P.E./n = 0.010/S = 1.47%

$$Q = 1.49 AR^{2/3} S^{1/2} / n$$

$$Q = 1,550 \text{ gpm}; \text{ Capacity of Existing Collector}$$

Storm water runoff generated by the 1 -year to 10-year storm events on roads.

4) Potential Flows for Snow King Master Plan

The collector sewers have been designed for peak flows that include a factor applied at four times the expected average daily flow. The collector sewers were then sized using the peak flows and Manning's equation. Manning's equation is utilized to predict the adequate pipe diameter required for full flow design based on pipe diameter, pipe slope and peak flow, a minimum slope of 0.75 percent was used to represent a minimum pipe slope scenario. The pipe is then checked for a minimum scouring velocity of 2.5 ft/s applied with a lower average daily flow rate.

Proposed Master Plan Flow Potential-2000

494 Hotel Units at 225 gpd/room	=	111,150 gpd
120 Hotel Units at 225 gpd/room		27,000 gpd
100 Hotel Units at 225 gpd/room		22,500 gpd
Commercial Space and Assembly at 146,000 SF		
Assume .05 gpd / ft ² (5000 SF at 225 gpd per)		7,300 gpd
Commercial Theaters/Health Club/Daycare/		
Pool at 37,000 SF. Assume 0.11 gpd/ft ²		
(2000 SF at 225 gpd per)		4,200 gpd
Restaurant/Services - 200 seats at		
80 gpd each		16,000 gpd

Deleted: The collection system at the proposed mid-mountain lodge shall incorporate a settling tank for the treatment of suspended solids. This collection of solids is necessary due to the steepness of slope required to move wastewater from the mid-mountain lodge to the Town of Jackson interceptor system.

Employee Housing at 18 units at 450 gpd each	=	8,100 gpd
Condominiums at Love Ridge at 40 units at 450 gpd each	=	18,000 gpd
Cottages at 8 units at 450 gpd each	=	3,600 gpd
Proposed Max. Day Flow Total (2)	=	217,850 gpd
Proposed Max. Waste Water Flow (2)	=	152 gpm
(See Water and Waste Predicted Usage Table for additional breakdown)	=	223 gpm
Max Daily Waste Water Flow (1 & 2)	=	319,800 gpd
Avg Day Flow (Day/2)	=	108,925 gpd
		76 gpm
Peak Hour Flow (Avg Day* 4)	=	305 gpm

5) Total Flow - Existing and Proposed

Existing Peak Hour Flow (Reflects potential flow upstream from Resort)	385 gpm
Proposed Peak Hour Flow (Reflects 2000 Snow King Master Plan)	305 gpm
Existing Max. Day Waste Water Flow (1) Total Flow (QT= 385+305+71)	106 gpm = <u>796 gpm</u>

6) Existing Collector Capacity at the Resort Discharge

10" PE / n = 0.010 / S = 1.47%
 $Q = 1.49 \text{ AR}^{2/3} \text{ S}^{1/2} \text{ n}$ Full Flow = Manning's Equation
 QE.C. = 1,550 gpm Capacity of Existing Pipe = QE.C.
 QT = 796 gpm
 QE.C. = 1,500 fpm > QT = 796 gpm

7) Existing Town of Jackson Collector Capacity - Downstream of Resort

- Line parallel with West Karns Avenue between Mateosky Park and Flat Creek Drive MH C10-10
- Existing 8" clay / minimum slope downstream = 1.2 %
- Current land use designated: residential

The existing Town of Jackson Interceptor Sewers were checked for the capacity of three times the future maximum expected average daily flow, the maximum future flows are representative of the maximum possible build-out potential of all upstream sewers in accordance with the current land use plan.

Dwelling Units Representing Potential Downstream Flows Influencing Existing Collector Capacity on West Karns Avenue.

<u>Zone</u>	<u>Area</u>	<u>Max Density</u>	<u>No. of Units</u>	<u>Flow- May Day (gpd)</u>
AR	12 Acre	4.6/Acre	55	24,200
NC / MHP	6 Lots	2 / Lot	12	5,280
PI SP	24 Acre			<u>10,560</u>

Existing Downstream Max Day Flow Potential 40,040

Existing Downstream Max.
Day Flow Potential = 30 gpm

Existing Downstream Peak Hour Flow 42 gpm

* (Reflects max build-out of existing land use
upstream of Park and Snow King Resort) 385 gpm

Proposed Peak Hour Flow (Reflects 2000
Snow King Master Plan) 305 gpm

Existing Peak Hour Flow (1) 106 gpm

Potential Total Peak Hour Flow at MH CI 0-10 838 gpm

Existing Collector Capacity

8" Clay / n == 0.013 / S = 1.2 %
Manning's equation for Full Flow
 $Q = 1.49 A R^{2/3} S^{1/2}$ n = 593 gpm
593 gpm < 830 gpm

Therefore, 8" existing TOJ sewer main must
be replaced with new 10" main,
approximately 1,200 LF

The peak hour flows for maximum build-out and the proposed Snow King facilities exceed the downstream Town of Jackson 8-inch diameter collector by 245 gpm. Expansion in accordance with the Snow King Master Plan beyond a potential flow of 593 gpm will require approximately 1,200 linear feet of existing Town of Jackson interceptor to be replaced with a 10-inch diameter interceptor. The interceptor could be replaced upon reaching 80 percent of the 593 gpm that exceeds the 8-inch interceptor's capacity. This would allow the Town of Jackson and Snow King Resort to plan and acquire the funding required to replace this line. The Town may be interested in creating a joint investment account that both parties could contribute to annually, raising and sharing the cost of the infrastructure replacement. It would be of great benefit for the Master Plan to indicate rate of development, so that a proper fund could be established that would accrue at a rate equal to the anticipated replacement occurrence.

Note :

Town of Jackson WWTF Flows Indicate

- Max day = 2 * Avg day
- Max hour = 2.7 * Avg day

Snow King Master Plans Calculations Utilize

- Max day = 2 * Avg day
- Max hour = 4 * Avg hour

TOJ Line Capacity Calculations Utilize

- Max day = 2 * Avg day
- Max hour = 3 * Avg day

D. Storm water Management Plan

A complete storm water management program contains many elements including on-site infiltration and detention, collection, and transport systems. The Snow King Resort Storm water Management Plan was developed to meet several major objectives associated with post-development storm water runoff. The most critical is to convey storm water away from developments, thus diminishing the water buildup from minor storms and damage that can be associated with major storms.

Storm water Runoff Design Conditions

The methodology for calculating peak rate of runoff from undeveloped and developed areas and runoff storage is "Rational Method." Runoff calculations are based on the Jackson Intensity Duration Frequency data CIA "RATIONAL METHOD"

Find: Rainfall intensities for 10-year and 100-year events.

Find: Max allowable pre-development release for 100-year storm event.

The rational method assumes that the maximum flow will occur at the time when all of the runoff flows from the contributing watersheds reach the outlet.

Existing Site Conditions (In Acres)

Sub- Area	Total Area	Pervious Area	Impervious Area
1	4.51	13.50	1.03 (Roof & Asphalt)
2	4.96	4.52	0.044 (Dirt)
3	5.28	5.28	0.00
4	13.09	12.09	1.00
5	13.55	10.27	3.28 (Roof & Asphalt)
6	17.70	16.70	1.00 (Dirt)

Pre-Development Runoff Summary

<u>Sub-Area</u>	<u>Time of Concentration (min)</u>	<u>10-Year Event (CFS)</u>	<u>100-Year Event (CFS)</u>
1	20.3	3.88	6.09
2	24.9	1.23	1.93
3	22.2	1.08	1.69
4	28.4	2.82	4.51
5	22.3	5.11	8.02
6	29.8	3.48	5.52

Pre-Development Runoff and Conditions

Assume 100% pervious surface conditions
C= 0.3 for undeveloped with sparse grass

Time of concentration

$$T_c = \frac{1.8 (1.1-C) V L}{(S)^{1/3}} = \frac{1.8 (1.1-0.3) V 2200}{(15)^{1/3}} = 27.4 \text{ min}$$

Rainfall Intensity: 10-Year 0.89 in / hr
100-Year 1.40 in / hr

QIO = 0.3 (0.89) 69 18.45 CFS
QIOO = 0.3 (1.40) 69 28.98 CFS

Post-Development Runoff and Conditions

No development shall cause adjacent landowners, water courses or conduits to receive storm water runoff from the proposed development at a higher peak flow rate than would result from the same storm event occurring over the site if the land was in its undeveloped condition. The storm events considered will be for a 10-year and 100-year event.

Post-Development Site Conditions

<u>Sub-Area</u>	<u>Total Area</u>	<u>Pervious Area</u>	<u>Impervious Area</u>
1	14.51	6.22	8.29
2	4.96	1.06	3.90
3	5.28	2.72	2.56
4	13.09	9.29	3.80
5	13.55	11.13	2.42
6	17.70	16.07	1.63

Post-Development Runoff Summary

<u>Sub-Area</u>	<u>Total Area</u>	<u>Pervious Area</u>	<u>Impervious Area</u>
1	20.31	9.32	14.63
2	31.71	2.98	4.72
3	28.1	2.45	3.92
4	13.09	9.29	3.80
5	13.55	11.13	2.42
6	17.70	16.07	1.63

Storm water Runoff Summary

<u>Sub-Area</u>	<u>Acres</u>	<u>Post-Dev. Runoff (CFS)</u>	<u>Minimum Diameter Storm Pipe (3 CFS)</u>	<u>Design Release</u>	<u>(CFS)</u>
1	14.51	14.63	24"	9.67	6.09
2	4.96	4.72	15 "	3.12	1.93
3	5.28	3.92	15"	2.59	1.69
4	13.09	7.23	18"	4.78	4.51
5	13.55	7.15	1 8"	4.71	8.02
6	29.80	<u>5.99</u>	<u>15 "</u>	<u>4.10</u>	5.52
		43.65	Mass Calc. -	28.98	
			Ind. Calc.		27.76

27.76 Max allowable release- 100-year event base

Storm water subsurface facilities are required to carry the runoff from a 25-year storm event as minimum design criterion. Storm water surface facilities shall be sized to handle additional runoff from the 100-year storm event as a minimum.

Non-contaminated storm water from roofs and landscaped areas shall be designed to flow into natural detention areas. These designed detention areas shall be sized to accommodate the 100-year storm event. The rate of flow leaving these detention areas shall not exceed the pre-development rate for the 10-year to 100-year storm.

Sub-Area Release and Storage Summary - 100-Year event

<u>Sub-Area</u>	<u>Acres</u>	<u>Release (CFP)</u>	<u>Storage Volume (CF)</u>
1	14.51	6.09	5,987
2	4.96	1.93	3,135
3	5.28	1.69	2,085
4	13.09	4.51	1,545
5	13.55	4.71	966
6	29.80	5.52	50

Previous calculations show that a 36" pipe in a 4' x 5' percolation trench provides 10.05 CF/LF storage. 24" provides 7.43 CF/F: storage.

Sub-Area	Volume	Length	
		36"	24"
1	5,987 CF	596 LF	806
2	3,135	312	422
3	2,085	208	281
4	1,545	153	208
5	966	96	130

Storm water runoff generated by the 1 -year to 10-year storm events on roads and parking areas shall pass through treatment facilities to remove and trap settleable solids and floating petroleum products from the storm water as practical without resuspension of contaminants by runoff from subsequent storm events. Storm water runoff generated by the 10-year to 100-year storm events shall bypass the treatment facilities and proceed directly to the Town of Jackson collection facilities, but shall not discharge at a rate greater than the pre-development rate for the 10-year to 100-year storm event.

Storm water runoff from the Forest service property shall be naturally diverted around Snow King Resort utilizing resort facilities to handle mountain runoff for the 100-year storm event.

The Resort Master Plan should incorporate detention basins of volume as shown in the 100-year storage summary table. Additional infrastructure will then carry overland flow not detained on site. The Storm Water infrastructure shall be sized to accommodate 100-year event storms and be incorporated with the existing Town of Jackson Storm Water Infrastructure.

E. Other Utilities

The Site is supplied with sufficient capacity of electrical, gas, telephone and cable television lines. Expansion of these utilities will be available as expansion occurs. Within the site, the Snow King Resort Master Association will administer private telephone, internet, broadband satellite /cable TV lines and construct additions as needed. In cooperation with the Town of Jackson, the Applicant is undertaking an expansion of the snowmaking water capabilities during the summer of 2000. The mountaintop west electronic site was expanded during the 1999 summer to allow for additional wireless telephone and high-speed internet equipment. Additional room is available at this site for future expansion to serve the Resort and the community at large.

F. Additional Conditions

At the time of approval of this Master Plan, the following conditions were included as part of the approval:

Prior to the submittal of the first Snow King Resort Final Development Plan, additional analysis and information shall be submitted for the storm water collection and discharge systems to be installed at the resort. The additional storm water analysis shall include but not be limited to: the preliminary design layout of all onsite collection and discharge systems, a preliminary grading plan, a capacity analysis of the existing Kelly Avenue storm drainage system, a review of the impacts which may be created to adjacent offsite areas and a plan layout which indicates the sub-basin areas and the impervious surfaces to be installed in each. This additional analysis shall be completed to comply with all existing Town standards.

The applicant shall be responsible to complete offsite storm drainage improvements necessary to convey storm water flows from the site to the Kelly Avenue drainage system and, if warranted based on the provided engineering analysis, complete improvements to the Kelly Avenue drainage system that are a consequence of the development within the Snow King Master Plan.

To facilitate the conveyance of storm water flows between the Kelly Avenue storm drainage system and Snow King Estates, the applicant shall provide the Town with a storm drainage easement in the easterly area of the site. The easement location and language shall be mutually agreed to by the Town and the applicant.

An additional water system analysis and information shall be provided and approved by the Town Engineer. The additional information shall be provided with and without the Town's system supplying snow making water and shall include but not be limited to: a comprehensive Town water system hydraulic model which indicates the adequacy of the existing Town system at the estimated build out date of the development, a review of available fire flow capacities in the area of the resort at build out, a review of the water velocities produced in transmission pipes which are 8 inches in diameter and less, an analysis of the existing Town storage capacity, a summary of the installation of the proposed high pressure zone, calculations indicating the size of the proposed storage tank preliminary pump sizing calculations and an implementation plan for onsite systems.

The applicant shall be responsible to ensure that under, the additional water demands created from the developments build out, the Town's system shall remain in compliance with DEQ water system regulations and Town ordinances.

The applicant shall insure that the Town's right to inspect onsite water systems is maintained.

Prior to occupancy of the first Final Development Plan building, the applicant shall be required to complete the installation of an 8" inch (minimum) watermain from the development to Kelly Avenue. The new watermain shall be completed per Town standards and shall be installed in the Cache Creek Drive and Redmond Street Right-of-ways.

A sanitary sewer system report shall be provided to and approved by the Town. The sanitary sewer plan shall include a preliminary onsite sanitary system design.

Sanitary sewer systems completed shall be constructed, tested and maintained in accordance with DEQ and Town standards.

The applicant shall insure that the Town's right to inspect onsite sewer systems is maintained

The applicant shall be required to provide the Town with financial mitigation fees for the completion of the Cache and Willow Street corridors (from Snow King Avenue to Broadway Avenue) and the intersection of Snow King/Willow.

The amount collected shall be based on the calculated increased levels of traffic and pedestrian impacts created from the development together with the estimated project completion costs for roadway, curb, pedestrian and landscaping improvements. The improvements required shall be based on the preliminary design as completed in the year 2000 charrette process. The mitigation fee to be provided to the Town shall be based on the estimated project costs required to complete the corridor work at the time the fee is due. Any improvements to the Willow Street corridor that are completed by others prior to reaching the levels of new development described below are not to be included in the calculations of mitigation fees. The mitigation fees shall be provided to the Town in cash at the time the levels of development are reached and prior to issuance of building permit.

The total new square footage allowed under the proposed resort master plan is estimated to be approximately 700,000 SF. This new square footage does not include the existing hotel building or the Love Ridge development. As such the mitigation fees shall be forwarded to the Town as follows:

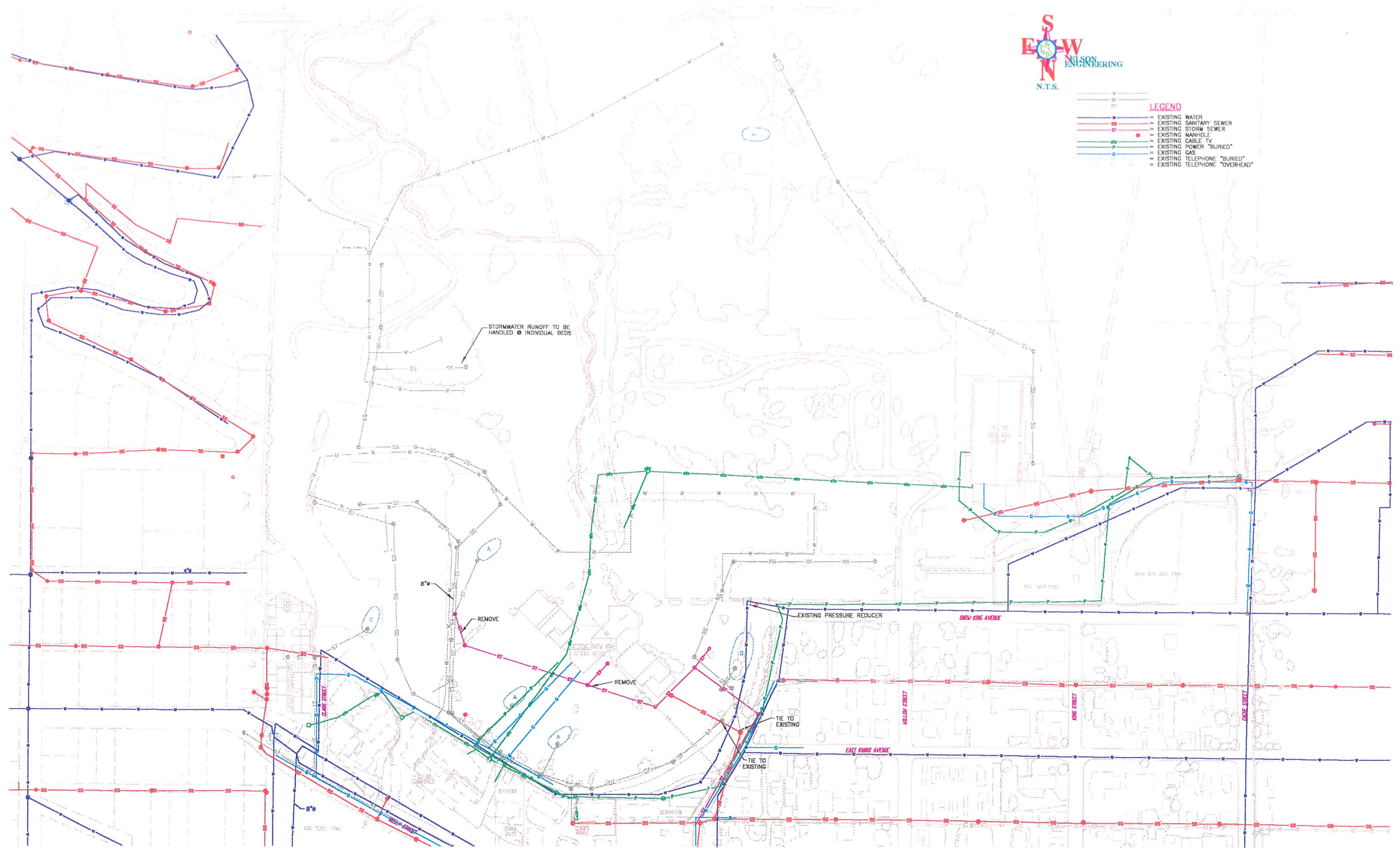
At 200,000 SF of new development: The applicant shall be required to provide 100% of the project costs associated with the completion of improvements to the Snow King/Willow Street intersection. Improvements shall be completed to satisfy the Town standard Level of Service (LOS) requirements for the traffic anticipated at the build out of the development.

