Final Environmental Impact Statement:
Snow King Mountain Resort
On-Mountain Improvements Project

Prepared by:
US Department of Agriculture – Forest Service
Bridger-Teton National Forest

With the assistance of:
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SNOW KING MOUNTAIN RESORT
ON-MOUNTAIN IMPROVEMENTS PROJECT
FINAL ENVIRONMENTAL IMPACT STATEMENT

JACKSON, WYOMING

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Abstract: The Jackson Ranger District, Bridger-Teton National Forest, proposes to authorize Snow King Mountain Resort, which operates under Forest Service special use permit, to implement elements of the ski area's accepted master development plan. These elements are intended to maintain and improve the winter-sports 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, 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.

Four alternatives including the required no-action alternative, the proposed action, and two action alternatives, were developed and analyzed to provide a range of options for development at the ski area. Alternative 4 has been identified as the agency's preferred alternative.

Opportunity to Object: The draft decision is subject to objection pursuant to 36 CFR 218, Subparts A and B. Only those individuals or organizations who submitted timely, specific, written comments during a public comment period are eligible to file an objection. Incorporation of documents by reference in the objection is permitted only as provided for at 36 CFR 218.8(b). Minimum content requirements of an objection (36 CFR 218.8) include: (1) objector's name and address with a telephone number if available, with signature or other verification of authorship supplied upon request; (2) identification of the lead objector when multiple names are listed, along with verification upon request; (3) names of the project, responsible official, and national forest/ranger district of project, and (4) sufficient narrative description of those aspects of the proposed project objected to, specific issues related to the project, and suggested remedies which would resolve the objection.

How to Object and Timeframe: Written objections, including any attachments, must be sent via regular mail Objection Reviewing Officer, USDA-Forest Service Intermountain Region, 324 25th Street, Ogden, UT 84401 or email objection to objections-intermtn-regional-office@usda.gov within 45 days following the publication of the legal notice in the *Casper Star-Tribune*.

Information about this EIS is posted on the Bridger-Teton's projects website, under the "Analysis" tab, at:

http://www.fs.usda.gov/project/?project=54201

The draft decision is posted under the "Decision" tab.

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EXECUTIVE SUMMARY

INTRODUCTION

On June 5, 2018, the Bridger-Teton National Forest (Bridger-Teton) received a proposal from Snow King Mountain Resort (Snow King), requesting authorization to implement elements of their 2017 master development plan, as amended (MDP). The MDP analyzes current conditions at the resort and, based on that analysis, outlines anticipated development and management of the resort over the next 10 years. The MDP is intended to enhance the year-round recreational opportunities available at the resort and on the Bridger-Teton. It is the result of a collaborative, multi-year process involving input from Snow King, the Bridger-Teton, the Town of Jackson, Teton County, the Snow King Mountain Stakeholder Group, and members of the public (see Chapter 5, Consultation and Coordination).

Snow King is located in the Gros Ventre mountain range adjacent to Jackson, Wyoming (Figure 1-1 of the Final EIS), in Teton County, T41N, R116W, Sections 33 and 34, and T40N R116W, Sections 3 and 4. The operational ski area is approximately two-thirds on National Forest System land and one-third on Town of Jackson land or private property.

The resort operates under a special use permit (permit) issued by the USDA Forest Service (Forest Service) and administered by the Bridger-Teton. The *Bridger-Teton National Forest Land and Resource Management Plan*, as amended (hereafter referred to as the Forest Plan; Forest Service 1990), provides primary guidance for management of Bridger-Teton resources, including those within the ski area.

Teton County and the Town of Jackson are cooperating agencies in this environmental impact statement (EIS) process (40 CFR 1501.6).

PROPOSED ACTION

The proposed action includes the following elements:

Permit Boundary Adjustment

- 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.

Terrain Development

- A new ski school/teaching center with beginner and novice terrain on the ridgeline west of the Snow King summit.
- New ski runs on both the front and back side and adjustments to some existing runs totaling 117.8 acres of new terrain. Includes runs 3–14, 16–25, Lift B and C terrain, and modifications of Moose, Belly Roll, Upper Exhibition, and Bearcat.
- Gladed ski terrain and forest health maintenance totaling about 35 acres.

Summit Access Road/Novice Skiway

- A new roughly 2-mile access road to the top of the summit gondola that would also serve as a novice skiway.

Lifts

- A new gondola replacing the aging Summit lift.
- A new back-side chairlift.
- Two teaching center conveyor lifts.
- A new surface tow or carpet on the back side bringing skiers to the summit.

Facilities

- Summit restaurant/guest services building and ski patrol facility, 20,000–25,000 square-feet. Construction would require removal of the existing Panorama House and the unloading dock of the original Summit lift.
- A 500-square-foot observatory near the summit.
- A temporary ski patrol building at the top of Cougar.
- A year-round yurt camp at the southern point of the permit area, with nine yurts 20-30 feet in diameter and a 1-mile ADA-compliant access trail from the summit.
- A small, open-air wedding venue west of the summit building.

Night Skiing

- 27.3 acres of expanded lighting for night skiing.

Snowmaking Coverage

- 147.7 acres of added snowmaking (with few exceptions, all existing and proposed runs).