The applicant shall also provide a mitigation fee in the amount of 15 % of the total estimated project cost required to complete the Willow and Cache Street corridors.

At 400,000 SF of new development: The applicant shall provide an additional mitigation fee in the amount of 15% of the total estimated project cost required to complete the Willow and Cache Street corridors.

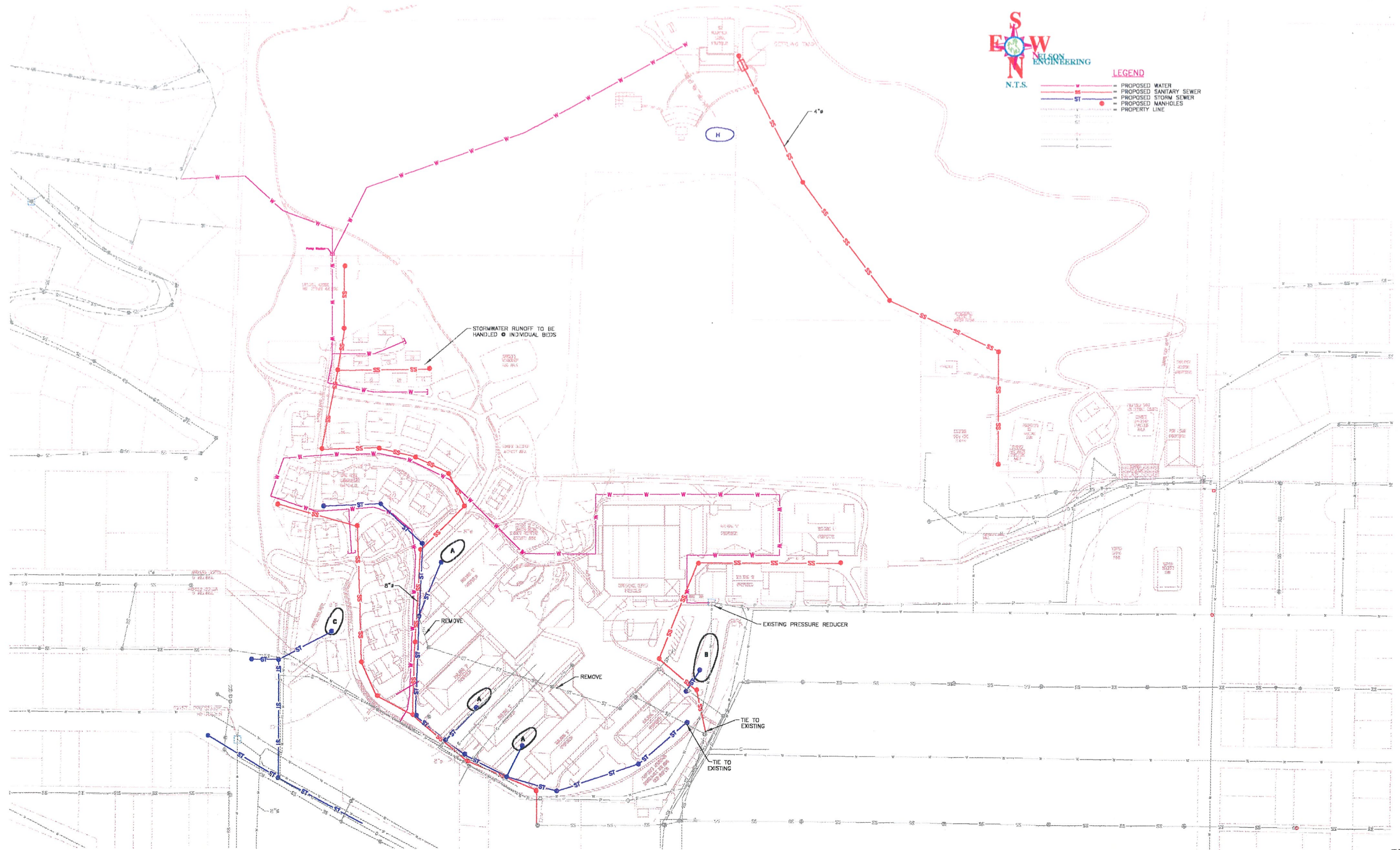
At 600,000 SF of new development: The applicant shall provide an additional mitigation fee in the amount of 15% of the total estimated project cost required to complete the Willow and Cache Street corridors.

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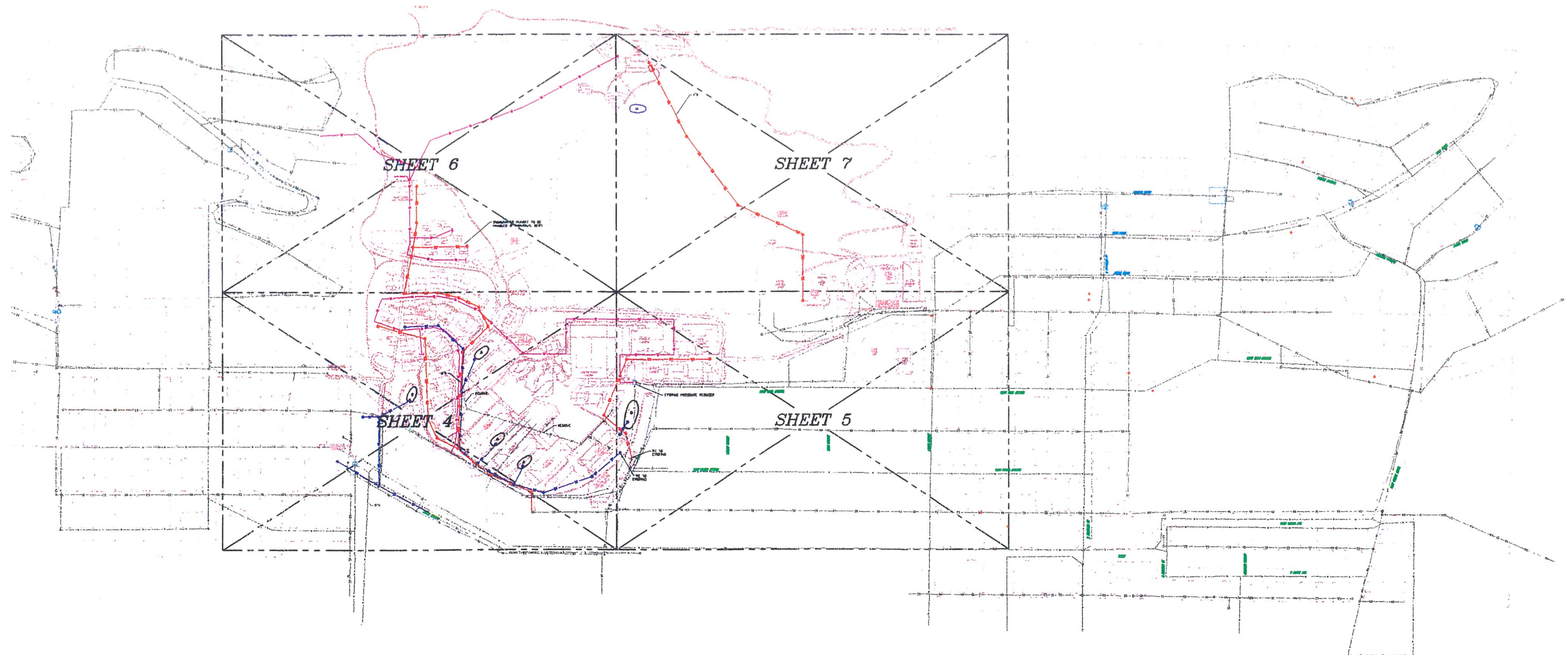
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EXISTING UTILITY PLAN



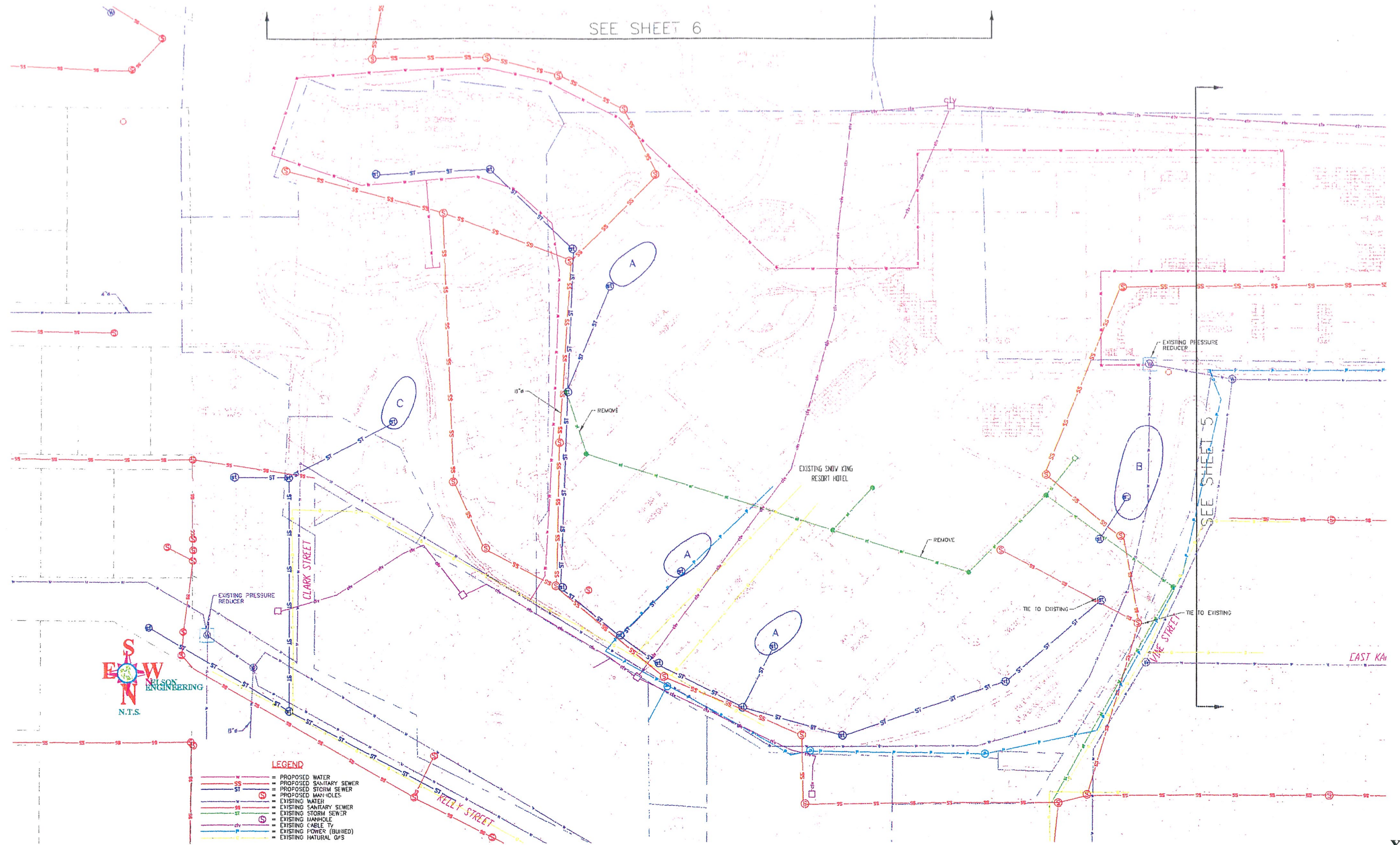
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PROPOSED UTILITY PLAN



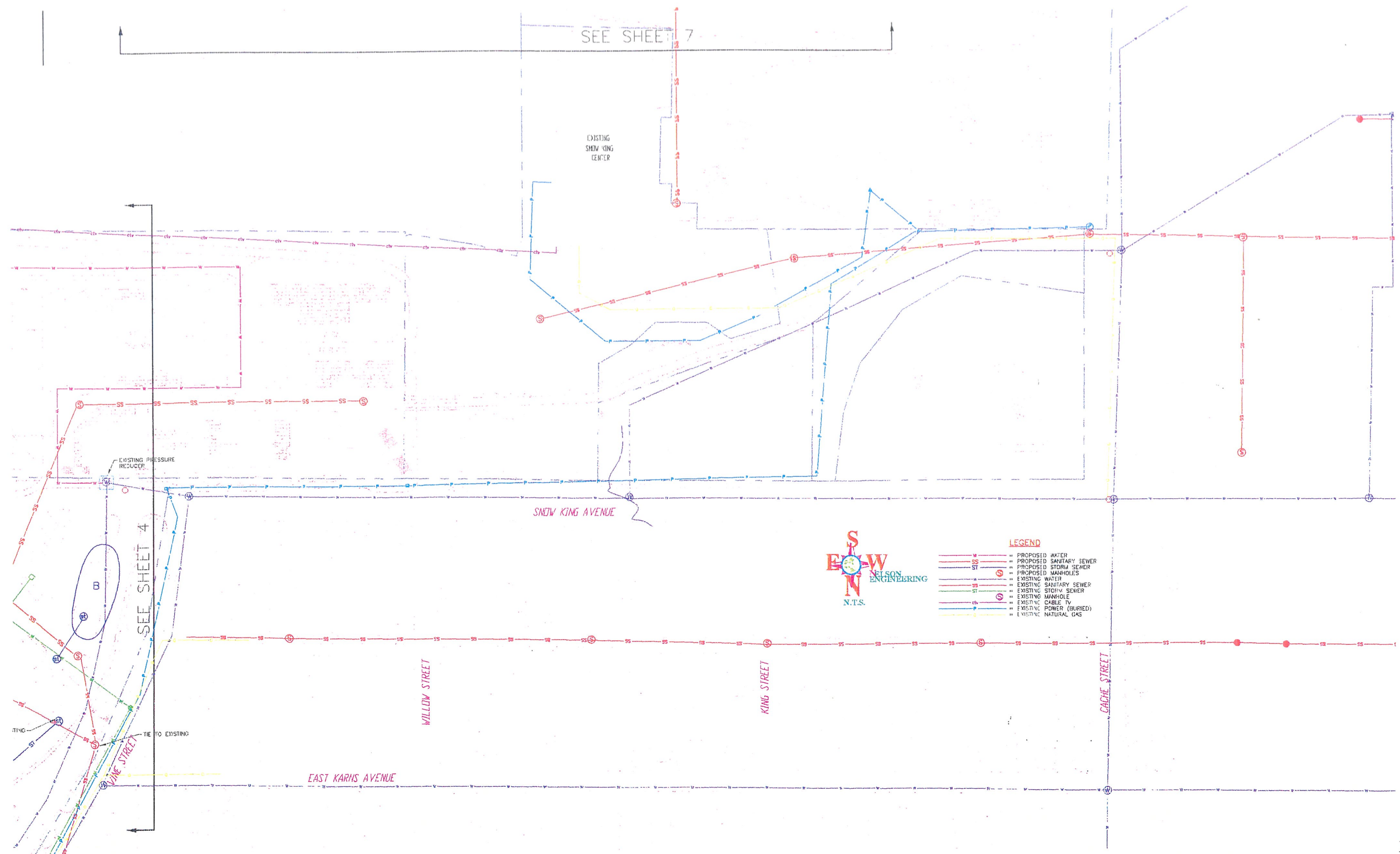
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ENLARGED PLAN INDEX



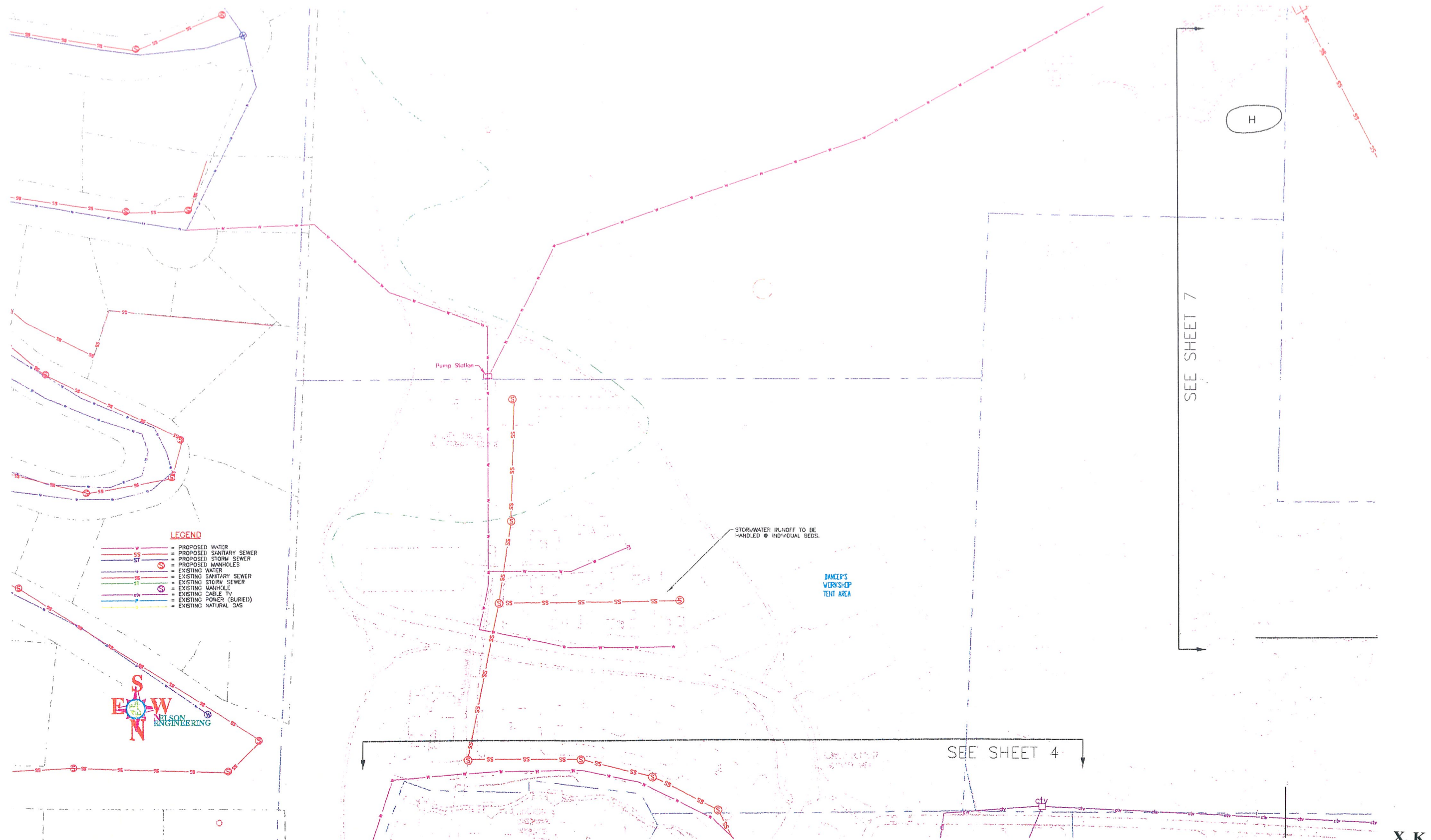
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ENLARGED PLAN - SHEET 4