Summer Activities

- A 3,900-linear-foot zip line from the summit to the west base area, paralleling the Summit lift.
- About 6.5 miles of front-side mountain bike trails and a 110-acre back-side mountain bike zone with a skills park and trails of various difficulty levels. Detailed plans for this zone have not been developed.
- Hiking trails between the summit and the west base, west of Exhibition run, including an improved 0.6-mile Stairway trail and a 1.5-mile trail in the Bearcat Glades area.
- Obliteration of 1.1 miles of existing service roads made unnecessary by the proposed summit access road/novice skiway and user-created trails.

Comfortable carrying capacity would increase to 2,620.

PURPOSE AND NEED

Management considerations at three levels underlie the purpose and need for the proposed action. At the national level, 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. Responding to this trend is consistent with our 2012 *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. 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.

At the Forest level, the Bridger-Teton 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."

At the level of the ski area itself, Snow King has been in operation for over 80 years. Locally known as the "Town Hill," it is an integral part of the community. That said, two ongoing constraints limit the ski area's ability to move ahead in accordance with the national and Forest-level direction cited above. First, ski terrain within the current operating boundary is extremely steep. This meets the needs of expert skiers and race-training programs but does not fit the ability-level profile of the broader skier market. There are few options for beginner, novice, and low intermediate skiers within the current ski area boundary at Snow King due to the topography of the site.

Second, while Snow King has developed several summer recreation activities on private and National Forest System land at the base area and around the Rafferty lift mid-station, the upper slopes have been developed mostly for skiers. Aside from a few hiking and biking trails, there is little infrastructure for summer recreation.

Beyond these two constraints, the on-mountain facilities and infrastructure at Snow King are in need of replacement and/or upgrades.

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

- Maintain and improve the winter-sports 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 to achieve these purposes include:

- Improve and increase beginner and intermediate ski terrain, lifts, and facilities to better respond to skier-market demand and to introduce and recruit new skiers to the sport.
- Expand the snowmaking system to enable an early November opening for ski race training, provide coverage to the upper mountain, and aid in fire suppression.
- Introduce high-quality guest service facilities to attract and retain local and destination skiers and serve as an event venue for Jackson residents and visitors.
- Provide access to a wide range of year-round activities catering to the variety of visitors and residents in the Town of Jackson.

The alternative descriptions in Chapter 2 provide additional detail on the need for individual elements of the alternatives.

DECISIONS TO BE MADE

In consideration of the stated purpose and need and the analysis of environmental effects documented in this EIS, the Responsible Official will review the proposed action and alternatives in order to make the following decisions:

- Whether to authorize the proposed action or an alternative, including the required no-action alternative, all or in part;
- What design criteria to require as a condition of the authorization; and

- What evaluation methods and documentation to require for monitoring project implementation and the effectiveness of design criteria.

RELATIONSHIP TO THE FOREST PLAN

A vision statement prepared by the Bridger-Teton summarizes management goals as follows: "The Bridger-Teton is home to world-class headwaters, wildlife, Wilderness, and wildlands. Providing for year-round recreation and sustainable uses, while conserving these values is our legacy."

As indicated in the Forest Plan (Forest Service 1990), Snow King falls within Forest Plan Management Area 41, Jackson Hole South, Desired Future Condition (DFC) 9B, Special Use Recreation Areas. A DFC 9B area is defined as:

> An area managed for permitted, private recreation homes, permittees, and others offering services to the public, including related roads and sites. Overall, you find many signs of people. But, you see little or no evidence of resource development other than recreation. Cabins and buildings used by permittees are visible but blend into the surroundings. Roads are generally graveled but may be paved in higher use areas. Off-highway vehicle use is limited to entry and departure routes. In some locations, you see extensive development associated with ski areas: hotels, buildings, ski lifts, gondolas, and snowcat equipment. In the winter, such areas are often quite crowded with roads clogged and many pedestrians in the area. (Forest Service 1990).

Within this context, the Forest Plan provides direction for management of lands in the Forest to sustain plant, wildlife, water, and soil conditions, contribute to community prosperity, and provide a diversity of recreation opportunities. Three relevant Forest Plan goals for DFC 9B are:

- 1.1(f) "Provide areas for alpine skiing and commercial ski and snowmobile operations,"
- 2.2(a) "retain, improve, and add developed sites," and
- 2.2(b) "design facilities for all ages and abilities."

All elements of the proposed action are within the DFC 9B boundary, are consistent with the Forest Plan management prescription for DFC 9B, and implement this Forest Plan direction.

PUBLIC INVOLVEMENT

On August 3, 2018, the Bridger-Teton issued a public scoping notice summarizing Snow King's proposed improvements project and inviting comments regarding the scope of the associated NEPA review. The projects included in the proposed action are included in Snow King's current master development plan, accepted by the Bridger-Teton.

Information regarding the scoping period and available materials for review was sent to the agencies, organizations, and individuals on the Bridger-Teton mailing list. The scoping notice was posted on the Bridger-Teton project website at https://www.fs.usda.gov/project/?project=54201 and made available on CD or in hard-copy form to anyone requesting it.

The scoping period formally began on August 3, 2018, when a Notice of Intent to Prepare an Environmental Impact Statement was published in the Federal Register (Vol. 83, No. 150, pp. 38117-38118). The scoping period was scheduled to close 30 days later on September 2, 2018. A correction to the project website address and extension of the scoping comment period to September 13, 2018, was published in the Federal Register on August 14, 2018 (Vol. 83, No. 157, pp. 40215-40216). A news release was circulated August 14, 2018, notifying the public of the comment period extension. On September 14, 2018, notice of a second extension of the scoping period was published in the Federal Register (Vol. 83, No. 179, p. 46701), allowing submittal of comments until October 4, 2018.

Comment letters were received from 10 agencies, 11 organizations, and 419 individuals. The scoping notice, comment letters, and scoping report are included in the project record. A scoping report and issues

summary were released publicly in the spring of 2019, and draft alternatives were released in the fall of 2019 in advance of the Draft EIS.

In accordance with agency regulations (36 CFR 215.6), the Bridger-Teton published a legal notice describing an opportunity to comment on the Draft EIS in the *Casper Star-Tribune* on January 31, 2020. The notice was also emailed to subscribers on the BTNF mailing list and posted on the Bridger-Teton website. Hard copies of the notice were made available by the Forest Service to those requesting a copy. A Notice of Availability of the Draft EIS was also published in the Federal Register on January 31, 2020, initiating a 45-day comment period, as stipulated in the agency's notice and comment regulations. On March 13, 2020, an amended notice was published in the Federal Register extending the comment period another 2 weeks, to March 31, 2020. This comment period also met pertinent public involvement requirements of the National Historic Preservation Act (36 CFR 800.6[a][4]).

Comments were received from 9 agencies, 33 organizations, and 388 individuals. A report was prepared, listing the comments received and providing Bridger-Teton responses to substantive comments considered by the Responsible Official. The response-to-comments document is included as Appendix A. The legal notice, comments, and other documentation are included in the project record.

ALTERNATIVES

NEPA requires that an EIS address a reasonable range of alternatives to the proposed action. An EIS must address the alternative of no action to provide a benchmark for comparison of the magnitude of environmental effects of the proposed action and action alternatives. Action alternatives should meet the stated purpose and need for action; avoid or reduce significant, adverse, environmental effects; and be technically and economically feasible.

Alternative 1 - No-Action Alternative

The no-action alternative is defined as continuation of current operation and maintenance activities on National Forest System lands at Snow King, with no further infrastructural development or operational changes.

Alternative 2 - Proposed Action

The elements of the proposed action are summarized above and described in detail in Chapter 2 of this EIS. It emphasizes improving recreational opportunities.

Alternative 3

This alternative was developed to address the following environmental concerns while still meeting the recreational-opportunity objectives of the proposed action:

- The recreational effects of locating the bottom terminals of the proposed gondola and zip line in Phil Baux Park.
- The effects of lift-served mountain bike access to the summit of Snow King Mountain on the recreational experience of hikers and bikers using the existing Cache Creek/Game Creek trail system.
- The effects of proposed improvements on the eligibility of Snow King's historic landscape for listing on the National Register of Historic Places.
- The Bridger-Teton's concerns regarding fire protection within with fuel management and fire protection at the wildland/urban interface.
- The impact on skier safety of an additional road–the proposed summit access road/novice skiway–crossing the front-side ski runs.
- The impact on big game winter habitat on the back side of Snow King Mountain.

- The visual effect of additional infrastructure on the already highly developed front side of Snow King Mountain.
- The quality and sustainability of proposed Bearcat Glades hiking trail in terms of alignment, maintenance, and erosion control.
- The noise the proposed zip line might generate at the base area.

In response to these concerns, Alternative 3 alters elements under the headings of boundary adjustment, lifts, facilities, and summer activities relative to Alternative 2, as described in Chapter 2 of the EIS. Terrain development, summit access road/novice skiway, night skiing, and snowmaking coverage would remain the same as Alternative 2.

Alternative 4

This alternative was initially developed to emphasize resource protection rather than full achievement of the recreational opportunity objectives of the proposed action. As described in the Draft EIS, it addressed more aggressively the concerns driving Alternative 3, particularly impacts on Snow King's historic landscape and the existing Cache Creek/Game Creek trail system and its users. This alternative also responded to the following, additional concerns identified through scoping, community input, and internal, interdisciplinary review:

- The impact and sustainability of proposed biking trails on the front side in terms of location, maintenance, and erosion control.
- The effects of development in the eastern boundary adjustment area and associated infrastructure and use on goshawk habitat.

As modified in this Final EIS, Alternative 4 maintains its initial focus, but it reflects these additional inputs: the outcome of consultation on the historic landscape regarding the effect of new ski runs; ongoing concern expressed in comments on the Draft EIS regarding management of lift-served mountain biking, protection of specialized elk and deer habitat in Leeks Canyon, and Cougar lift removal; new data on goshawk habitat use; and public interest in eBiking opportunities.

In response to these concerns, Alternative 4 alters specific elements under the headings of terrain development, lifts, snowmaking coverage, and summer activities relative to Alternative 3, as described below. Boundary adjustment, summit access road/novice skiway, facilities, and night skiing would remain the same as Alternative 3.

COMPARISON OF ENVIRONMENTAL EFFECTS

Table S-1 summarizes and compares the direct and indirect environmental effects of the proposed action and alternatives. The full, in-depth analysis that this summary is based on is provided in EIS Chapter 3.

Table S-1. Summary and comparison of environmental effects.