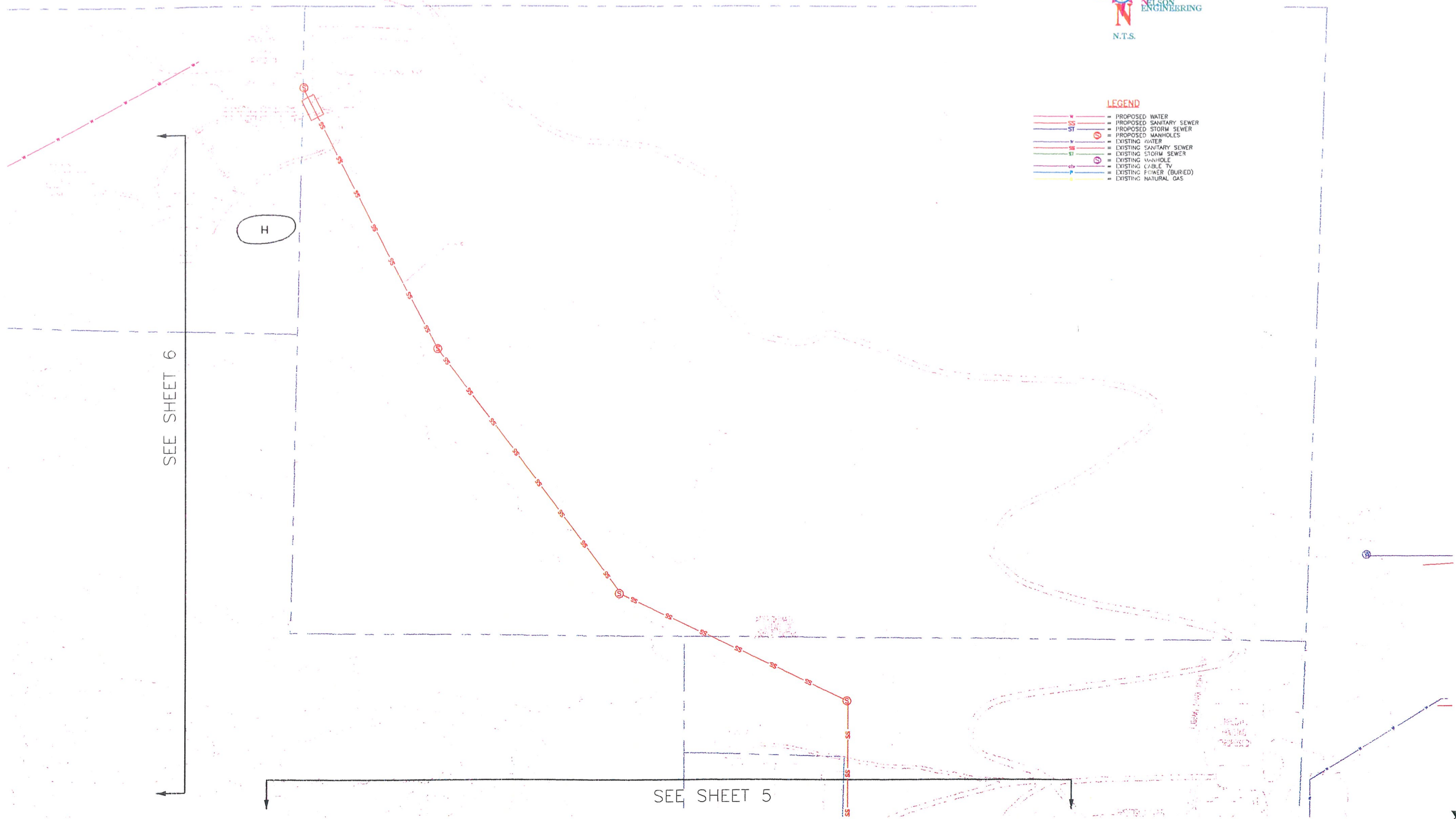
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ENLARGED PLAN - SHEET 5





- LEGEND**
- W = PROPOSED WATER
 - SS = PROPOSED SANITARY SEWER
 - ST = PROPOSED STORM SEWER
 - ⊙ = PROPOSED MANHOLE
 - v = EXISTING WATER
 - ss = EXISTING SANITARY SEWER
 - st = EXISTING STORM SEWER
 - ⊙ = EXISTING MANHOLE
 - ctv = EXISTING CABLE TV
 - p = EXISTING POWER (BURIED)
 - g = EXISTING NATURAL GAS



X.L

ENLARGED PLAN - SHEET 7

XI. PHASING AND THE SNOW KING RESORT MASTER ASSOCIATION

The PRO regulations require a phasing plan and an explanation of relevant management policies and procedures that will guide the implementation of the master plan. The phasing plan must include performance objectives and must be sufficient to assure that development will take place in a logical sequence and that an adequate monitoring program is in place to determine the accomplishment of proposed remedies and mitigation measures for projected impacts.

Snow King will develop the property in phases and in a well-balanced manner. While there is no specific timeline and individual phases will be constructed according to market demand, Snow King will insure that all facilities required for the convenience of guests, public safety and mitigation of any negative impacts are constructed in a timely and concurrent fashion and follow a logical sequence. As additions are completed, the entire infrastructure and other required performance components for each phase will be in place and performance standards will be adhered to. These components include utilities, parking, housing and transportation elements that will be developed in increments in tune with commercial, lodging and other development. When any of these components are built in excess of the required needs of a particular phase, and in excess of the cumulative needs to date, this excess will be credited towards the requirements of future phases. Final Development Plans for each building or phase will address the specific impacts and required mitigation associated with it.

As a first phase, Snow King plans to improve the periphery road (Snow King Loop) concurrent with the construction of infrastructure associated with the Love Ridge development. When this road is built, utilities will be oversized to accommodate future needs envisioned in this Master Plan.

The Snow King Resort Master Association (SKRMA) will oversee the proper phasing and administration of all development within the resort district. The intent of this organization is to have one voice represent the resort district and to ensure that adequate monitoring programs are established for development within the district.

SKRMA will be controlled by the landowners in the District and will ensure that development occurs in groups, or bundles, that ensure a well-balanced development. SKRMA will be managed by a Board of Directors consisting of up to seven members elected by the District property owners, with voting based on assessed valuation. SKRMA will assign responsibilities and cost sharing among entities other than the applicants.

The responsibilities of SKRMA include serving as the conduit for all major development applications within the resort district, and assessing dues and fees for landscaping, snowplowing, and common area road repairs within the district. SKRMA is tasked with the responsibility of carrying out the Transportation Demand Monitoring plan associated with this master plan and submitting results as required to the Town of Jackson. The organization will have one primary point of contact for all inquiries, billing, and organizational requests. SKRMA will exist in perpetuity to oversee the administration and development plans of the resort district and to ensure that resort commitments within this Master Plan are transferable to all new future owners of property within the district. SKRMA members will pay dues on an annual basis to cover costs associated with the management and operation of the organization.

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Initially all developments, the concurrent construction of required mitigation elements and the management of the entire complex will be the responsibility of Snow King Resort, or its assigns. As development progresses and sub-divisions of unplatted land are proposed, responsibilities for common aspects of the development will be gradually transferred to a Master Association. Prior to approval of the first Final Development Plan a detailed organization of the Snow King Resort Master Association will be prepared for review and approval by Town Staff.¶

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Deleted: common aspects of the development

Deleted: An adequate monitoring program will be established for determining the remedies and implementing mitigation measures for projected impacts. The intent is that only one voice will represent the Resort.

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Deleted: composed by the applicant alone since all property owners within this Master Plan are acting as one entity. It will be

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Before any land is subdivided or construction by any entities other than this applicant takes place in Sub-Areas 1,2,4,5 and 6,

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All areas and developments within the resort district will be required to participate as members of SKRMA.

SKRMA's involvement on the Existing Condominiums area will be mostly limited to controlling any future redevelopment to conform to this Planned Resort District Plan. In addition, SKRMA will partition fees associated with the maintenance of common roads, sidewalks, and areas to existing condominiums.

The Snow King Resort Master Association will be:

- Implementing and monitoring the Transportation Demand Management Plan, Housing Mitigation Plan, adherence to Design and Dimensional Limitation Plans and will act as the Architectural Review Board for the Snow King Planned Resort District. The Snow King Resort Master Association will be responsible for building or providing all required improvements or services as needed according to the phased development commensurate and coincidental with phases of the resort's development.
- Empowered to either own or have others build and own, as well as to maintain, employee housing, parking areas and structures and other infrastructure. All roads, pathways and utilities within the extent of this Master Plan will remain private.
- Act as a Master Association for all the property owners within Sub-Areas 1,2,3,4, and 5 and coordinate the activities within Sub-Area 3 and the Existing Condominiums area that may affect common utilities, safety, transportation, employee housing and parking within the Snow King PRD district.
- Responsible for snow removal, lighting, signing, construction and maintenance of common roads. SKRMA will ensure that it's members continue operation of airport, Teton Village and Town Square shuttles as required for TDM strategies.
- Be the vehicle for pre-screening any final development applications prior to presentation to the Town of Jackson for final development approval. All Final Development plans submitted for review by the Town shall be first reviewed and approved by the Snow King Resort Master Association.

Ultimately, SKRMA will act as a pseudo improvement district and be entitled to assess and collect dues and assessments from all property owners, renters, resort guests and from any entities performing management functions, owning property or obtaining revenues within this Planned Resort District. These dues are intended to cover all of SKRMA 's costs including various mitigation plans, constructing and maintaining any improvements that are its responsibility including landscaping, roads, utilities, employee housing, parking, pathways, recreation, common signage, transportation, and any other aspects associated with the proper and successful implementation of this Master Plan and its goals and objectives.

Deleted: Sub-Area 3, Love Ridge, will be added to SKRMA responsibilities at an appropriate time, after development is completed. Entities within Sub-Area 7 will be encouraged to join on a limited basis.

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Deleted: development of marketing materials, operation of common elements, security systems and personnel, information booths, special events, central check-in areas and other common activities.

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IX. COMMUNITY SERVICES ELEMENT

Introduction

The PRD regulations include an optional Community Services element to describe the interrelationship between the resort and the community. It is recognized that community services are an important part of maintaining the balance between visitors and residents and can contribute significantly to the quality of life of the community.

Community involvement is of paramount interest to Snow King. Community service attributes are woven throughout this Master Plan presentation and are an integral and foremost part of Snow King's vision and philosophy. Since 1939 Snow King has been a proud community partner. Being a "Community Resort" is in fact part of Snow King's Mission Statement. For over 60 years Snow King and the Jackson Hole community have had a very close and symbiotic relationship. Snow King's services to the community are well known and indisputable. Snow King hosts, assists and supports practically all of the local non-profit organizations and service clubs. Our doors are always open and our record of community assistance, involvement, dedication and good will is impeccable. Snow King is very proud of its continuous contributions to this community as a partner. This Master Plan is one more step in continuing and expanding upon this tradition.

Snow King as a Community Partner

A stated purpose and intent of the resort district is to provide recreational opportunities that rely on indigenous natural attributes of the area. These opportunities are provided to both the community and the visitor through the development of resort facilities. The unique in-town nature of these recreational amenities makes them a very important asset to town residents and visitors.

The Snow King Mountain provides a venue for the junior ski racing programs, adult ski racing as well as recreational skiing and snowboarding, both day and night. In addition, the ski area contributes to community integration through supporting efforts of the Doug Coombs Foundation to give low-income students and families the opportunity to learn to ski. On the mountain, improved snowmaking provides early season training opportunities for foreign, regional and local ski racing programs as well as for recreational skiers. The tubing park has become an extremely popular winter outdoor family activity for both locals and visitors. The ski area also accommodates many other special events such as the Town Downhill, regional and national races, and snowmobile events such as the annual World Championship Hill Climb. As a very unique and special service, Snow King presently provides after school ski programs with access via the activity bus to Town and Wilson schools in cooperation with the Teton County School District. Snow King has embraced the spectacular growth of uphill skiing in the wintertime through progressive policies to allow this activity and ultimately charge affordable season long and day ticket prices. This activity will continue to be permitted into the future and where possible distinct trails and routes will be further improved for this user group.

Snow King Mountain supports Parks and Recreation programs such as the annual Snow King Hill Climb Run, as well as offers reduced rates for community events and non-profit organizations such as the Teton County School District Winter Sports Program, the Doug Coombs Foundation ski programs, the Jackson Hole Ski and Snowboard Club, and Teton Youth and Family Service programs.

As part of the 2018 update to this master plan, Snow King Mountain has proposed to build a mountain sports center adjacent to the Snow King Center as an additional community benefit. This sports center is envisioned to including indoor rock climbing and athletic training facilities available to the public. The Jackson Hole Ski and Snowboard club will use the space for athlete training in addition to other groups in the community. Snow King will also work with and support the Jackson Hole Ski and

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Snowboard Club to expand and improve the existing lodge room and administrative facilities above. As part of proposed improvements at the summit of the mountain Snow King Mountain seeks to build a planetarium and observatory that can be used for educational and scientific purposes as well as making the world of astronomy more accessible to the community. In conjunction with improvements to the base of the mountain for the addition of a gondola located in the existing parking lot loop, Snow King has proposed increasing the grass turf fields to maximize the green-space at the base of the mountain. As part of this base area improvement Snow King Mountain seeks to work with local artists to create a welcoming gateway to the resort at the corner of Cache St. and Snow King Ave. and improve Phil Baux Park via additional landscaping and potentially a concert pavilion. These multi-million-dollar investments into infrastructure that directly benefits the community are another direct way of demonstrating Snow King's commitment to Jackson Hole. In addition, Snow King will support the addition of a second sheet of ice on Town of Jackson property to serve the growing hockey and skating community.

Both summer and winter, Snow King Mountain hosts a wide variety of athletic events and competitions for the community including uphill ski races, obstacle course races, bike races, running races, scavenger hunts, snowmobile races, and downhill ski racing.

The Hagen trail connection to Cache Creek, the tubing hill and snowboard terrain park diversify and improve the winter activities while annual events such as the Hill Climb continue to draw large numbers of visitors. The figure skating and hockey programs have blossomed since the opening of the Snow King Center. An excellent example of public-private partnership, the Snow King Center has been successfully providing recreation and many other services to the community for over 6 years.

During the summer, Snow King provides a trail system that has become a much-used hiking, running, biking and horseback riding area for residents and visitors alike. Summer mountain improvements envision trail upgrades, pathways, outdoor pools, climbing walls, a planetarium and observatory, on mountain dining, and additional outdoor activities. Unlike winter uphill travel where there are high costs associated with snowmaking, grooming, and ski patrol, summer use of the trail system for hiking on Snow King will be free to the public in perpetuity. Ultimately, the resort desires to serve as the primary jumping off point for access to USFS trails in the greater Snow King trail system with improved trails for hikers, bikers, uphill skiers, and outdoor recreationalists of all kinds.

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It must be noted that many of our community partnership activities mentioned above often come at a high cost to Snow King. Resort and operation of lodging, [conference, and on mountain activities](#) provide the financial and operational platform and the resources to support these and other community-oriented activities.

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Snow King Resort has provided the largest year-round meeting and conference facilities in the county since 1976. These facilities are regularly used by virtually every community organization in Jackson Hole. In many cases, Snow King has provided the only appropriate facilities available for community events and programs.

Within the larger Wyoming community, Snow King has, over the years, hosted practically all of Wyoming's professional and trade associations as well as many statewide events, political conventions and innumerable meetings. Larger facilities will attract other Wyoming and regional gatherings that have outgrown our facilities.

Snow King has, for many years, been one of the largest employers in Teton County. Among the large employers, we pride ourselves in maintaining a very high rate of year-round, stable and level employment. This is a valuable contribution to the stability of our local workforce.

Since the hotel opened in 1976, we have always had our doors open to a great variety of community meetings and events. We have also pioneered innovative relationships with the U.S. Forest Service, with the Town of Jackson and with many community organizations, such as the Jackson Hole Ski Club. Virtually every non-profit organization in Teton County uses Snow King facilities to bring people together.

Although it would frankly be tedious to list all the community groups that Snow King has assisted and cooperated with over the years, we would like to highlight some specific examples. Snow King provides discounted and sometimes complimentary rates for meeting and lodging rooms to a wide variety of governmental and non-profit organizations. Snow King assists Arts organizations, [the Jackson Hole Ski and Snowboard Club](#), [the Doug Coombs Foundation](#), St. John's Hospital, the school district and many others with programs offering complimentary or discounted benefits to their employees, incentives and other discounts. Providing rooms for visiting speakers or artists and nameless other acts of community involvement are the norm for Snow King. Each year [Snow King donates over fifty thousand dollars in complementary rooms, activities, and services to community non-profits and will continue to support these organizations into the future](#). Community Service is an integral part of the Snow King culture.

Deleted: EMT's complimentary dinners,

Deleted: the Firemen's Ball, Ski Ball, Christmas Bazaar Alliance Art Auction, CES Extravaganza and the CCP Halloween Party are sponsored and assisted by Snow King, and are among the largest fundraising events for each of these organizations

[Every season for the past 5 years Snow King Mountain has offered locals appreciation days with free or discounted activities that are affordable to the permanent population and will continue this practice into the future as a means of supporting our community.](#)

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Since its construction, Snow King Resort has contributed to the community a lively, multi-purpose facility. Summer and winter, the Resort's facilities have encouraged visitors to step out of their rooms and into the mountains. Indoors and outdoors, the Resort has enhanced the daily life of the community. From youth skiing and skating to Rotary lunches and Chamber of Commerce banquets. From catering to the desires of visitors to fulfilling community needs, Snow King's dual roles exemplify the "town as heart of the region" and our own "community resort" goals. This Master Plan intends to improve upon this dual function in the future and presents a next generation vision of Snow King's partnership with the Jackson Hole community.