Issue	Alternative 1 No Action	Alternative 2	Alternative 3	Alternative 4
Climate Change and Snow Quality				
Issue 1: How would climate change affect snow quantity and the long-term operation of the proposed infrastructure and uses?	No change in snowmaking (90 acres) or summer recreation opportunities. Winter recreational use and the long-term operation of Snow King would remain vulnerable to the effects of climate change.	Snowmaking system coverage would increase by 147.7 acres, for a total of 237.1 acres, and additional summer recreational opportunities including mountain bike and hiking trails, a zip line, a summer scenic lift rides to the summit, would be provided. These changes would effectively offset the impact of reduced snowfall due to climate change on Snow King's winter recreational use and long-term operation.	Same as Alternative 2.	This alternative would be slightly less effective in offsetting the impact of reduced snowfall on Snow King's winter recreational use and long-term operation. Snowmaking coverage would increase by the same amount. The front-side mountain bike system would be shorter. Adaptive management could limit the mountain-bike program's contribution to summer recreation as an offset to climate change.
Air Quality				
Issue 1: How would construction and use of the proposed infrastructure affect protected airsheds around the project area?	No notable change in Snow King's impact on visibility or particulate concentrations in Teton National Park or other area Class I airsheds.	A temporary increase in emissions and dust would occur during construction due to grading and excavation (68.1 acres). Glading would increase by 32.7 acres, with associated slash burning. With the design criteria identified through this analysis in place, Alternative 2 is unlikely to have a discernible effect on visibility or particulate concentrations in Grand Teton National Park or other Class I airsheds in the area.	Same as Alternative 2 but with 4.6 acres less excavation and grading and 154.2 acres of additional thinning and associated slash burning. However: there is a wide margin between current visibility and particulate ratings; slash burning is a minor contributor of particulates; burning would comply with Wyoming Air Quality Division Smoke Management Program requirements; and burning would take place in late fall, when air quality is good. Based	Grading and excavation would decrease by 0.2 acres relative to Alternative 3. This minor change would not alter the conclusion drawn under Alternative 3.

Table S-1 (cont'd). Summary and comparison of environmental effects.

Issue	Alternative 1 No Action	Alternative 2	Alternative 3	Alternative 4
			on these considerations, slash burning could be increased substantially without causing a poor visibility rating in the Park or exceeding Wyoming or national particulate standards in Class I airsheds.	
Issue 2: How would the proposed increase in snowmaking system coverage affect the "snowmaking cloud" that impacts the neighborhood around the base area?	No change from current snowmaking practices. The frequency and duration of snow cloud formation would remain unchanged.	Some increase in the frequency and duration of snowmaking cloud formation would result from increased water use. However, most of the increase in snowmaking coverage would be at higher elevations where wind would dissipate the cloud or on the back side where the cloud would not affect Jackson.	Same as Alternative 2.	Same as Alternatives 2 and 3. Minor changes in the location of snowmaking system additions would not alter the conclusion drawn under Alternative 2.
Water, Soils, and Watershed				
Issue 1: How would the proposed increase in snowmaking and clearing of ski runs affect surface runoff, and groundwater recharge?	No change from current conditions in terms of snowmaking (90 acres) or run clearing (135.6 acres). Surface runoff currently does not leave the ski area boundary but infiltrates to groundwater.	Snowmaking system coverage would increase by 147.7 acres and cleared ski terrain would increase by 117.8 acres. Snowmaking system coverage would not necessarily correspond to a proportional increase in water. Any change in snowmelt runoff, infiltration, and groundwater recharge would remain within the current range of variability in volumes and rates.	Same as Alternative 2.	Slightly less snowmaking system coverage would be added (0.5 acres less than Alternatives 2 and 3), and minor changes in run clearing would occur. These changes would not alter the conclusion drawn under Alternative 2.

Table S-1 (cont'd). Summary and comparison of environmental effects.

Issue	Alternative 1 No Action	Alternative 2	Alternative 3	Alternative 4
Issue 2: How would the ground disturbance associated with construction and use of the proposed infrastructure affect soil erosion and slope stability?	No change from current infrastructure. Erosion would continue at existing rates, and conditions that influence soil erosion and slope stability would remain unchanged.	Temporary erosion and stability impacts could occur during and immediately following construction within the 144.5-acre disturbance area. Of the 31 separate project elements, 13 would have a high erosion/sedimentation risk rating before BMPs were applied, and 13 would have a moderate risk rating. With BMPs in place, risk ratings for all project elements would fall to low, and no measurable long-term change in erosion, sediment transport, or slope stability would result.	Disturbance area would increase by up to 154 acres relative to Alternative 2, due to forest stand thinning. Of 32 project elements, up to 15 would have high risk ratings before BMPs were applied, and up to 14 would have moderate ratings. These changes would not alter the conclusion drawn under Alternative 2.	Disturbance acreage would increase 3.6 acres relative to Alternative 3, but there would be no change in project element risk ratings compared to Alternatives 2 and 3. These changes would not alter the conclusion drawn under Alternative 2.
Issue 3: How would construction and use of the proposed infrastructure affect impaired water bodies in the area?	No change from current water quality conditions in Cache Creek or Flat Creek would occur.	Construction activities would result in disturbance and short-term opportunities for erosion and surface runoff. Due to the distance between proposed disturbance and creek channels, the BMPs that would be in place, and the naturally high filtration rates, no long-term or short-term impacts on water quality in Cache Creek or Flat Creek would occur.	Same as Alternative 2. Alteration of disturbance acreage would not affect the conclusion drawn under Alternative 2. See Issue 2 above.	Same as Alternatives 2 and 3. Alteration of disturbance acreage would not affect the conclusion drawn under Alternative 2. See Issue 2 above.

Table S-1 (cont'd). Summary and comparison of environmental effects.

Issue	Alternative 1 No Action	Alternative 2	Alternative 3	Alternative 4
Vegetation				
Issue 1: How would construction and use of the proposed infrastructure affect the introduction and spread of noxious weeds?	No change from current noxious weed conditions. Seventeen noxious weed species have been reported within or adjacent to the ski area boundary. The ski area would continue to treat existing and new weed infestations, consistent with the terms of their vegetation management plan.	This alternative would result in 80.4 acres of glading and clearing, with limited potential to increase weed introduction or spread, and 64.1 acres of grading and excavation, with higher potential to create conditions favorable to weeds due to high levels of soil disturbance and equipment operation. Recreational use during the spring, summer, and fall months would increase, potentially expanding this vector for the spread of weeds. Implementation of the integrated weed management program identified as a design criterion in this analysis should preclude any substantial increase in weed introduction and spread.	Glading and clearing acreage would increase by up to 154.6 acres due mostly to stand thinning, and grading and excavation would decrease by up to 0.6 acre. Increased efforts to obliterate unnecessary roads and trails would help concentrate increased recreational use on established routes. These changes would not alter the conclusion drawn under Alternative 2.	Gladed and cleared acreage would increase by 3.4 acres relative to Alternative 3, and grading and excavation would increase by 0.2 acres. Decreasing the extent of front-side bike trails would reduce the potential for weed introduction and spread through recreational use. Overall, relative to Alternatives 2 and 3, this alternative would have similar potential for the introduction and spread of noxious weeds.

Table S-1 (cont'd). Summary and comparison of environmental effects.

Issue	Alternative 1 No Action	Alternative 2	Alternative 3	Alternative 4
Wildlife				
Issue 1: How would construction and use of the proposed infrastructure affect special-status wildlife species?	Since there would be no change from current habitat and disturbance conditions under this alternative, there would be no change in Snow King's effect on threatened and endangered species, Forest Service sensitive species, migratory birds, or specialized habitats.	Alternative 2: - Has the potential to negatively impact 122 acres of suitable Canada lynx habitat but is consistent with the *Northern Rockies Lynx Management Direction* and its amendment to the Forest Plan. - Would have no impact on the grizzly bear, wolverine, bald eagle and peregrine falcon. - May impact individuals but is not likely to result in a measurable impact on bighorn sheep population numbers. - May impact individuals but is not likely to cause a trend toward federal listing or loss of viability for: fisher, spotted bat, Townsend's western big-eared bat, boreal owl, flammulated owl, great gray owl, northern goshawk, and three-toed woodpecker. - May impact migratory birds but not substantially given design criteria and the large amount of alternative habitat available.	Relative to Alternative 2: - Disturbance of suitable lynx habitat would increase to 261 acres, but the determination would remain the same. - The amount of forested habitat impacted would increase from 93 acres under Alternative 2 to 230 acres, but the determinations for the fisher, boreal owl, flammulated owl, great grey owl, and northern goshawk would remain the same. - Impacts on bighorn sheep, spotted bat, Townsend's western big-eared bat, bald eagle, peregrine falcon, three-toed woodpecker, and migratory birds would be the same.	Relative to Alternative 3: - Disturbance of suitable lynx habitat would increase slightly to 264 acres, but the determination would remain the same. - The amount of forested habitat impacted would increase slightly to 234 acres, but the determinations for the Fisher, boreal owl, flammulated owl, great grey owl, and northern goshawk would remain the same. - Impacts on migratory birds would be the same.

Table S-1 (cont'd). Summary and comparison of environmental effects.

Issue	Alternative 1 No Action	Alternative 2	Alternative 3	Alternative 4
Issue 2: How would construction and use of the proposed infrastructure affect elk or mule deer winter use?	No change from current elk or mule deer winter habitat conditions would occur, as there would be no back-side development.	No designated winter or parturition range for elk or mule deer would be directly affected, with exception of the lightly used northeast corner of the permit area on the front side. Localized displacement of elk and mule deer in and around the project area due to disturbance from expanded recreation would occur but would not result in a measurable impact on population numbers due to the abundant surrounding habitat, relatively low levels of habitat loss, and low level of current use in both the ski area permit boundary and its zone of visual influence.	Shifting the southern boundary of the western boundary adjustment up to the ridgeline above Leeks Canyon would provide minor benefit to wintering, but the conclusion drawn for Alternative 2 would remain the same.	The changes in infrastructural development and use under this alternative would not alter the effects on winter elk and deer use described under Alternative 2.
Cultural				
Issue 1: How would construction and use of the proposed infrastructure affect Snow King's historic landscape?	The remaining resources contributing to the eligibility of Snow King's historic landscape would be unaffected.	Fourteen of the 15 remaining contributing resources would be adversely affected: the 12 historic ski runs by modification and/or alteration of their visual signature through construction of intermingled new runs, and the Panorama House and unloading platform/observation deck by removal. The CCC Summit Shelter would not be affected. Consultation under Section 106 of the Historic Preservation Act resulted in stipulations to mitigate adverse effects on the historic landscape.	Impacts on contributing resources would be the same as under Alternative 2, but Snow King would develop an interpretive program focusing on the history of the ski area to offset these adverse effects.	Impacts on contributing resources would be the same as under Alternatives 2 and 3, except for the 12 historic ski runs. Most of the proposed new ski runs in and adjacent to the historic landscape would be eliminated to protect the visual integrity of the historic runs.

Table S-1 (cont'd). Summary and comparison of environmental effects.