PARCEL 1-A

That part of the SW ¼ NW ¼ and SE ¼ NW ¼ of Section 34, Township 41 North, Range 116 West, Teton County, Wyoming, lying within the incorporated limits of the Town of Jackson, describe as follows: Beginning at a point on the south line of said SE ¼ NW ¼ identical with the southeast corner of that tract of record in the Office of the Clerk of Teton County in Book 5 of Deeds on Page 507, and N 89 degrees 54 minutes E, 1582.70 feet from the west one-quarter corner of said Section 34 described on the Certified Land Corner Recordation Certificate of record in the said Office; thence N 01 degrees 36 minutes W, 340.35 feet along the east line of said tract to a point identical with the Northeast corner; thence N 89 degrees 44 minutes W, 307.10 feet along the North line of said tract to a point identical with the southeast corner of the Meadowland Addition to the Town of Jackson; thence N 08 degrees 15 minutes E, 211.10 feet along the east line of said Addition to a point; thence N 26 degrees 03 minutes E, 235.80 feet along the east line of said Addition to a point; thence N 27 degrees 46 minutes E, 135.70 feet along the east line of said Addition to a point; thence N 89 degrees 51 minutes E, 91.64 feet to a point; thence N 00 degrees 32 minutes W, 9.95 feet to a point; thence S 88 degrees 28 minutes E, 316.33 feet to a point; thence S 59 degrees 03 minutes E, 379.47 feet to a point identical with the northwest corner of that tract of record in said Office in Book 14 of Deeds on Page 42; thence S 00 degrees 22 minutes E, 687.83 feet along the west line of said tract to a point on the south line of said SE ¼ NW ¼ identical with the southwest corner of said tract; thence S 89 degrees 54 minutes W, 618.10 feet along the said south line to the point of beginning; EXCEPTING THEREFROM that portion of said property conveyed by instrument dated October 20, 1998, recorded October 26, 1998 in book 363 of Photo page 1068 to 1073, said parcel being more particularly described as follows:

A Tract of Land in the NE ¼ SW ¼ and the SE ¼ NW ¼ of Section 34, T41N, R116W, 6th, P.M., Town of Jackson, Teton County, Wyoming, being described as:

Beginning at the Southwest Corner of Tract B as shown on Map T-71-C as recorded in Said Office of the Teton county Clerk;

Thence along the southerly line of Said Tract B, S89°54'07"E, 297.93 feet to the southeast corner of Said Tract, the southwest corner of Tract BB as shown on Map T-71-C as recorded in Said Office;

Thence along the southerly line of Said Tract BB, N89°56'17"E, 15.37 feet to a point;

Thence S18°38'21"W, 36.32 feet to a point;

Thence N71°21'39"W, 53.64 feet to a point;

Thence N88°42'59"W, 121.72 feet to point;

Thence S5°55'38"W, 22.04 feet to a point;

Thence N84°04'22"W, 125.61 feet to a point;

Thence N54°19'44"W, 79.57 feet to a point;

Thence N47°04'07"E, 51.10 feet to a point;

Thence N0°16'09"W, 485.63 feet to a point;

Thence N58°37'40"E, 29.20 feet to a point on the westerly boundary line of Said Tract B, Map T-71-D;

Thence along said westerly boundary line, Tract B, S0°16'09"E, 558.05 feet to the Corner of Beginning.

PARCEL 1-B

The south twenty-five (25) feet of the following described tract of land:

Commencing at a point on the west line of Section 34, which is 2325 feet from the NW corner of said Section 34 T. 41 N. R. 116 W. 6th P.M., Teton County, Wyoming; thence North 89°46'E. 1264 feet, thence N. 7°16' E. a distance of 213.2 feet, thence N 24° 23' E. a distance of 234.5 feet, thence N. 27° 43' E. a distance of 214.5 to Corner No. 1 and place of beginning, on old fence line and alley line of the Meadowland Addition to the Town of Jackson, County of Teton, State of Wyoming; thence N. 88° 57'E. a distance of 55 feet to Corner No. 2; thence south 70 feet to corner No. 3, thence west to east line of the Meadowland Addition, which is the street line, thence N 27° 43' E. to corner No. 1 and place of beginning.

Parcels 1-A and 1-B contain approximately 14.54 Acres.

XIII. A.1

PARCEL 2-A

A parcel of land situated in the SE ¼ NW ¼ of Section 34, T41N, R116W, the P.M., Teton county, Wyoming, being part of that parcel described in Warranty Deed recorded in Book 10 Deeds, page 544, more particularly described as follows:

BEGINNING at the southeast corner of Lot 16, Block 2 of Harold Clark Subdivision, Town of Jackson and running thence west 140 feet more or less to the northeast corner of that tract of land described in Warranty Deed recorded in Book 12 Deeds, page 233, thence south along the east line of said tract described in Book 12 Deeds, page 233, 60 feet more or less, thence east 140 feet more or less to the southwest corner of that tract described in Warranty Deed recorded in Book 276 Photo, page 946-947 and thence north 60 feet more or less along the west line of said tract described in Book 276, page 946-947 to the point of beginning;

And,

The North forty-five (45) feet of the following described tract of land:

Commencing at a point on the west line of Section 34, which is 2325 from the NW corner of said Section 34 T. 41 N. R. 116 W. 6th P.M., Teton county, Wyoming; thence North 89°46'E. 1264 feet, thence N. 7°16'E. a distance of 213.2 feet, thence N 24°23'E. a distance of 234.5 feet, thence N 27°43'E. a distance of 214.5 to Corner No. 1 and place of beginning, on old fence line and alley line of the Meadowland Addition to the Town of Jackson, County of Teton, State of Wyoming; thence N 88°57'E. a distance of 55 feet to Corner No. 2; thence south 70 feet to Corner No. 3, thence west to east line of the Meadowland Addition, which is the street line, thence N 27°43'E. to Corner No. 1 and place of beginning,.

Parcel 2-A contains approximately 0.27 Acre.

PARCEL 2-B

Parcel 2-B is comprised of the 5 separate Clark's Knoll plats, aggregating to approximately 1.3 Acres:

Plat #785:

That part of the SE ¼ NW ¼ of Section 34, T41N, R116W, within the incorporated limits of the Town of Jackson, Teton county, Wyoming, including a part of Lots 12, 13 and 14 of the Harold Clark Plat of the Town of Jackson of record in the Office of the Clerk of Teton county as Plat No 136, described as follows: BEGINNING at the southeast corner of said Lot 12:

Thence S00° 04'41" E, 70.21 feet, along the east line of that tract of record in said Office of Book 10 of Photo on pages 404 to 405 as it is shown on said Map No. D-46 to the point on the northeast line of the Snow King Resort tract of record in said Office in Book 12 of Deeds on page 630 found as shown on that map of record in said Office as Map No. T-71-A titled "MAP TO ACCOMPANY LOT DIVISION PERMIT AMERICANA SNOW KING RESORT...", dated 1982-83;

Thence N59° 02'27"W, 94.21 feet, along said Northeast line to an angle point marked by a 2" galvanized steel pipe, 28" long, with a brass cap inscribed: PAUL N. SCHERBEL RLS 164 BIG PINEY WYOMING", and appropriate details;

Thence N88° 31'18"W, 8.03 feet, along the north line of said Snow King Resort tract to a point;

Thence N59° 21'46"W, 9.21 feet, to a point;

Thence N88° 31'18"W, 44.20 feet, to a point;

Thence N00° 07'49" E., 32.76 feet, to a point;

Thence N30° 30'53"E, 90.49 feet, to a point;

Thence S59 °-16'-11"E, 110.21 feet, to a point on the east line of said Lot 12;

Thence S00° 06'28"E, 38.69 feet, along said east line to the Point of Beginning;

ENCOMPASSING and area of 0.32 Acre, more or less;

PARCEL 2-B (Continued)

Plat #801:

That part of lots 12 and 13 of the Harold Clark Plat to the Town of Jackson of record in the Office of the Clerk of Teton County as Plat no. 136, within the SE ¼ NW ¼ of Section 34, T41N, R116W, described as follows:
BEGINNING at the northeast corner of CLARKS KNOLL FIRST ADDITION to the Town of Jackson of record in said Office as Plat No. 136, N00° 06'28"W, 38.69 feet of the southeast corner of said Lot 12;
Thence N00°06'28"W, 143.156 feet along the east line of Lot 12 of said HAROLD CLARK PLAT, to the northeast corner thereof;
Thence N64°34'56"W, 44.50 feet, along the north line of said Lot 12 to an angle point;
Thence S89°48'19"W, 9.03 feet, along the north line of said Lot 12 to the northeast corner of Lot 13 of said HAROLD CLARK PLAT;
Thence continuing S89°48'19"W, 45.44 feet, along the north line of said Lot 13 to a point N89°48'19"E, 5.33 feet, of the northwest corner of said Lot 13;
Thence S00° 06'28"E, 105.76 feet, to the northerly corner of said CLARKS KNOLL FIRST ADDITION; Thence S59°16'11"E, 110.21 feet, along the northeast line of said ADDITION to the POINT OF BEGINNING;

ENCOMPASSING an area of **0.28** Acre, more or less;

Plat #810

That part of Lots 13, 14 and 15 of Block 2 of the Harold Clark Plat to the Town of Jackson of record in the Office of the Clerk of Teton County as Plat No. 136, within the SE ¼ NW ¼ of Section 34, T41N, R116W, described as follows:
BEGINNING at the northwest corner of CLARKS KNOLL SECOND ADDITION to the Town of Jackson of record in said Office as Plat No. 801, N89°48'19"E, 5.33 feet FROM THE NORTHEAST CORNER OF SAID Lot 14;
Thence S00°06'28"E, 105.76 feet, along the west line of said CLARKS KNOLL SECOND ADDITION to the southwest corner of said CLARKS KNOLL SECOND ADDITION;
Thence S30°30'53"W, 29.87 feet, along the northwest line of CLARKS KNOLL FIRST ADDITION, of record in said Office as Plat No 785 to a point;
Thence N70°09'40"W, 77.79 feet, to a point;
Thence N00°07'49"E, 104.57 feet, to a point on the north line of said Lot 15;
Thence N89°25'38"E, 32.57 feet, to the northeast corner of said Lot 15;
Thence N89°48'19"E, 55.33 feet along said north line of said Lot 14 and Lot 15 at CORNER OF BEGINNING;

ENCOMPASSING an area of **0.24** Acre more or less;

Plat #829

That part of Lots 15 and 16 of Block 2 of the Harold Clark Plat to the Town of Jackson of record in the Office of the Clerk of Teton County as Plat No. 136, within the SE ¼ NW ¼ of Section 34, T41N, R116W, described as follows:

BEGINNING at the northwest corner of CLARKS KNOLL THIRD ADDITION to the Town of Jackson of record in said Office as Plat No. 810, S89° 25'38"W, 17.63 feet of the northwest corner of said Lot 15:
Thence S00° 07'49"W, 104.57 feet, along the west line of said CLARKS KNOLL THIRD ADDITION;
Thence S70° 09'40"E, 44.34 feet, along the southwest line of said CLARKS KNOLL THIRD ADDITION;
Thence S89° 53'31"W, 109.56 feet, to a point on the west line of said Lot 16;
Thence N00°07'46"E, 119.15 feet, along said west line of the northwest corner of said Lot 16;
Thence N89° 25'38"E, 67.83 feet, along the north line of said Lots 15 and 16 to the CORNER OF BEGINNING;

ENCOMPASSING an area of **0.19** Acre, more or less;

Parcel 2-B (Continued)
Plat #844

That part of the SE ¼ NW ¼ of Section 34, T41N, R116W, within the incorporated limits of the Town of Jackson, Teton County, Wyoming, including a part of Lots 14, 15 and 16 of Block 2 of the Harold Clark Plat to the Town of Jackson of record in the Office of the Clerk of Teton County Plat No. 136, described as follows:

BEGINNING at the southwest corner of Clarks Knoll Fourth Addition to the Town of Jackson of record in said Office as Plat No. 829, on the west line of said Lot 16;

Thence N89° 53'31"E, 109.56 feet, along the south line of said Addition to a point on the southwesterly line of Clarks Knoll Third Addition to the Town of Jackson of record in said Office as Plat No. 810;

Thence S70° 09'40"E, 33.45 feet, along said southwesterly line to a point on the northwesterly line of Clarks Knoll First Addition to the Town of Jackson of record in said office as Plat No. 785;

Thence S30° 30'53"W, 60.62 feet, along said northwesterly line to a point;

Thence S00° 07'49"W, 32.76 feet, along the west line of said First Addition, to a point;

Thence N88° 31'18"W, 10.00 feet, to a point;

Thence S00° 07'49"W, 4.49 feet, to a point on the north line of the Snow King Resort tract of record in said Office in book 12 of Deeds on page 630;

Thence N88° 31'18"W, 100.42 feet, along said north line to a point at the intersection of said north line with the southerly extension of the west line of said Lot 16;

Thence N00° 07'46"E, 97.77 feet, along said extension and the west line of said Lot 16 to the POINT OF BEGINNING

ENCOMPASSING an area of **0.27** Acre, more or less;

PARCEL 2-C

A parcel of land in the SE ¼ NW ¼ of Section 34, T41N, R116W, 6th P.M. Town of Jackson, Teton County, Wyoming, being a portion of Lot 11 and a portion of the west ½ of Lot 10 of Block 2 of the Harold Clark Addition, Plat No. 136, as recorded in the Office of the Clerk of Teton County, also being a portion of that record parcel in Book 248 of Photos, pages 751-752 as recorded in said Office and being more particularly described as follows:

Beginning at the northwest corner of Lot 11 of said record Plat 136:

Thence along the north boundary line of said Lot 11 and said west one-half of Lot 10 S63° 49'41"E, 86.65 feet to a point, the northwest corner of Pitchfork Townhomes Addition to the Town of Jackson, Plat No. 717 as recorded in said Office:

Thence along the east line of said west one-half of Lot 10, S00 29'31"E, 96.47 feet to a point;

Thence N85° 38'49"W, 78.64 feet to a point on the west line of said Lot 11;

Thence along said west line of Lot 11, N00° 05'00"W, 128.72 feet to the Corner of Beginning.

Said parcel contains **0.20** acres, more or less.

PARCEL 2-D

A parcel of land in the SE ¼ NW ¼ of Section 34, T41N, R116W, 6th P.M. Town of Jackson, Teton County, Wyoming, being a portion of Lot 11 and a portion of the west ½ of Lot 10 of Block 2 of the Harold Clark Addition, Plat No. 136, as recorded in the Office of the Clerk of Teton County, also being a portion of that record parcel in Book 248 of Photos, pages 751-752 as recorded in said Office and being more particularly described as follows:

Beginning at the southwest corner of Lot 11 of said record Plat 136;

Thence along the west boundary line of said Lot 11, N00°05'00"W, 52.94 feet to a point;

Thence S85° 38'49"E, 78.64 feet to a point on the east line of the west one-half of said Lot 10;

Thence along the said east line, S00° 29'31"E, 94.61 feet to the southeast corner of said west one-half of Lot 10;

Thence along the south boundary of said west one-half of Lot 10 and the south boundary of said Lot 11, N58° 57'38"W, 92.37 feet to the Corner of Beginning.

Said Parcel contains **0.28** acres, more or less.

PARCEL 2-E

Said tract is located within the Incorporated Limits of the Town of Jackson, Wyoming and is identical with Lots 2,3,4,5,6,7,8,9 and the E ½ of Lot 10 of Block 2 of the Harold Clark Plat, of record in said Office as Plat No. 136, which is located in the SSE 1/4 NW 1/4 of Section 34, T41N, R116W, 6th P.M., Teton County, Wyoming. TOGETHER WITH an additional portion of said SE ¼ NW ¼ of Section 34:

Said tract is more particularly described as follows:

BEGINNING at the northwest corner of Lot 1, Block 2 of said Harold Clark Plat, which lies on the southerly line of Kelly Street, and is monumented by a 5/8 inch diameter steel reinforcing bar with aluminum Surv-Kap inscribed "NELSON ENGR PE & LS 578";
Thence along the west line of said Lot 1, S01° 38'23"E, 56.55 feet to the southwest corner of said Lot 1, which is monumented by the same type monument described in the paragraph above;
Thence along south line of said Lot 1, S65° 32'56"E, 154.12 feet to the northeast corner of said Lot 2 which lies on the wet line of Clark Street; coincident with the east line of said Block 2;
Thence along the west line of said Clark Street and said east line of Block 2, S00° 00'00"E, 185.68 feet to a corner on the north boundary of a parcel of record in said Office in Book 70 of Photo on page 504;
Thence along the boundary of said record parcel in Book 70 of Photo, S00° 10'34"W, 70.21 feet to an angle point monumented by a car axle;
Thence continuing along said boundary N58° 49'00"W, 341.24 feet to the northwest corner of said record parcel in Book 70 of Photo; identical with the northeast corner of that parcel of record in said Office in Book 12 of Deeds on page 630;
Thence along the north line of said parcel in Book 12 of Deeds, N59° 0'00"W, 192.03 feet to the south corner of that parcel of record in said Office in Book 14 of Deeds on page 494, where is found a 5/8 inch diameter steel reinforcing bar with aluminum Surv-Kap inscribed "NELSON ENGR PE & LS 578";
Thence along the east line of said parcel of record in Book 14 of Deeds, N00° 23'28"W, 71.02 feet to the southeast corner of the W ½ of Lot 10, Block 2 of said Harold Clark Plat, which is part of said parcel of record in Book 14 of Deeds; said corner being monumented by a 5/8 inch diameter steel reinforcing bar with aluminum Surv-Kap inscribed "NELSON ENGR PE & LS 578";
Thence continuing along the east line of said parcel in Book 14 of Deeds and the east line of said W ½ of Lot 10, N00° 23'28"W, 191.04 feet to the northeast corner of said parcel in Book 14 of Deeds, identical with the northeast corner of said W1/2 of Lot 10, and which lies on the north line of said Block 2, coincident with the south line of Kelly Street;
Thence along the north line of said Block 2 and the south line of Kelly Street, S62° 59'21"E, 355.47 feet to the CORNER OF BEGINNING;

All corners called for above, but not previously described herein, are monumented by a 5/8 inch diameter steel reinforcing bar with aluminum cap inscribe "P.M. JORGENSEN PE & LS 2612";

ENCOMPASSING an area of **2.80** acres, more or less;

PARCEL #3

A tract of land in the SE1/4NW1/4 of Section 34, Township 41 North, Range 116 West, 6th P.M., in the Town of Jackson, Teton County, Wyoming, being part of the tract described in the warranty deed recorded in Book 14 of Deeds, Page 42, in the office of the Clerk of Teton County, and described as follows:

Beginning at 5/8" diameter rebar with cap inscribed PLS 3831" on the North line of said record parcel, from which a 5/8" diameter rebar with cap inscribed "PE&LS 2612" marking the Northwest corner of said record parcel is North 58 degrees 57 minutes 57 seconds West 156.26 feet; thence South 58 degrees 57 minutes 57 seconds East 185.00 feet along said North line which is common with the South line of the Pitchfork Townhomes Addition to the Town of Jackson (Plat No. 713) to the Southeast corner of said plat; thence North 00 degrees 10 minutes 08 seconds East 70.44 feet along the East line of said plat to the North Northwest corner of said record tract marked by a 5/8" diameter rebar with cap inscribed "PE&LS 2612; thence South 58 degrees 46 minutes 43 seconds East 50.79 feet to 5/8" diameter rebar with cap inscribed "PLS 3831" marking the Northeast corner of said record tract; thence South 03 degrees 32 minutes 37 seconds West 140.46 feet along the East line of said record tract to a 5/8" diameter rebar with cap inscribe "PLS 3831"; thence South 89 degrees 53 minutes 59 seconds West 69.04 feet to a 5/8" diameter rebar with cap inscribed "PLS 3831"; thence North 58 degrees 57 minutes 57 seconds West 108.81 feet to a 5/8" diameter rebar cap inscribed "PLS 3831"; thence North 25 degrees 00 minutes 58 seconds West 116.39 feet to a 5/8" diameter rebar with cap inscribed "PLS 3831"; thence North 31 degrees 02 minutes 03 seconds East 35.00 feet to the Point of Beginning.