Issue	Alternative 1 No Action	Alternative 2	Alternative 3	Alternative 4
Issue 2: How would construction and use of the proposed infrastructure affect Traditional Cultural Places or other Native American tribal resources?	No change from current effects on Native American concerns would occur.	Tribal consultation identified no Native American concerns, and no significant Native American sites have been identified within the project area. As a result, no impacts on this resource are anticipated under this alternative. Design criteria would protect any undiscovered heritage resources or sites encountered during construction. Stipulations from the July 2020 Memorandum of Agreement resulting from consultation under Section 106 of the National Historical Preservation Act would be in force under this or any action alternative authorized.	Same as Alternative 2.	Same as Alternatives 2 and 3.
Land Use				
Issue 1: How would construction and use of the proposed infrastructure affect grazing?	No back-side development would occur, so impact on the Leeks Canyon grazing allotment would not change and utilization rates would be unchanged.	A minor reduction in forage availability and some disturbance or displacement of livestock would occur within the ski area boundary. Beyond the ski area boundary, mountain bike traffic down Leeks Canyon Road could increase, potentially disturbing and displacing horses in lower portion of the canyon. However, additional use would be limited due to steepness of road and the private property boundary near the bottom. The allotment is of sufficient size to ensure adequate amounts of forage for the number of livestock involved, even if some displacement of animals	Mountain bikers would be restricted to the dedicated downhill mountain bike trail system, precluding any new impact on livestock in lower Leeks Canyon. Otherwise, impacts would be the same as under Alternative 2. Compared to Alternative 2, potential effects on utilization rates outside the ski area would be reduced.	Adaptive management of the mountain bike program would initially allow bikers to use lower Leeks Canyon road, potentially impacting livestock or livestock management. However, this impact would be addressed in development of annual operating plans, resulting in effects similar to Alternative 3.

Table S-1 (cont'd). Summary and comparison of environmental effects.

Issue	Alternative 1 No Action	Alternative 2	Alternative 3	Alternative 4
		occurred. Increased levels of utilization could occur in some areas of the allotment, but annual standards would be met.		
Noise				
Issue 1: How would construction and use of the proposed infrastructure affect noise levels around the ski area?	No change from current noise levels would occur. Avalanche explosive use may temporarily exceed the Town of Jackson's 65 dBa property-line noise limit (used as a threshold in this analysis though the ordinance does not apply to National Forest System land).	A short-term increase in equipment noise during construction and a long-term increase in noise due to increased avalanche control explosives, mechanical noise from the zip line trolley, and zip line rider noise would occur. All new snowmaking would be higher on the mountain than current activities and would generally not lead to increased noise. Helicopter staging on private land during gondola construction, if authorized by the Town of Jackson, may temporarily exceed 65 dBa.	Moving the bottom zip line terminal to the Rafferty mid-station would reduce noise at Phil Baux Park. Otherwise, noise impacts would be similar to Alternative 2.	The addition of run 15 would result in an increase in temporary construction noise, including chainsaw operations, and long-term noise due to snowmaking within 200 feet of homes adjacent to the ski area. Both noise sources would be substantially reduced by distance and vegetation screening. It is unlikely the Town of Jackson noise standard would be exceeded by these activities. Otherwise, noise impacts would be the same as outlined under Alternative 3.
Recreation				
Issue 1: How would the proposed ski terrain development affect Snow King's terrain mix?	The current terrain mix would be unchanged, limiting Snow King's ability to meet the needs of the broader skier market and bring new skiers into the sport.	An additional 117.8 acres of new ski terrain, including 39.8 acres of beginner, novice, and low intermediate and 20.8 acres of intermediate terrain. Terrain mix would remain heavily skewed toward advanced and expert terrain but would be substantially closer to the skier	Same as Alternative 2.	The effects would closely match Alternatives 2 and 3.

Table S-1 (cont'd). Summary and comparison of environmental effects.

Issue	Alternative 1 No Action	Alternative 2	Alternative 3	Alternative 4
		market profile and provide a better progression in terrain for lower skier ability levels.		
Issue 2: How would the proposed summit access road/novice skiway affect existing ski runs?	Current ski run conditions would not change because no new ski runs or skiways would be constructed. Upper mountain runs would cross skiways nine times.	The number of skiway crossings would increase to 15, reflecting the new summit access road/novice skiway and construction of new front-side runs. However, skiway crossings are a common and manageable issue at ski areas. The impact on skier flow would vary by run.	Obliteration of more existing skiways would eliminate six crossings of existing runs and bring the net number of crossings to five. That would be a notable improvement in skier flow over existing conditions. Nine total skiway crossings.	Retaining Slow Trail would maintain three crossings of existing runs relative to Alternative 3. For new trails, run 2 may merge onto run 4, creating a new crossing of the summit access road/novice skiway. Eliminating run 11 would reduce crossings by one, resulting in a total of 12.
Issue 3: How would the proposed downhill mountain bike trails and zone affect the existing Cache Creek/Game Creek trail system and its users?	No change from current use of the Cache Creek/Game Creek trail system (about 1,526 people per day during summer peak) beyond the 1–3% annual increase associated with population growth in Jackson.	Lift-served mountain bike access to the summit is projected to result in an estimated increase of 58 cyclists daily in the number of trail system users, but a major shift in use patterns. Higher-elevation, more distant trails would be much more accessible to mountain bikers, resulting in roughly two to four times more use on trails such as Skyline, Ferrin's, Wilson Canyon, and Josie's Ridge. This could increase user conflicts, trail damage, and resource impacts. Traffic on currently heavily used lower trail segments would be correspondingly reduced, decreasing crowding and trail damage. These effects may remain consistent with the Roaded Natural Recreational Opportunity Spectrum classification,	A combination of rider information, trail design, enforcement, and changes to allowed use of existing trails (closure of upper Skyline and Josie's ridge to bicycles) that would be employed under this alternative to restrict lift-served bike use to the dedicated downhill trail system and mountain bike zone. This should preclude notable adverse effects on the Cache Creek/Game Creek trail system and its users described under Alternative 2.	An adaptive approach to developing and operating the downhill mountain bike program would be implemented, making all of the management options included in Alternatives 1–3 available to be applied as appropriate through annual operating plans based on monitoring. The front-side downhill mountain bike trail system would be shifted largely to the Rafferty area and downsized in terms of trail miles and ability level. Overall, this alternative is projected to be more effective in protecting the