Encompassing an area of **0.553** acres, more or less.

PARCELS 4-A AND 4-B

A parcel of land located in the SE $\frac{1}{4}$ NW $\frac{1}{4}$ and the NE $\frac{1}{4}$ SW $\frac{1}{4}$, Section 34, T41N, R116W, 6th P.M., Town of Jackson, Teton County, Wyoming, being all of Tract B as shown on Map T-71D and a portion of Tract BB as shown on Map T-71C as recorded in the Office of the Teton County Clerk and a portion of that parcel of record described in Said Office in Book 255 of Photos pages 12-14 as "Parcel No. 4", all being more particularly described as follows:

Beginning at a point on the east line of Said SE $\frac{1}{4}$ NW $\frac{1}{4}$ which lies N $0^{\circ} 4' 39''$ W 156.30 feet from the southeast corner of Said SE $\frac{1}{4}$ NW $\frac{1}{4}$, the center $\frac{1}{4}$ corner of Said Section 34,
Thence S $89^{\circ} 55' 38''$ W, a distance of 159.06 feet to a point on the east boundary line of Said Tract B;
Thence along said east boundary line S $03^{\circ} 35' 36''$ W, a distance of 50.85 feet to a point;
Thence S $71^{\circ} 21' 39''$ E, a distance of 42.01 feet to a point;
Thence S $18^{\circ} 38' 21''$ W, a distance of 133.50 feet to a point;
Thence N $71^{\circ} 21' 39''$ W, a distance of 53.64 feet to a point;
Thence N $88^{\circ} 42' 59''$ W, a distance of 121.72 feet to a point;
Thence S $05^{\circ} 55' 38''$ W, a distance of 22.04 feet to a point;
Thence N $84^{\circ} 04' 22''$ W, a distance of 125.61 feet to a point;
Thence N $54^{\circ} 19' 44''$ W, a distance of 79.57 feet to a point;
Thence N $47^{\circ} 04' 07''$ E, a distance of 51.10 feet to a point;
Thence N $00^{\circ} 16' 09''$ W, a distance of 485.63 feet to a point;
Thence N $58^{\circ} 37' 40''$ E, a distance of 29.20 feet to a point on the west boundary line of Said Tract B;
Thence along said west boundary line, N $0^{\circ} 16' 09''$ W, a distance of 129.02 feet to the northwest corner of Said Tract B, a point on the southerly boundary line of Pitchfork Townhomes Addition to the Town of Jackson, a subdivision of record in Said Office as Plat no. 713;
Thence along the northerly line of Said Tract B and the southerly line of Said Pitchfork Townhomes Addition, S $58^{\circ} 54' 59''$ E, a distance of 156.35 feet to a corner of Said Tract B, the northwest corner of Tract A as shown on Said Map T-71D;
Thence along the line between said tracts A and B thorough the following courses and distances:
S $31^{\circ} 08' 57''$ W, a distance of 34.90 feet to a point;
S $24^{\circ} 57' 35''$ E, a distance of 116.33 feet to a point;
S $58^{\circ} 54' 43''$ E, a distance of 108.85 feet to a point;
N $89^{\circ} 56' 21''$ E, a distance of 69.09 feet to the northeast corner of Said Tract B and the southeast corner of Said Tract A, which corner lies on the west boundary line of Tract AA as shown on Said Map T-71C;
Thence departing the line between Said Tracts A and B and proceeding along the east boundary line of Said Tract B and the west boundary line of Said Tract AA, S $03^{\circ} 36' 11''$ W, a distance of 40.26 feet to a point;
Thence along the line between Said Tracts AA and BB through the following courses and distances:
S $58^{\circ} 54' 02''$ E, a distance of 88.98 feet to a point;
N $89^{\circ} 51' 02''$ E, a distance of 69.00 feet to the northeast corner of Said Tract BB and the southeast corner of Said Tract AA;
Thence departing the line between Said Tracts AA and BB and proceeding along the east line of Said Tract BB, S $00^{\circ} 02' 30''$ E, a distance of 51.50 feet to a point;
Thence continuing along said east line, Tract BB, S $00^{\circ} 04' 39''$ E, 121.44 feet to the Point of Beginning.

Containing 5.037 Acres, more or less.

PARCEL 5
(5A & 5B Combined)

That part of the NE ¼ SW ¼ of Section 34, T41N, R116W, within the incorporated limits of the Town of Jackson, Teton County, Wyoming described as follows:

BEGINNING at the northeast corner of said NE ¼ SW ¼; thence 01°-56.5'W, 1253.65 feet along the east line of said NE ¼ SW ¼ to the southeast corner thereof; thence S89°-54' W, 1332.41 feet along the south line of Said NE ¼ SW ¼ to the southwest corner thereof; thence N01°-55'E, 424.85 feet along the west line of said NE ¼ SW ¼ to the southwest corner of that tract of record in the office of the Clerk of Teton County in Book 11 of Deeds on page 312; thence S89°-58.5'E, 427.64 feet (East, 400 feet rec.) along the south line of said Tract in Book 11 of Deeds on page 312 to the southeast corner thereof; thence N00°-01.5'W, 830.17 feet (North, 830 feet rec.) along the east line of said Tract in Book 11 of Deeds on page 312 to the northeast corner thereof on the north line of said NE ¼ SW ¼; thence 89°-57'E, 933.34 feet along said north line of the CORNER OF BEGINNING;

And that parcel of land conveyed to Snow King Resort, Inc. a Wyoming corporation by instrument dated October 14, 1998, recorded October 26, 1998 in book 363 of Photo, page 1074 to 1076, more particularly described as follows:

A tract of land in the SE ¼ NW ¼ of Section 34, T41N, R116W, 6th P.M., Town of Jackson, Teton County, Wyoming, being a portion of Tract BGB as shown on Map T-71-C as recorded in the Office of Teton County Clerk, and being more particularly described as follows:

Beginning at the Southeast Corner of Said Tract BB, the center one-quarter corner of Said Section 34;

Thence along the southerly boundary line of Said Tract BB, S89°56'17"W, 153.71 feet to a point;

Thence N18°38'21"E, 97.18 feet to a point;

Thence N71°21'39"W, 42.01 feet to a point on the westerly boundary line of Said Tract BB;

Thence along said westerly boundary line, N3°35'36"E, 50.85 feet to a point;

Thence departing said westerly boundary line and proceeding N89°55'38"E, 159.06 feet to a point on the easterly boundary line of Said Tract BB;

Thence along said easterly boundary line S0°04'39"E, 156.30 feet to the Corner of Beginning.

Excepting therefrom: Conveyance to SK Land Limited Liability Company dated October 20, 1998, recorded October 26, 1998 in Book 363 of Photo, page 1068 to 1073, said parcel being more particularly described as follows:

Beginning at the Southwest Corner of Tract B as shown on Map T-71-D as recorded in the Office of the Teton County Clerk:

Thence along the southerly line of Said Tract B, S89°54'07"E, 15.37 feet to a point;

Thence N71°21'39"W, 53.64 feet to a point;

Thence N88°42'59"W, 121.72 feet to a point;

Thence S5°55'38"W, 22.04 feet to a point;

Thence N84°04'22"W, 125.61 feet to a point;

Thence N54°19'44"W, 79.57 feet to a point;

Thence N47°04'07"E, 51.10 feet to a point;

Thence N0°16'09"W, 485.63 feet to a point;

Thence N58°37'40"E, 29.20 feet to a point on the westerly boundary line of Said Tract B, Map T-71-D;

Thence along said westerly boundary line, Tract B S0°16'09"E, 558.05 feet to the Corner of Beginning.

The total area of Parcels 5 is approximately 30.82 Acres

PARCEL #6
KM6 LLC

Property described by a metes and bounds survey as follows:

Beginning at Corner No. 1, the northwest corner of the tract hereby conveyed, the said Corner No. 1 being 344 feet north of the East-West Quarter Section line through Section 34, T41N, R116W, (6th P.M.) and 950 feet east of the west line of said Section 34, thence easterly and parallel to the aforesaid Quarter Section line for 633.14 feet to Corner No. 2, thence southerly and parallel to the aforesaid west line of Section 34 for 344 feet to the aforesaid Quarter-Section line and to Corner No. 3, thence westerly along said Quarter Section line for 633.14 feet to Corner No. 4, thence northerly and parallel to the aforesaid west line of Section 34 for 344 feet, more or less, to Corner No. 1, the point of the beginning. All bearings being true bearings and the tract thus enclosed containing five (5.0) acres more or less, lying wholly within the S ½ NW ¼, Section 34, T41N, R116W, (6th P.M.) together with all improvements situated thereon and all rights and privileges pertaining thereto.

The area of this parcel is approximately 4.92 Acres.

PARCELS 7-A, 7-B, 7-C & 7-D

These parcels are owned by the Town of Jackson and leased to Snow King Resort, Inc. under lease agreements dated April 22, 1994 extending through May 1, 2033. These parcels are described in Exhibits H-1, H-2, I and J to the Ski Shelter, Ski Lift and Mountain Tract lease and Exhibit A to the Ice Rink Tract lease.

These parcels aggregate to approximately **34.196 Acres**.

PARCEL 8

That part of the NW ¼SW¼ of Section 34, T41N, R116W, within the incorporated limits of the Town of Jackson, Teton County, Wyoming it being the intent to redescribe Tract No. 1 of the record in the Office of the Clerk of Teton County in book 11 of Deeds on page 313 as follows:

BEGINNING at the west one-quarter corner of the said Section 34; thence N89°-54.5'E, 792.36 feet (N89°-46'E, 793 feet rec.) along the north line of said NW ¼ SW ¼ to a corner; thence S00°18'E, 425.85 feet (South, 429 feet rec.) to a corner; thence N89°-49.5'W, 807.92 feet (West, 793 feet rec.) to an intersection with the west line of said NW ¼ SW ¼; thence N01°-48.5'E, 422.32 feet (North, 429 feet rec.) along said west line to the CORNER OF BEGINNING; EXCEPTING THEREFROM conveyance to the Town of Jackson for the Ice Rink Tract as contained in instrument dated April 24, 1992, recorded July 17, 1992 in Book 255 of Photo, page 15 to 17, more particularly described as follows:

A tract of land in the NW ¼ SW ¼ of Section 34, T41N, R116W, in the Town of Jackson, Teton County, Wyoming described as follows:

Beginning on the north line of said NW ¼ SW ¼ at a 3" diameter brass cap on an iron pipe marking a corner of Aspen Hill Cemetery, and from which the Northwest corner of said NW ¼ SW ¼ is S 89°54'00"W, 792.23 feet, the Base Bearing for this description,

Thence S 00° 18'26"E, 277.90 feet along the west line of the Aspen Hill Cemetery to a point;

Thence S 00° 02'00"W, 206.99 feet to a point;

Thence N 00° 58'00"E, 120.00 feet to a point;

Thence S 89° 02'00"E, 14.00 feet to a point;

Thence N 00° 58'00"E, 90.00 feet to a point;

Thence N 89° 02'00"W, 16.00 feet to a point;

Thence N 00° 58'00"E, 26.00 feet to a point;

Thence N 89° 02'00"W, 35.00 feet to a point;

Thence N 00° 58'00"E, 37.41 feet to a point; on the north line of said NW ¼ SW ¼;

Thence N 89° 54'00"E, 237.85 feet along said north line to the Point of Beginning;

Encompassing an area of 1.296 acres, more or less.

The total area of Parcel 8 is approximately **6.494 Acres**.

LEASE PARCEL

Exhibit H-1

That part of Blocks 7,8 and 9, Aspen Drive, Laural Drive, King Street and the area designated Parking in the Meadowland Addition to the Town of Jackson, recorded as plat number 127 in the Office of the Clerk of Teton County, Wyoming described as follows:

Beginning at the Northeast corner of said Parking area on the south line of Snow King Avenue (Norwood Ave.) the northwest corner of the "Murie Tract," THENCE South 00 degrees 12 minutes 53 seconds West for a distance of 136.08 feet along the east line of said Addition to a point;
 THENCE North 88 degrees 18 minutes 02 seconds West for a distance of 24.36 feet to a point;
 THENCE North 80 degrees 31 minutes 02 seconds West for a distance of 74.35 feet to a point;
 THENCE North 74 degrees 23 minutes 12 seconds West for a distance of 54.84 feet to a point;
 THENCE South 16 degrees 21 minutes 46 seconds West for a distance of 28.35 feet to a point;
 THENCE South 06 degrees 29 minutes 47 seconds East for a distance of 7.85 feet to an intersection with the east west mid-section line of section 34, T41N, R116W;
 THENCE South 89 degrees 54 minutes 00 seconds West for a distance of 282.13 feet along said mid-section line to a point;
 THENCE South 89 degrees 53 minutes 50 seconds West for a distance of 49.85 feet continuing along said line to a point;
 THENCE North 07 degrees 54 minutes 12 seconds West for a distance of 127.80 feet to a point;
 THENCE North 72 degrees 02 minutes 48 seconds East for a distance of 70.00 feet to a point;
 THENCE South 54 degrees 19 minutes 35 seconds East for a distance of 38.41 feet to a point;
 THENCE North 89 degrees 54 minutes 15 seconds East for a distance of 69.70 feet to a point;
 THENCE North 47 degrees 28 minutes 01 seconds East for a distance of 45.91 feet to a point;
 THENCE North 59 degrees 23 minutes 01 seconds East for a distance of 50.07 feet to a point;
 THENCE East for a distance of 5.25 feet to a point;
 THENCE North 00 degrees 02 minutes 30 seconds West for a distance of 161.45 feet to an intersection with the north line of said block;
 THENCE South 89 degrees 59 minutes 45 seconds East for a distance of 258.81 feet along the north line to the POINT of BEGINNING.

Together with and subject to covenants, easements, and restrictions of record.

Said property contains 2.75 acres more or less.

MOUNTAIN TRACT

Exhibit J

NW1/4SW1/4 of Section 34, T41N, R116W, Teton County, Wyoming, excepting therefrom the North 429 feet.

LEGAL DESCRIPTION
 FOR A
 PARKING AREA

Exhibit H-2

That part of Blocks 7,8 and 9, Aspen Drive, Laural Drive, King Street and the area designated Parking in the Meadowland Addition to the Town of Jackson, recorded as plat number 127 in the Office of the Clerk of Teton County, Wyoming described as follows:

Beginning at a point on the east-west mid-section line of Section 34, which is S 89° 54' 00"E, 35.00 feet from the west 1/4 corner of said Section, Thence N 00° 13' 00"E, 66.00 feet parallel with the west line of said subdivision to a point,
 Thence N 89° 56' 59"E, 150.81 feet to a point,
 Thence N 79° 16' 02"E, 35.73 feet to a point,
 Thence N 60° 43' 41"E, 58.86 feet to a point,
 Thence N 47° 13' 04"E, 48.28 feet to a point,
 Thence N 33° 54' 07"E, 51.74 feet to a point,
 Thence N 24° 27' 24"E, 29.55 feet to a point,
 Thence N 88° 25' 34"E, 16.55 feet to a point,
 Thence N 01° 45' 13"W, 139.37 feet to an intersection with the south line of Snow King Avenue (Norwood Ave.),
 Thence S 89° 59' 45"E, 41.99 feet along said south line to the northwest corner of Phil Box Park Parcel,
 Thence S 89° 59' 45"E, 551.88 feet along the west line of said park parcel to a point,
 Thence S 63° 44' 48"W, 778.37 feet along the west line of said park parcel to a point on said east-west mid-section line,
 Thence N 89° 54' 00"W, 222.09 feet to the POINT OF BEGINNING.

Said property contains 2.63 acres more or less.

Exhibit A

Exhibit I

DIVISION 2500. PLANNED RESORT (PR) DISTRICT**SECTION 2510. PURPOSE AND INTENT**

The purpose of the Planned Resort District standards are to provide for and guide the creation or continuation of a planned development configured around a major recreational activity. The intent of this District is to:

- A. Encourage recreational activities that rely on indigenous natural attributes of the area, contribute to the community's character and economy and have had a long-standing, beneficial role in the community; and
- B. Provide flexibility for planning and developing recreational resort facilities in a creative, efficient and coordinated manner in order to provide quality visitor experiences; and
- C. Create a process in which applicants, Teton County and the Town of Jackson collaborate with landowners in planning and designing resort master plans that meet community goals and respond to the unique circumstances of the resort area; and
- D. Permit resort development that contributes to expanding the winter and shoulder economic seasons; and
- E. Ensure that resort plans incorporate a mix of land uses, promote alternative modes of transportation, and provide a pedestrian-oriented community in order to alleviate traffic-related impacts; and
- F. Ensure resort plans are consistent with the Comprehensive Plan, and therefore, are beneficial to the community; and
- G. Enable long-range planning for infrastructure, capital facilities, and community land use patterns by establishing a level of predictability in the maximum potential size and character of each resort area; and
- H. Ensure a balance is maintained between tourism and community that promotes social diversity but does not cause undesired shifts away from rural, western community character; and
- I. Produce resort plans that make significant contributions toward protecting attributes of the community that are considered critical to the community's long-term health, welfare, and well-being.

SECTION 2520. APPLICABILITY

- A. **PR District.** Only those lands described below shall be eligible for PR District (hereinafter Planned Resort) zoning. The intent is that a limited number of PR Districts be created and only in locations that are consistent with the Jackson/Teton County Comprehensive Plan.

- I. **Snow King Ski and Summer Resort.** For the purposes of this Division, this area shall be known as "Snow King" and shall encompass the property mapped in Section 2550.M.3.g, Area description.

SECTION 2530. PROCEDURE

This procedure is intended to promote collaboration among landowners, the County, and the Town of Jackson in designing land development standards specific for each resort area. While one or more landowners may propose a Planned Resort master plan, and maintain the role of the applicant as identified herein, all landowners within a resort area are encouraged to participate in the design of the Master Plan. Participation of all landowners within the PRD, however, is not required for the Town to adopt a Master Plan for the Planned Resort.