Table S-1 (cont'd). Summary and comparison of environmental effects.

Issue	Alternative 1 No Action	Alternative 2	Alternative 3	Alternative 4
		but they could degrade the recreational opportunity provided by the Cache Creek/Game Creek trail system.		Cache Creek/Game Creek trail system and users than Alternative 3, mostly due to its flexibility in matching management options to observed issues to efficiently avoid adverse direct and indirect effects.
Issue 4: How would the proposed Summit gondola and zip line affect users of Phil Baux Park?	Recreational opportunities for park users would remain unaltered.	Construction of the gondola and zip line bottom terminals would result in the loss of the Phil Baux Park parking lot and a change in the recreational opportunities it currently provides. Open green space available for recreational activities would increase.	No new infrastructure would be sited in Phil Baux Park. The gondola bottom terminal would be located nearby but far enough away to maintain the park's current recreational opportunities. The parking lot would remain intact.	Effects would be the same as outlined under Alternative 3.
Safety				
Issue 1: How would the proposed mountain bike trails and mountain bike zone affect the safety of other summer visitors?	The safety of other summer visitors would not change because there would be no development of additional mountain bike trails under this alternative.	Use of trails within the Snow King boundary would increase, with most of this increase occurring on the new downhill mountain bike trails. A combination of design criteria requiring adequate sight lines around intersections, signage warning users of both trails that they were approaching an intersection, features designed to slow riders on the downhill trails, and bridges or underpasses where necessary would preclude any substantial change in safety risk.	Same as Alternative 2.	The number of trail crossings would be reduced relative to Alternatives 2 and 3, reducing impacts marginally. Otherwise, changes in visitor safety would be similar.

Table S-1 (cont'd). Summary and comparison of environmental effects.

Issue	Alternative 1 No Action	Alternative 2	Alternative 3	Alternative 4
Issue 2: How would the proposed summit access road/novice skiway affect skier safety?	The summit access road/ novice skiway would not be constructed, so there would be no change in skier safety.	The risk of beginner skiers without adequate skills using the summit access road/novice skiway would be reduced by design of the teaching center terrain and the skiway and by signage. The risk posed for skiers crossing the summit access road/novice skiway is discussed above under Recreation Issue 2. Neither risk is unique to Snow King or this alternative, and neither presents safety hazards beyond the industry norm, with standard safety practices in place.	Same as Alternative 2.	Same as Alternatives 2 and 3.
Issue 3: How would the proposed ski run clearing and summit access road/novice skiway affect avalanche hazard?	No additional ski runs would be developed, so there would be no change from current avalanche hazard conditions. Avalanche risk is generally low due to low elevation and low average snowfall, even though the slopes are generally steep. Some small wet-slide avalanches have occurred. Over the long term, climate change may cause conditions.	The increase in skiable terrain where avalanches could occur in proximity to in-bounds skiers would result in a slight increase in avalanche hazard. All new terrain would be subject to Snow King's standard avalanche hazard reduction practices in place. New avalanche starting zones would be at least 1,500 feet away from any structures below the ski area, an unprecedented movement distance for an avalanche at Snow King.	Marginal decrease in risk associated with unsupported slabs forming above skiways, due to obliteration of the Slow and Fast Trail skiways. Otherwise same as Alternative 2.	Retention of Slow Trail would slightly increase risk associated with unsupported slabs forming above skiways. Otherwise same as Alternative 3.

Table S-1 (cont'd). Summary and comparison of environmental effects.

Issue	Alternative 1 No Action	Alternative 2	Alternative 3	Alternative 4
Scenery				
Issue 1: How would the proposed infrastructure affect the scenic quality of Snow King Mountain?	The existing landscape would not change. Snow King would continue to appear as a small ski area, adjacent to a town, consistent with the visual quality objectives (VQOs) of modification and partial retention assigned by the Forest Plan.	New ski runs would occupy substantially more of the Snow King landscape, but with prescribed design criteria would maintain compliance with VQOs. The proposed buildings would comply with the Forest Service Built Environment Image Guide and Jackson/Teton County Comprehensive Plan direction regarding skyline construction.	Forest stand thinning, removal of Cougar lift, realignment of the Summit gondola and zip line, and other minor changes under this alternative would not alter the conclusions drawn for Alternative 2.	Elimination of several proposed runs in the central part of the ski area and the addition of runs to the east and west would disperse ski terrain expansion across a wider area and retain more of the existing character in the central portion of the front side most visible from Jackson. Otherwise, the same conclusions drawn for Alternative 2 and 3 would hold.
Issue 2: How would the proposed lighting for night skiing and operation of summit facilities affect the nighttime view and dark sky?	The current night lighting situation would not change, except for planned night lighting development on Lower Elk.	This alternative would result in an increase in light sources, area illuminated, and possibly extend hours of illumination in the ski area. New lighting sources would employ dark sky designs and operating practices to minimize visual impact while complying with Jackson/Teton County Comprehensive Plan direction.	Same as Alternative 2.	Same as Alternatives 2 and 3.