- A. **Master plan review and approval.** Public review and approval for Planned Resort master plans follows the procedures set forth for Sketch Plans and serves as a Sketch Plan pursuant to Section 51200, Development Plan. The standards for review of the master plan, however, are the standards set forth in this Division, in order to allow for flexibility and creativity in the master plan and discretionary review thereof.
 1. **Purpose and intent of master plan.** The purpose of a Planned Resort master plan is to establish the development standards and serve as a guide to all future development within the Planned Resort. The Planned Resort master plan is intended to be of sufficient detail to describe the amount, type, size, location, and impact of the proposed resort, but technical specifications of the proposed development, such as fully engineered plans or fully detailed architectural drawings, are not required.
 2. **Submittal components.** A Planned Resort master plan application shall include all lands in a given resort area, as listed in Section 2520, Applicability. The minimum requirements for a master plan application shall be established by the Planning Director and shall include, but not be limited to:
 - (a) Statement of Purpose
 - (b) Master Site Plan
 - (c) Dimensional Limitation Plan
 - (d) Design Guidelines
 - (e) Transportation Demand Management Plan
 - (f) Housing Mitigation Plan
 - (g) Capital Improvements Plan
 - (h) Land Use Plan
 - (i) Phasing Plan
 - (j) Community Services Element (optional)
 3. **Recordation.** Upon approval, the Planned Resort Master Site Plan and a Certificate of Standards and Conditions, and any amendments thereto, shall be recorded in- the Teton County, Wyoming Clerk's Office. The Certificate shall be in the form of an affidavit and

shall detail the Planned Resort master plan conditions of approval and the development standards to be applied within the Planned Resort, as well as any other standards, conditions, or agreements pertaining to future development or responsibilities of landowners within the Planned Resort. The Planning Director shall prepare the affidavit in a form acceptable to the Town Attorney.

4. **Joint review by Town and County.** In addition to the review procedure set forth in Section 51200, Development Plan, the Town Planning Commission and Town Council shall make recommendations to the County Planning Commission and Board of County Commissioners regarding any Planned Resort master plan application within unincorporated portions of Teton County. For the same purpose, the Town Planning Commission and the Town Council shall receive and consider recommendations from the County Planning Commission and Board of County Commissioners regarding any Planned Resort master plan application in the Town of Jackson.
 - a. **Purpose.** The purpose of the County's and Town's review of any Planned Resort in the other jurisdiction is to recognize the impact of resorts on neighboring jurisdictions and to provide an opportunity for cooperation in planning and mitigation of potential impacts.
 - b. **Intent.** The intent of review is for the County Planning Commission and Board of County Commissioners to have an opportunity for review and comment on a proposed Master Plan. The role of Teton County is advisory only and does not include a voting participation in review of the Planned Resort master plan.

B. Final Development Plan review and approval. After approval of a Planned Resort master plan, Final Development Plan and building permit approvals are required prior to commencement of any construction or operation of any new land use within the Planned Resort.

1. **Final Development Plan application.** Final Development Plan applications shall be in accordance with the Planned Resort master plan and shall be reviewed and approved pursuant to Section 51200, Development Plan. No Sketch Plan review is required. No Final Development Plan shall be approved unless the proposal is consistent with the Planned Resort master plan.
2. **Phasing.** A Final Development Plan application may encompass only an increment of the total resort development in accordance with an approved phasing plan.

C. Other development options. The purpose of this subsection is to provide development options for properties within the Planned Resort District prior to adoption of a Planned Resort master plan, for individual properties which comprise a minor component of a Planned Resort District, and for properties which are not included in an approved Planned Resort master plan.

1. **Prior to master plan approval.** Until such time as a Planned Resort master plan is approved, development shall only be permitted in accordance with dimensional standards

and limitations listed for Auto-Urban Commercial/Lodging Overlay (AC/LO) and Auto-Urban Residential (AR) in Table 2400, Schedule of Dimensional Limitations, except that for non-residential development, the Floor Area Ratio (FAR) shall be limited to .25. Uses allowed shall be those listed for AC/LO and AR in Table 2200, Use Schedule.

2. **Prior to master plan approval - waiver for individual properties.** Upon written request of the applicant, the Town Council may for individual properties waive the limitations set forth in this subsection if the Council finds that the property constitutes a minor component of the total Planned Resort District, and development of the property prior to adoption of a master plan will not compromise the purpose or intent of the Planned Resort District or these Land Development Regulations. In the event Council waives the limitations as described herein, the applicant may submit a Sketch Plan or Final Development Plan, as appropriate, pursuant to Section 51200, Development Plan. Standards for review and approval shall be those applicable standards set forth in Section 51200, Development Plan and in Section 2550.M, Character element.
3. **Standards for properties not part of an approved master plan.** Immediately upon approval of a Planned Resort master plan any parcels not included in the master plan may be developed in accordance with the dimensional standards and limitations listed for Auto-Urban Residential (AR) in Table 2400, Schedule of Dimensional Limitations. Uses allowed shall be those listed for the AR in Table 2200, Use Schedule. Approval of any development shall be in accordance with Section 51200, Development Plan.

SECTION 2540. STANDING, AMENDMENTS, EXPIRATION, EXTENSION AND RECONSIDERATION

- A. **Standing of Planned Resort master plan.** An approved Planned Resort master plan shall specify the development standards for the Planned Resort. Upon approval of a Planned Resort master plan, any amendments to these Land Development Regulations shall not affect the approval of the Planned Resort master plan, or the conditions of approval, provided development within the Planned Resort proceeds in accordance with an approved phasing plan and provided none of the conditions occur that prescribe expiration of the Planned Resort master plan, pursuant to Section 2540.C, Expiration.
- B. **Amendment of master plan.** Any amendment to the Planned Resort master plan shall be reviewed and acted upon pursuant to the procedures set forth in this Division for review and action on the original master plan. The amendment shall be subject to all applicable standards of this Division and these Land Development Regulations that are in effect at the time of review of the amendment. Notwithstanding, minor deviations from a Planned Resort master plan may be approved by the Planning Director, pursuant to Section 51200.J, Minor deviations.
- C. **Expiration.**
 1. **Time-frame.** A Planned Resort master plan shall expire three (3) years from the date of its approval unless a sufficient application for Final Development Plan, in accordance with the approved phasing plan, is filed with the Planning Department A Planned Resort master

plan shall expire five (5) years from the date of its approval unless there is commencement of construction or operation of land uses or activities in accordance with the approved phasing plan. Notwithstanding, alternate time frames for expiration of a Planned Resort master plan may be established in an approved phasing plan.

2. **Effect.** Upon expiration, approval of a Planned Resort master plan shall become null and void, and all rights that are established by the master plan shall expire.

D. Extension. A Planned Resort master plan approval may be extended by the Town Council provided a written request for extension is received at least thirty (30) calendar days prior to expiration of the Planned Resort master plan.

1. **Procedure.** The request for extension shall be reviewed by the Town Council at a regularly scheduled meeting, by which time a public hearing notice shall be advertised and any necessary information pertinent to the extension request can be made available. The Planned Resort master plan shall be deemed extended until the Town Council acts upon the request for extension.
2. **Grounds for extension.** The grounds for extending a Planned Resort master plan approval shall be specified by the Town Council and shall include, but not be limited to, the following:
 - a. **No change in conditions.** Conditions in the community have not substantially changed since the original Planned Resort master plan approval. No extension shall be granted if the Town Council finds that changes in the community result in the resort plan being consistent with the community's land use patterns, these LDRs, or the community's ability to provide infrastructure and services to accommodate the resort.
 - b. **Good faith efforts.** Activities and investments on the part of landowners within the Planned Resort demonstrate good faith efforts in pursuing the development permitted by the Planned Resort master plan.

E. Reconsideration. If development within a Planned Resort fails to proceed in general accordance with the approved phasing plan, the Town Council may require reconsideration of the Planned Resort master plan and either amend the phasing plan or revoke the master plan, as appropriate.

1. **Amendment.** Amendment of the phasing plan shall be appropriate if either an acceptable alternative phasing plan that meets the standards of this Division or a development schedule acceptable to the Town Council for regaining compliance with the original phasing plan is presented.
2. **Revocation.** Revocation of the master plan shall have the effect of forfeiting all rights within the Planned Resort to any further development according to the Planned Resort master plan and shall be appropriate if:

- a. No material progress has been made in development of the resort for ten (10) consecutive years, or
 - b. There is substantial noncompliance with the performance objectives specified in the conditions of approval, or the monitoring program, and no agreement can be reached between representatives of the landowners within the Planned Resort or applicant of record and the Town Council for bringing the resort development into compliance with the standards of this Division.
3. **Procedure.** The Town Council shall hold a public hearing, in accordance with Section 5120.E, Notice of public hearings, and Section 5120.F, Public hearing procedure, for the purpose of examining the development that has occurred within the Planned Resort and its consistency with the Planned Resort master plan. The Town Council shall issue a determination as to whether amendment or revocation of the master plan is appropriate, in accordance with the above specified standards. Amendments to the master plan shall be accomplished pursuant to Section 2540.B, Amendment of master plan.

SECTION 2550. STANDARDS APPLYING TO ALL PLANNED RESORTS

- A. **Consistency with Comprehensive Plan.** Planned Resort master plans shall be consistent with the goals and objectives of the Jackson/Teton County Comprehensive Plan.
- B. **Compliance with Land Development Regulations.** A Planned Resort master plan shall comply with the standards of these LDRs. Notwithstanding, the applicant for a Planned Resort master plan may propose, and the Town Council may approve, alternative standards for development that are consistent with the purpose and intent of this Division. It is fully consistent with this Division that Planned Records may have dimensional, design, and other development standards different from those described in other sections of these LDRs due to the unique circumstances of, and community objectives for, resort development.
- C. **Statement of purpose.** The Planned Resort master plan shall have a Statement of Purpose which describes the applicant's rationale for resort expansion and the design theme of the resort development. The Statement also shall describe how the resort master plan fulfills the intents of this Division, as specified in Section 2510, Purpose and Intent.
- D. **Master Site Plan.** The Planned Resort master plan shall have a Master Site Plan that clearly illustrates the proposed development and the site to the satisfaction of the Planning Director.
- E. **Dimensional Limitation Plan.** The Planned Resort master plan shall have a Dimensional Limitation Plan which specifies dimensional limitations necessary to achieve the design theme identified by the applicant. The plan shall include floor areas and floor area ratios, densities landscape ratios, height, setbacks, building envelopes, etcetera, or other lines delineating areas on which restrictions of development are to be imposed and areas in square feet for each lot or building.

Any dimensional limitations unspecified by the Planned Resort master plan shall be established by the standards set forth in Section 2530.C, Other development options.

F. **Housing element.** The Planned Resort master plan shall have a housing element is to ensure a supply of affordable and employee housing that is commensurate to the demand for housing created by development within the Planned Resort.

1. **Affordable housing.** Affordable housing shall be provided in conjunction with residential development pursuant to Division 49400, Residential Affordable Housing Standards, of these LDRs.

2. **Employee housing.** Employee housing shall be provided in conjunction with nonresidential development pursuant to Division 49500, Employee Housing Standards, of these LDRs.

a. **Employee housing calculations.** Since development of a Planned Resort may span time periods over which numbers of employees and their salaries may fluctuate, the calculations performed in developing a Housing Mitigation Plan shall use data current for the most recent full year prior to application for Planned Resort master plan.

b. **Master plan estimate.** The number of employees required to be housed and the locations where they will be housed, as presented in the Planned Resort master plan, shall be treated as an estimate/concept, and shall be finalized by the Planning Director as Final Development Plans within the Planned Resort are reviewed and acted upon. Each approved Final Development Plan shall establish the actual number of employees required to be housed and the locations in which they will be housed for that portion of the Planned Resort master plan.

G. **Design element.** The Planned Resort master plan shall include design guidelines, and a mechanism for their implementation, that establish design parameters for both buildings and spaces in the Planned Resort. The design theme of the resort shall be defined by the applicant and be consistent with the standards of this Division. This subsection establishes concepts that the design guidelines shall address; the design guidelines shall be evaluated as to whether or not they address these concepts, as well as character objectives for specific resorts set forth in Section 2550M, Character element. The design guidelines shall be prepared by an architect or landscape architect licensed in the State of Wyoming; preparation by a person or persons of similar expertise may be permitted by the Planning Director.

1. **General.** The design theme of the Planned Resort shall have an emphasis on outdoor recreational activities and create a sense of place. A sense of place is created when site planning and architecture:

a. Concentrate activities and human interaction into identifiable spaces, such as a plaza or mall;

- b. Assemble a built environment that connects buildings, spaces and structures through common scale, design, and materials;
- c. Incorporate into the built environment the natural features and cultural heritage of the area, and;
- d. Produce an identifiable image that is associated with the planned resort and with Jackson Hole.

There shall be visual continuity among the resort structures and design elements without unduly limiting variety in design. Development shall be compatible with the surrounding built and natural environment in both scale and character.

2. **Architecture.** Building design guidelines shall reflect:

- a. The community's architectural character and themes
- b. A human scale, pedestrian-orientation, which are created when:
 - (1) The height of buildings does not overwhelm people walking beside the buildings; and
 - (2) The ground level doors, windows and design features of buildings create an interesting diversity for people walking past the buildings.
- c. A built environment in keeping with the cultural and aesthetic values of the community
- d. Natural attributes of the immediate vicinity
- e. Building materials and colors compatible with the surrounding natural and built environment.

3. **Bulk and scale.** The design guidelines shall ensure the bulk and scale of individual buildings within the Planned Resort achieve compatibility with:

- a. Other structures within the Planned Resort when the resort development is completed, and
- b. Neighboring structures that are not a part of the resort, and
- c. The natural environment.

4. **Signs.** The design guidelines shall include a sign component that sets forth the sign theme for the Planned Resort and specifies criteria for determining permitted sign sizes, types, and

locations. The guidelines shall contain prototypical examples of all types of signs, including wall, canopy, freestanding, directional, and informational signs. The flexibility extended to Planned Resorts via this Division, to propose standards for signs different from those specified in Chapter 15.28, Signs, of the Jackson Municipal Code, is encouraged with the purpose of having sign guidelines in keeping with the unique character and needs of the resort.

5. **Lighting.** The design guides shall include an analysis of proposed project lighting. Areas to be illuminated (parking areas, walkways, entries, etc.) shall be identified, and general standards should be set forth. Identification of models and types of standards and fixtures is encouraged, but specific illumination plans and photometric footprints are not required. Generally, lighting shall be low-intensity, low profile, and shielded to avoid "light pollution" and glare to off-site areas. General illumination standards are set forth in Section 49370, Exterior Lighting and Glare.

6. **Site planning.**

- a. **Orientation and aspect.** Structures and public spaces within the Planned Resort, generally, shall be arranged with views of, and access to, the principal resort recreational amenity.
- b. **Entrance features.** Entrances to the Planned Resort shall create a sense of arrival. A sense of arrival is created when the entrance into the Planned Resort is easily identifiable and is consistent with the design theme of the resort.
- c. **Natural resources.** The site design shall highlight the natural resources within the Planned Resort and integrate them into the layout of the resort in order to promote a connection to the natural environment. Consequently, natural features of the site, such as significant vegetation, rock outcroppings, water bodies, etc., shall be preserved and incorporated into the project design to the extent practicable.
- d. **Pathways and pedestrian facilities.** Pathways and pedestrian facilities, including access for the disabled, shall be integral components of the site design. The site shall provide an attractive, outdoor atmosphere that encourages use and reliance upon pathways and walkways.
 - (1) **Safe, convenient, and direct access.** Pathway and pedestrian systems shall provide safe, convenient, and direct access throughout the resort, to public lands, transit facilities and the existing or planned community pathway system, when adjacent to the resort.
 - (2) **Pathways.** Pathways shall be provided for non-motorized transportation, except motorized wheelchairs for the disabled shall be permitted. Bicycle racks, ski racks, etc., shall be provided at various destination points within the resort.

- e. **Transportation facilities.** Site design shall integrate safe, convenient, and direct access to transportation services and facilities (i.e., bus shelters, information kiosks) and shall incorporate the facilities necessary for the proper functioning of the Transportation Demand Management Plan (see subsection H.2, below.)
 - f. **Circulation.** The layout of local streets, alleyways, and parking lots shall be sensitive to the natural terrain and landscape. Cut and fill areas shall be minimized, and natural features of the site such as wooded areas, rock outcroppings, and water bodies, shall be preserved to the maximum extent practical.
 - g. **Access.** Safe vehicular access appropriate for refuse removal, recycling, emergency services, and delivery shall be provided. Service access shall not create unsafe conflicts with automobile and pedestrian access to primary destinations within the resort.
 - h. **Landscaping.** Project landscaping, including hardscape areas, shall be consistent with the overall design theme of the resort. Use of indigenous plant materials is encouraged. Existing vegetation shall be preserved and incorporated into the design of the project to the extent practical, especially wooded areas and other significant vegetation, which provides shelter or habitat for wildlife.
7. **Character objectives.** Section 2550.M, Character element, contains character and size objectives specific to each resort area that shall be incorporated into the design guidelines.
- H. **Transportation element.** The Planned Resort master plan shall have a transportation element to ensure that resort development does not produce an amount of vehicular traffic that undermines the community's character, and endangers the public health, safety and welfare (i.e., noise, air quality and traffic impacts.) The Planned Resort master plan shall provide an optimum mix of automobile, transit, and pathway facilities within the resort, encourage coordination of all resort transportation facilities with the County-wide transportation system, promote design and management which encourages shifts from single-occupancy vehicle trips to multi-occupancy trips, or other transportation modes, and provide equitable cost sharing for facilities and services.
1. **Traffic impact analysis.** A traffic impact and access analysis is required. At a minimum, this analysis shall contain:
- a. Projections of external vehicle trips generated by the Planned Resort.
 - b. Analysis of levels of service (LOS) impacts on roadway system segments and intersections serving the Planned Resort.
 - c. Specification of any improvements needed to roadway system segments and intersections as a result of increased traffic from the Planned Resort.

2. **Transportation Demand Management Plan.** The Planned Resort master plan shall include a Transportation Demand Management (TDM) Plan that demonstrates how the travel behavior of resort visitors and employees will be managed to minimize the number of vehicle trips on the roadway network resulting from the resort development. The Transportation Chapter of the Jackson Teton County Comprehensive Plan will allocate a number of vehicle trips to various roadway segments, based upon the projected traffic demand and the planned character of the roadway segments. A goal of the applicant's **TDM** Plan shall be to manage the transportation demands of the resort so that it is consistent **with** the allocation of vehicle trips to the various roadway segments that serve the Planned Resort. Potential mechanisms for managing travel behavior may include, but are not limited to:
 - a. Increasing average vehicle occupancy
 - b. Shifting vehicular trips (resident and visitor) to public transit
 - c. Shifting vehicular trips (resident and visitor) to walking, bicycling and other non-motorized means
 - d. Reducing vehicular trips through internal capture associated with mixed land use patterns.
 3. **Parking and loading.** The Planned Resort master plan shall provide parking and loading areas of sufficient amount and type to accommodate the resort's projected demand including parking for visitors and lodging guests, waiting and loading areas for transit vehicles and their passengers, and loading areas for delivery vehicles. Parking shall be designed to encourage non-motorized transportation, transit and high occupancy vehicle use and discourage single-occupancy vehicle use.
- I. **Capital improvements element.** The Planned Resort master plan shall have a capital improvements element to ensure that infrastructure and essential services will be provided in an efficient and timely manner to accommodate projected resort demands. Planned Resort master plans shall include a capital improvements element that identifies service providers, analyzes impacts and proposes a capital improvements plan for facilities and services needed by the resort. Such facilities and services may include, but are not limited to: transportation (including transit, parking and pathways;) potable water and wastewater treatment services; waste management (hazardous and solid;) utilities; storm water management and snow storage facilities.
1. **Identification and acknowledgment of service providers.** The applicant shall identify the provider of all infrastructure facilities and services included in the plan. Where services are to be provided by an entity other than the applicant, documents from the service provider shall demonstrate the commitment and ability to provide such service according to the Planned Resort master plan.
 2. **Impact analysis.** An impact analysis shall be performed for all facilities and services, unless waived by the Planning Director. Each impact analysis shall identify the following:

- a. The maximum daily peak capacity of existing facilities.
 - b. The current daily peak demand on existing capacity.
 - c. The daily peak capacity available for new development.
 - d. The projected daily peak demand generated by new development in the Planned Resort.
 - e. When development outside of a resort is reasonably anticipated to utilize the same infrastructure system as the resort, the Town of Jackson shall provide the applicant with estimated peak demand.
 - f. Any planned improvements by other entities, such as the Town of Jackson or the Teton Village Water and Sewer District, and the timing of such improvements.
 - g. Any deficits in daily peak capacity potentially resulting from development within the Planned Resort--either from a strict demand standpoint or from a timing standpoint--taking into account other potential new development outside the Planned Resort.
3. **Capital improvements program.** The capital improvements plan shall be consistent with the impact analysis and specify how any deficiencies in infrastructure will be remedied or mitigated, including descriptions of the infrastructure improvements, the responsibility and sources of funding for the improvements, and the timing for completion of improvements. Concept plans for improvements shall be included in the capital improvements plan; engineered plans shall be provided in the final development plan application for subsequent development.
- J. **Land use element.** The Planned Resort development shall have a land use element that identifies the land uses within a proposed Planned Resort. The land uses shall be consistent with both the applicant's design theme and the character objectives for the resort, as specified in Section 2550. **M, Character element**.
- I. **Permitted uses.** The type of development permitted within a Planned Resort shall be set forth in the Planned Resort master plan and shall be consistent with the following:
- a. Residential uses shall be permitted.
 - b. Uses necessary for operation of the resort's primary recreational activity (ski area, hot springs) shall be permitted.
 - c. Nonresidential uses that provide for the basic needs of the resort's lodging guests, day visitors, employees and vicinity residents shall be permitted.

- d. Regional-serving commercial uses which rely upon vehicle trips from a community-wide market area rather than the Planned Resort vicinity shall be prohibited, unless they are determined by the Town Council to be resort-related amenities.
 - e. Commercial amusement activities that are detrimental to the outdoor, natural resource character of Teton County shall be prohibited.
 - f. Special events such as music and dance festivals, art and craft shows, concerts, live theater, and similar events, which are compatible with the resort and its facilities, shall be permitted.
2. **Amount and type of development.** The amount and type of development in a Planned Resort master plan shall be consistent with:
- a. The applicant's rationale for resort expansion and the character objectives for the resort area pursuant to Section 2550.M, Character element.
 - b. The overall amount of development that can be permitted while preserving community character, as reflected in the Jackson Teton County Comprehensive Plan and the Town and County's LDRs.
 - c. The amount of infrastructure capacity that can be provided while maintaining consistency with community character goals.
 - d. Providing a level of self-sufficiency within the resort, such that vehicle trips ending outside the resort are minimized.
- K. **Phasing element.** The Planned Resort development shall have a phasing element to ensure that development within a Planned Resort occurs in logical sequence within the Planned Resort, including amenities and necessary public service expansions. Planned Resort master plans shall contain a phasing plan that identifies the sequence of resort structures, uses and amenities, installation of infrastructure, implementation of the Transportation Demand Management Plan, Housing Mitigation Plan, and implementation of Planned Resort master plan conditions of approval.
1. **Description.** All structures, land use activities, mitigation strategies and infrastructure expansions proposed, including such activities and improvements on public lands, shall be included in the phasing plan.
2. **Functional phases.** Each phase shall be self-sufficient, in conjunction with existing elements of the Planned Resort, i.e., transportation and parking needs, as well as amenities, for each phase shall be satisfied within each phase and shall not be dependent upon a future phase. Each phase shall represent a logical and compact extension of infrastructure and public services. In order to develop certain improvements in logical increments that provide for economies of scale, the phasing plan may propose that improvements required for an earlier phase be provided in a later phase only if:

- a. The delayed construction of the improvement does not create a negative impact or exacerbate an existing problematic condition, and
 - b. Financial assurance, in a form acceptable to the Town Council, is provided, i.e., letter of credit, that the improvement required for the earlier phase will be developed within a certain time-frame, even if later phases remain undeveloped.
3. **Coordinated with public services.** Phasing shall be coordinated with the improvements schedule or capital improvements program of public or semipublic service providers, as identified in the Capital Improvements Element.
4. **Relationship of phasing to overall resort plan.** Phasing shall implement the stated purpose of the Planned Resort master plan, i.e., if a destination ski area is the basis for the resort plan, the ski area facilities should not be the last increment of development. Similarly, open space dedications, amenities, and required performances that mitigate the impacts of the resort shall be developed or provided in proportion to the type and amount of development in each phase.
5. **Performance objectives.** The Town shall establish performance objectives as part of the Planned Resort master plan approval that ensure that development within the Planned Resort achieves the required mitigation of projected impacts on the community. The resort developers shall be responsible for ensuring that proposed mitigation measures are effective. For example, the resort approval may require vehicle trip reduction techniques in order to avoid undesired vehicle trips; performance objectives shall be identified and incorporated into a monitoring program, pursuant to subsection K.6, Monitoring proiTam, below.
6. **Monitoring program.** A program for monitoring compliance with performance objectives for each phase of development shall be designed in a collaborative effort between the applicant(s) and the Town, and shall be set forth in the Planned Resort master plan approval. The monitoring program shall be implemented by the applicant, or an entity that equitably represents all landowners within the Planned Resort, and will include monitoring of DM components, employee housing developments, and other such elements as identified by the Town Council.
 - a. **Program contents.** The monitoring program shall specify data collection needs, responsibility for data collection, techniques to be used in analyzing data, how the data shall be used to determine achievement of performance objectives, and the schedule for reporting to the Town the results of the monitoring effort
 - b. **Program results.** Representatives of the landowners within the Planned Resort shall have three (3) reporting opportunities to demonstrate achievement of performance objectives. If, by the third scheduled report, the resort has been unable to meet any specified performance objective, the Planned Resort master plan may be subject to reconsideration pursuant to Section 2540.E, Reconsideration.

7. Achievement of performance objectives. Approval of future final development plans may be delayed until the performance objectives of the previous phases are met or a strategy for achieving them has been approved by the Town Council.
- L. Community services element (optional). Resorts function as integral parts of the community by participating in civic initiatives and implementing the goals of the community. The optional community services element is intended to be a component of the Planned Resort master plan in which the benefits that the resort area provides to the community are acknowledged. Landowners within Planned Resorts are encouraged to continue with, and expand upon, programs designed to retain local access to the resort's main recreational activity and facilities. Community service programs help to maintain a balance at the resort between out-of-town visitors and the community, and contribute to the quality of life in the community. Examples of community services currently provided are:
1. Hosting activities for local disabled persons
 2. Hosting Parks & Recreation Department activities
 3. Providing trail head access to public forest land
 4. Hosting local nonprofit events, including free recreational activities and transportation
 5. Offering reduced facility rates for community events and nonprofit organizations
 6. Offering local appreciation and promotional reduction in activity fees
 7. Offering activity fees that are affordable to the permanent population
- M. **Character element.** The Planned Resort master plan shall have a character element to ensure that resort development is in keeping with the community's character and the planned character for the vicinity in which the resort development is located as described in this subsection. The standards set forth in this subsection are unique to each resort area in order to recognize the differences between the individual resorts, the planned character of their neighborhoods, and the community's expectation of resort development in that vicinity.
1. **General.** The standards specified in this Section are the minimum required, or maximum permitted, as indicated by a "no less than" or "no more than" statement. Minimum requirements may be increased in order to avoid or mitigate impacts of a specific Planned Resort master plan proposal, better achieve the character objectives for the resort, or better implement the goals and objectives of the Comprehensive Plan. Similarly, an applicant's ability to achieve the maximums permitted is dependent upon the Planned Resort master plan's avoidance or mitigation of negative impacts on the community, its achievement of the character objectives for the resort, or its contribution toward achievement of the goals and objectives of the Comprehensive Plan.

2. Definitions.

- a. **Guest.** A guest is a person who is accommodated in overnight lodging facilities within the Planned Resort. The number of guests is calculated by the "average peak occupancy" of the lodging accommodations.
- b. **Average peak occupancy.** For the purposes of this Section, the following average peak occupancies (APOs) shall be used in calculating the capacity of guest accommodations:
 - (1) **Hotel, motel, or similar lodging unit.** A hotel, motel, or similar lodging unit that exists as sleeping quarters only, and does not contain other types of living spaces such as a living room or kitchen, shall be assigned an APO of two (2.)
 - (2) **Dwelling unit.** A dwelling unit, used for short term rental, shall be assigned an APO of four (4.)
 - (3) **Other.** Other lodging facilities that do not meet the definitions above shall have an APO assigned that is the sum of the number of bedrooms the lodging facility contains multiplied by two (2.)

3. Snow King

- a. **Character and design.** As indicated on the Community Issues **Map** of the Jackson/Teton County Comprehensive Plan, Snow King Resort will continue its role as a unique, resort-oriented urban commercial node serving both visitors and residents. Improvements and expansions at Snow King will solidify its role as the main convention and conference facility in the community. Factors and resort characteristics important in Snow King's future development include:
 - (1) Capitalization on the location at the terminus of Snow King Avenue.
 - (2) Creation of a sense of arrival.
 - (3) Creation of an active, attractive, pedestrian streetscape along the eastern end of Snow King Avenue.
 - (4) An attractive, safe, and direct pedestrian streetscape connection to the Town Square.
 - (5) A layout that blends the edges of the resort into neighboring developments, creating a porous edge to the resort that encourages pedestrian travel into and through the area.

- (6) Structure sizes and layout that draw people into the resort area.
- (7) A continuity of architecture and activities within the resort, creating a multi-use sense of place.
- (8) Pathways throughout the resort and connections to the Jackson Hole pathways system.
- (9) Continued provision of the amenities of "town hill" skiing.

b. Capacity.

- (1) **Lodging.** Lodging capacity shall be for no more than 2,460 guests shall be provided within the Planned Resort.
- (2) **Buildings.** There shall be no more than a total of 1,080,000 square feet of gross floor area for all facilities and all uses located within both the Building Envelopes and the Recreation Land Use Zones within Sub-Areas 1-6 as defined in the Snow King Master Plan, as well as, all development within Sub-Area 7 located within the Planned Resort District, but not part of the Snow King Master Plan (Pitchfork, Clark' s Knoll, Grand Vista, Stevens, Remington). For purposes of allocating square footage 915,000 square feet shall be allocated to Sub-Areas 1-6 and 165,000 square feet to Sub-Area 7. The 1,080,000 square feet of gross floor area shall include all structures, both new, existing and all additions and/or redevelopment of structures. All floor area devoted to employee housing shall be exempt from the gross floor area calculation. With the exception of floor area devoted to employee housing, the total gross floor area shall include all floor area as defined by the Town's Land Development Regulations and as defined in the Planned Resort Master Plan for Snow King. **(Ord. 668, § 1, 1/2001)**

c. Land use. Convention center facilities shall be provided necessary to serve a year-round convention market, including community needs for convention space. Commercial services provided, in addition to convention facilities, shall be essential services to on-site guests and supplemental neighborhood services. The commercial space shall be sized and designed for serving the needs of on-site guests of the resort and nearby residents.

d. Landscape surface area. Within areas of the Planned Resort to be developed as lodging, conference, commercial and related facilities, the minimum landscape surface ratio shall be .25, exclusive of the already permitted residential development that exists upon the enactment of this Division (Clark's Knoll, Pitchfork Townhomes, Love Ridge, and Love Ridge Addition.) Notwithstanding, the Town Council may reduce the minimum landscape surface area to no less than twenty (20)

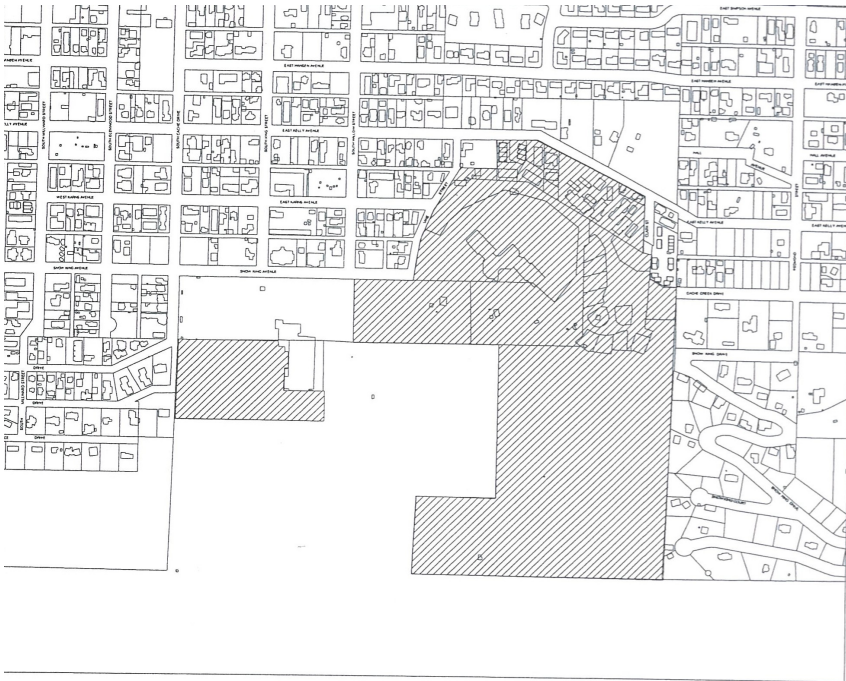
percent upon demonstration by the applicant that the following objectives are achieved with a reduced landscape surface area. The primary purposes of the landscaped areas within Snow King are to:

- (1) Create visually strong and attractive streetscapes.
 - (2) Create a porous edge to the Planned Resort such that residents and visitors in the surrounding areas are invited to enter the resort through attractive pedestrian ways.
 - (3) Support high quality urban design, including integral public spaces for interaction and public events.
- e. **Environmental analysis.** An EA with a visual component dealing with the potential visual impacts of development shall be performed pursuant to the procedures and standards of Division 3300, Scenic Resources Overlay (SRO) District. An EA shall be performed which recommends any action necessary to mitigate impacts to wildlife, migration corridors and crucial winter range.
- f. **Relationship to Town Square.** Programs and facilities shall be established that encourage non-motorized access and public transit access to the Town Square and other Town tourist environs, in conjunction with Town of Jackson planning efforts and goals.

A Planned Resort master plan shall be approved only if all of the following findings are made.

- A. **Consistency with Comprehensive Plan.** The Planned Resort master plan is consistent with the goals and objectives of the Jackson Teton County Comprehensive Plan.
- B. **Consistency with purpose and intent.** The Planned Resort master plan is substantially consistent with the purpose and intent of this Division, as set forth in Section 2510, Purpose and Intent
- C. **Affordable and employee housing.** The Planned Resort master plan ensures a supply of affordable and employee housing that is in accordance with the requirements for housing created by development within the Planned Resort.
- D. **Design guidelines.** The Planned Resort master plan contains design guidelines that
 - 1. Establish standards for buildings, spaces, signs, and lighting within the Planned Resort;
 - 2. Promote the design concepts set forth in Section 2550.G, Design element; and
 - 3. Establish a method for consistent implementation of the guidelines.
- E. **Transportation element.** The Planned Resort master plan contains a traffic impact analysis and transportation demand management plan that:
 - 1. Promote multimodal forms of transportation that are consistent with the transportation goals of the Jackson/Teton County Comprehensive Plan;
 - 2. Manage the generation of resort related traffic to avoid undermining community character and endangering the public health, safety, and welfare; and
 - 3. Identify an equitable cost sharing plan for transportation facilities and services.
- F. **Capital improvements plan.** The Planned Resort master plan contains a capital improvements plan that ensures infrastructure and essential services will be provided in an efficient and timely manner to accommodate projected resort demands.
- G. **Land use element.** The Planned Resort master plan promotes land uses that support and maintain the character of the resort as specified in Section 2550.M, Character element.
- H. **Phasing plan.** The Planned Resort master plan contains a phasing plan that ensures:
 - 1. Development of the resort, its amenities, and public facilities necessary to serve the resort, occur in logical sequence and

- g. **Area description.** The following map depicts the Snow King area that is within the Planned Resort District.



Planned Resort District

CALCULATION OF HOUSING NEEDS AT BUILDOUT

TABLE 3

Section Break (Continuous)

Land Use	Requirement	or Numbers	#Required
Column Break			
Section Break (Continuous)			
Office	0.03/1,000 SF	74,200 SF	85.85
Commercial Retail	0.41/1,000 SF	85,000 SF	
Restaurant/Bar	1.01/1,000 SF		
Commercial, Lodging, Hotel, Motel & Other		1,800 *	117.00
Short Term Rentals	0.065/guest		7.14
Conference/Meeting Rooms	0.06/1,000 SF	119,000 SF	Section Break (Continuous)
Indoor/Outdoor Recreational Facilities (to be determined in the future)	-----	3 1 1 6	
Column Break			
Total Required			241.51

1,800 = 2,208 less 408 guests (APO) in the existing hotel (204 rooms)

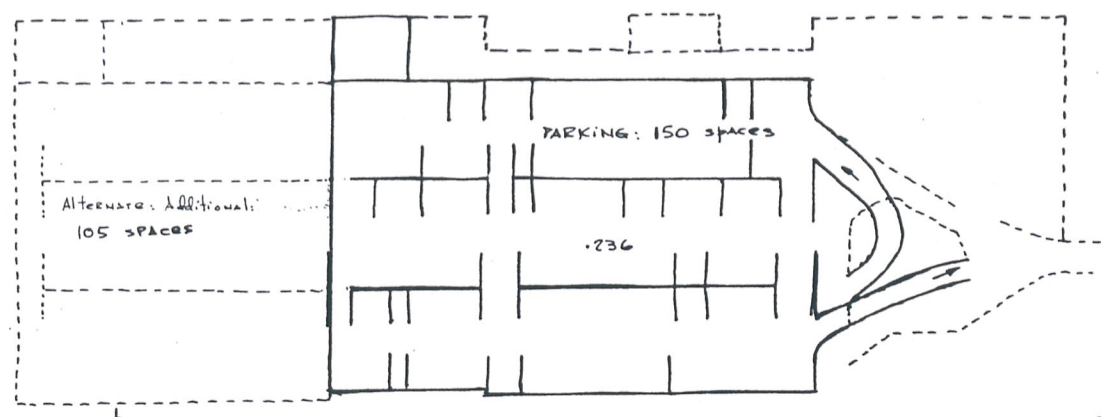
EMPLOYEE HOUSING DISTRIBUTION SUMMARY

TABLE 4

Section Break (Continuous)

Required Employees at	Build dout	Snow King Column Break Other Locations in Town
242	73	169

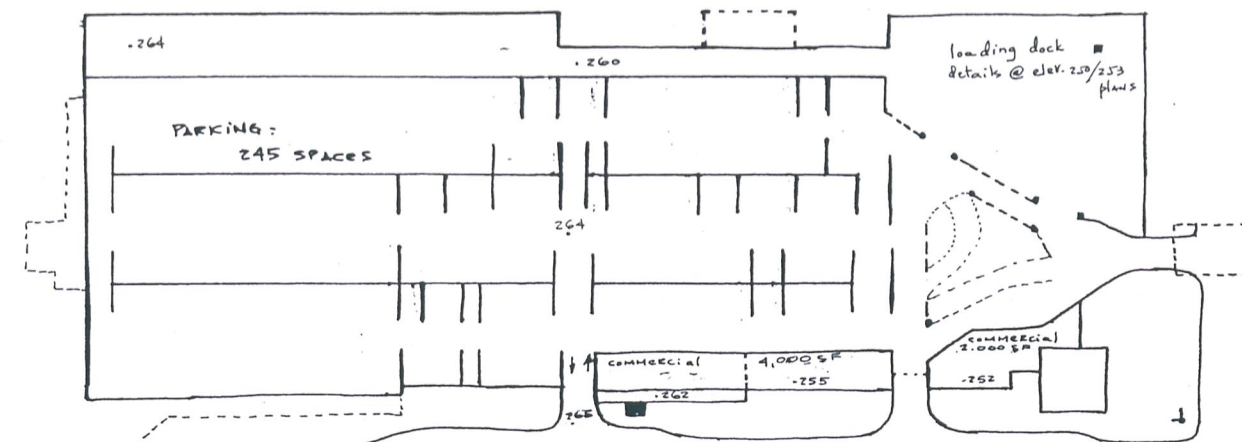
These calculations of required housing needed at buildout are only preliminary estimates. The final numbers will be determined by applying the required factors and formulas described in this section to the square footage or number of units actually built. As development occurs, the required employee housing shall be periodically updated as final development permits are obtained. Any changes in the formulas used for computing required employee housing that result in needs beyond the above described, shall be allowed to be met offsite.



ALTERNATE - A20

	SNOW KING	KMG	TOTALS
PARKING SPACES	28	77	105 EA
PARKING & CIRCULATION SF	14,000	28,000	42,000 SF
Mech. & Support	2,000	2,000	4,000 SF

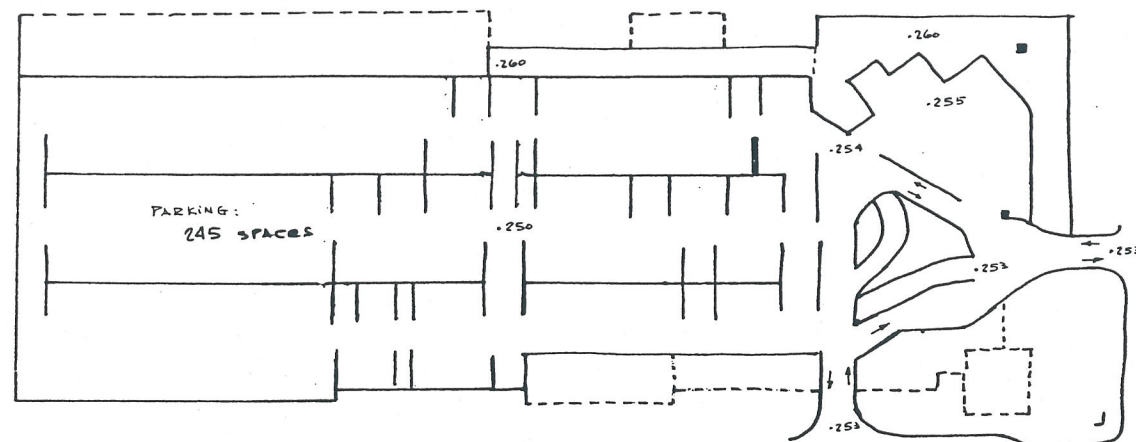
BASE BUILDING
 KMG: 150 parking spaces
 64,000 SF PARKING & CIRCUL.
 4,000 SF Mechanical & Support (underg.)
Elev. 236



Parking Spaces
 Parking & Circ. SF
 Underg. Support & Mech
 Commercial

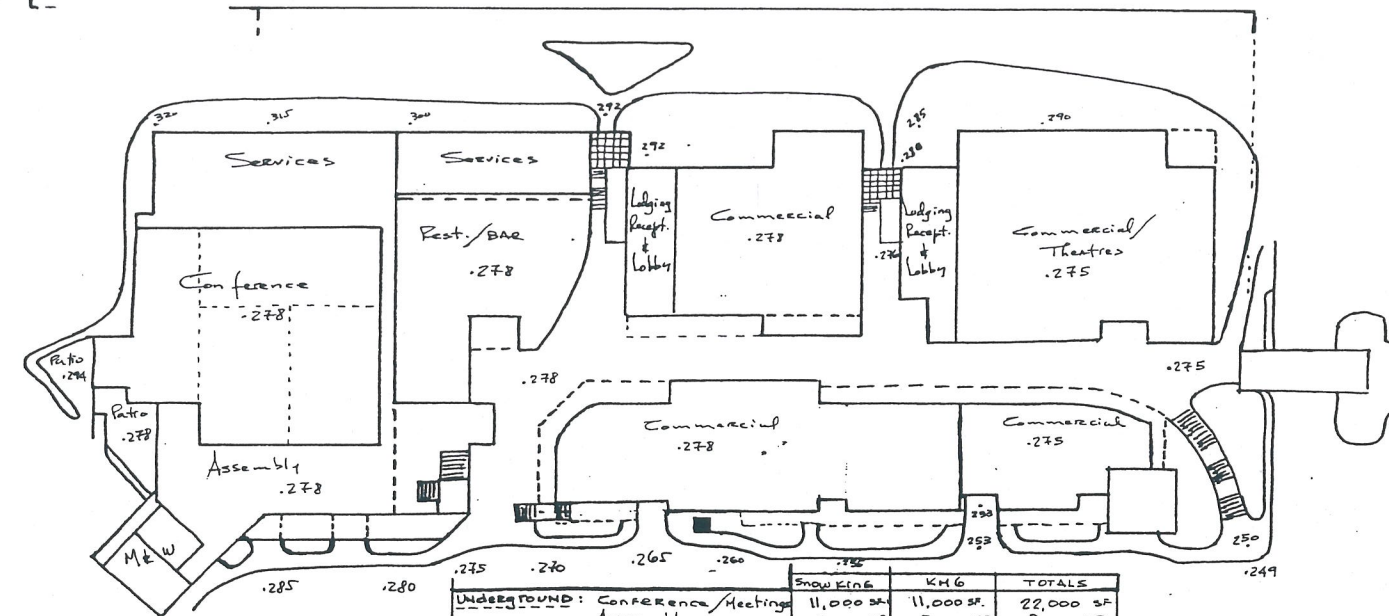
SNOW KING	KMG	TOTALS
25	220	245
13,000 SF	89,000 SF	102,000 SF
3,000 SF	13,000 SF	16,000 SF
-	6,000 SF	6,000 SF

Elev. 260/264



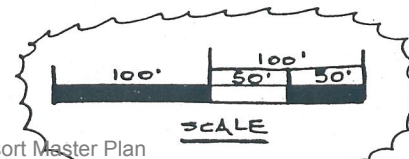
SNOW KING	KMG	TOTALS
25	220	245
13,000 SF	89,000 SF	102,000 SF
2,000 SF	6,000 SF	8,000 SF
-	22,000 SF	22,000 SF

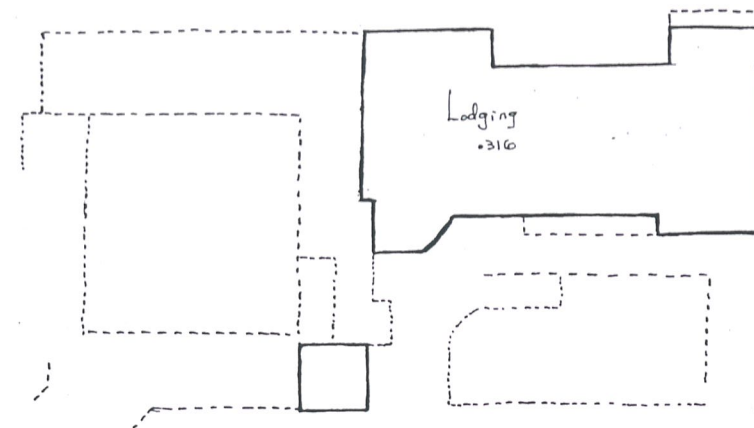
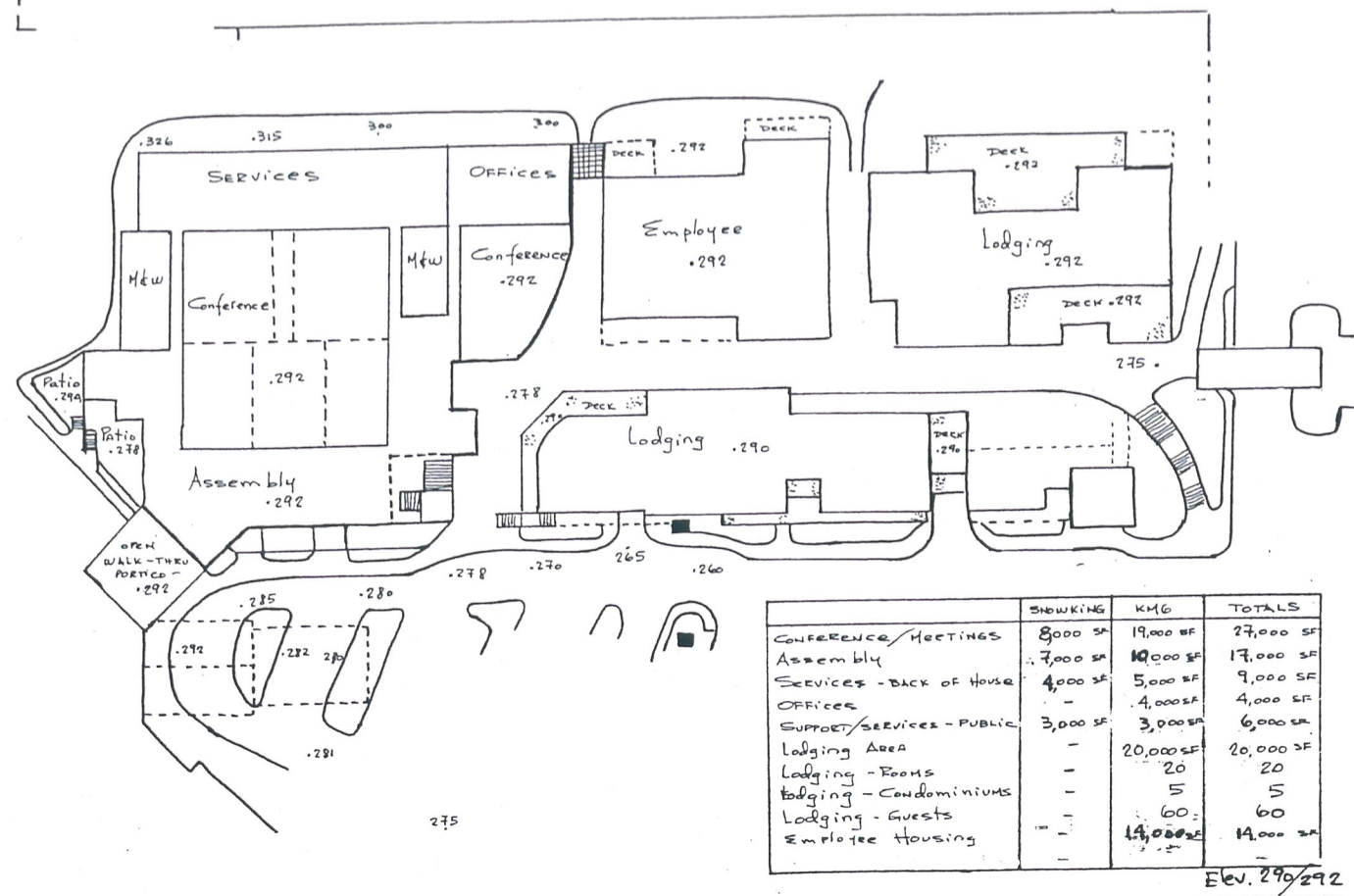
Elev. 250/253



	SNOW KING	KMG	TOTALS
UNDERGROUND: Conference/Meetings	11,000 SF	11,000 SF	22,000 SF
Assembly	4,000 SF	5,000 SF	9,000 SF
Services - back of house	5,000 SF	13,000 SF	18,000 SF
Support & Services - full	2,000 SF	-	2,000 SF
Above Ground: Commercial (F&B)	-	11,000 SF	11,000 SF
Commercial (unassg.)	-	34,000 SF	34,000 SF
Assembly	-	3,000 SF	3,000 SF
Lodging lobby & Receipt	-	6,000 SF	6,000 SF
Theatres or Commercial	-	9,000 SF	9,000 SF
GROUND COVERAGE: Buildings	22,000 SF	111,000 SF	133,000 SF
Landscaped PLAZA	-	37,000 SF	37,000 SF
Pathways, Sidewalks	2,000 SF	15,000 SF	17,000 SF

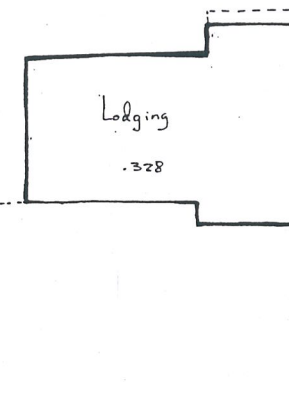
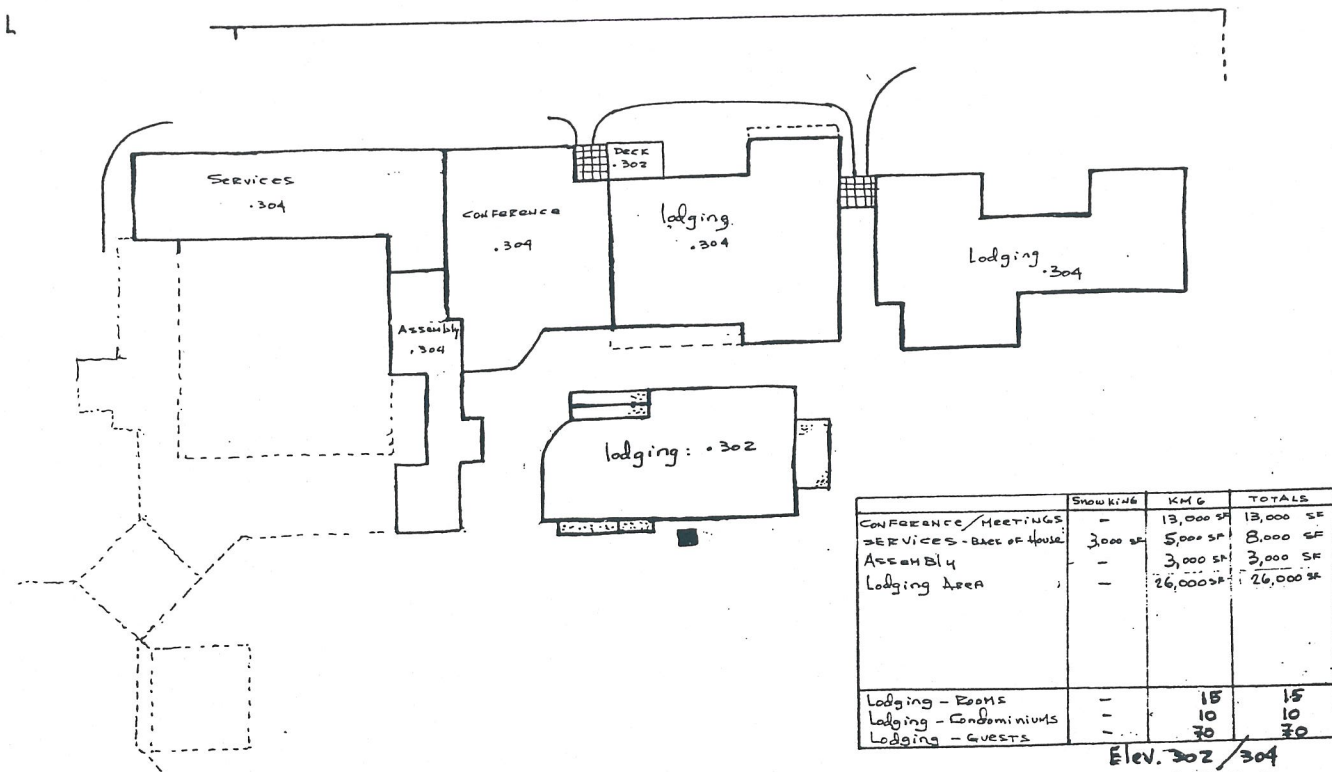
Elev. 275/278





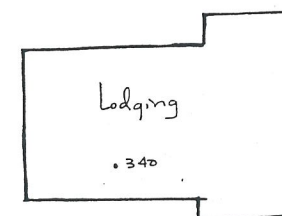
	KMG	TOTALS
Lodging Area	16,000 SF	16,000 SF
Lodging - Rooms	30	30
Lodging - Guests	60	60

Elev. 316



	KMG	TOTALS
Lodging Area	12,000 SF	12,000 SF
Lodging - Rooms	18	18
Lodging - Guests	36	36

Elev. 328



	KMG	TOTALS
Lodging Area	12,000 SF	12,000 SF
Lodging - Rooms	17	17
Lodging - Guests	34	34

XIII. C.

CONCEPTUAL BUILDING DESIGNS - SUB AREA 2