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ABAAS	Architectural Barriers Act Accessibility Standard
ADA	Americans with Disabilities Act of 1990
BA	biological assessment
BEIG	The Built Environment Image Guide for the National Forests and Grasslands
BMP	best management practices
Bridger-Teton	Bridger-Teton National Forest
CCC	Civilian Conservation Corps
CDA	connected disturbed area
CWPP	Community Wildfire Protection Plan
dBa	A-weighted decibels
DFC	desired future conditions
EIS	environmental impact statement
EVC	existing visual conditions
Forest Plan	Bridger-Teton National Forest Land and Resource Management Plan
GPM	gallons-per-minute
LAU	Lynx Analysis Unit
MDP	master development plan
MOU	memorandum of understanding
NEPA	National Environmental Policy Act of 1969
NHD	National Hydrography Dataset
NOI	Notice of Intent to Prepare an Environmental Impact Statement
NRCS	National Resources Conservation Service
NRLMD	Northern Rockies Lynx Management Direction
NWI	National Wetlands Inventory
Permit	special use permit
pph	person-per-hour
ROD	Record of Decision
SNOTEL	snowpack telemetry
Snow King	Snow King Mountain Resort
SWPPP	Storm Water Pollution Prevention Plan
UFAS	Uniform Federal Accessibility Standards
USDA Forest Service	United States Department of Agriculture, Forest Service
Vegetation Management Plan	2015 Snow King Mountain Resort Vegetation Management Plan
VQO	Visual Quality Objectives
WDEQ	Wyoming Department of Environmental Quality
WPDES	Wyoming Pollutant Discharge Elimination System

CHAPTER 1: PURPOSE AND NEED

1.1 INTRODUCTION

On June 5, 2018, the Bridger-Teton National Forest (Bridger-Teton) received a proposal from Snow King Mountain Resort (Snow King), requesting authorization to implement specific elements of their current master development plan (MDP). The MDP analyzes current conditions at the resort and, based on that analysis, outlines anticipated development and management of the resort over the next 10 years. The MDP is intended to enhance the year-round recreational opportunities available at the resort and on the Bridger-Teton. It is the result of a collaborative, multi-year process involving input from Snow King, the Bridger-Teton, the Town of Jackson, Teton County, the Snow King Mountain Stakeholder Group, and members of the public.

Snow King is located in the Gros Ventre mountain range adjacent to Jackson, Wyoming (Figure 1-1), in Teton County, T41N, R116W, Sections 33 and 34, and T40N R116W, Sections 3 and 4. The resort operates under a special use permit (permit) issued by the USDA Forest Service (Forest Service) and administered by the Bridger-Teton. The operational ski area is approximately two-thirds on National Forest System land and one-third on Town of Jackson land or private property.

The *Bridger-Teton National Forest Land and Resource Management Plan*, as amended (hereafter referred to as the Forest Plan; Forest Service 1990), provides primary guidance for management of Bridger-Teton resources, including those within the ski area. This environmental impact statement (EIS) is tiered to the Forest Plan, and the Forest Plan and associated EIS are incorporated by reference.

Under the terms of the *National Forest Ski Area Permit Act of 1986*, development and operation of ski areas on National Forest System lands is guided by MDPs, which describe existing conditions; identify physical, environmental, and socio-economic opportunities and constraints; establish the permittee's conceptual vision for the ski area; and outline near-to-long-term plans for achieving that vision. As a condition of permit issuance, the Forest Service must review and accept, modify, or reject a ski area's MDP. MDPs are intended to be dynamic documents, amended or revised periodically to reflect changes in operational opportunities and constraints, recreation-market demands, or agency management requirements.

One component of an MDP is planned development of the ski area's physical infrastructure. When a ski area decides to move ahead with specific development that involves National Forest System land, the permittee submits a proposal to the Forest Service describing those elements of the MDP. Implementation of the MDP is generally divided into phases, each addressing elements to be implemented within roughly the next 5 years. The Forest Service then evaluates the proposal, on the basis of established screening criteria, and initiates our decision-making process, including seeking public comments on the proposal and analyzing and disclosing the environmental impacts, in accordance with the *National Environmental Policy Act of 1969* (NEPA).

Snow King's current proposal is to implement elements of the ski area's 2017 MDP, as amended. As Snow King operates partially on National Forest System land, some of the proposed infrastructural improvements require Forest Service approval prior to implementation. These improvements on National Forest System lands (hereafter referred to as the proposed action or Alternative 2) have the potential to impact the human environment and therefore are reviewed in this EIS. Based on this EIS and associated documentation, the Responsible Official will determine whether, and under what conditions, the Forest Service will authorize this proposed action or an alternative, all or in part (see Chapter 2). Teton County and the Town of Jackson are cooperating agencies in this EIS process, in accordance with 40 CFR 1501.6.

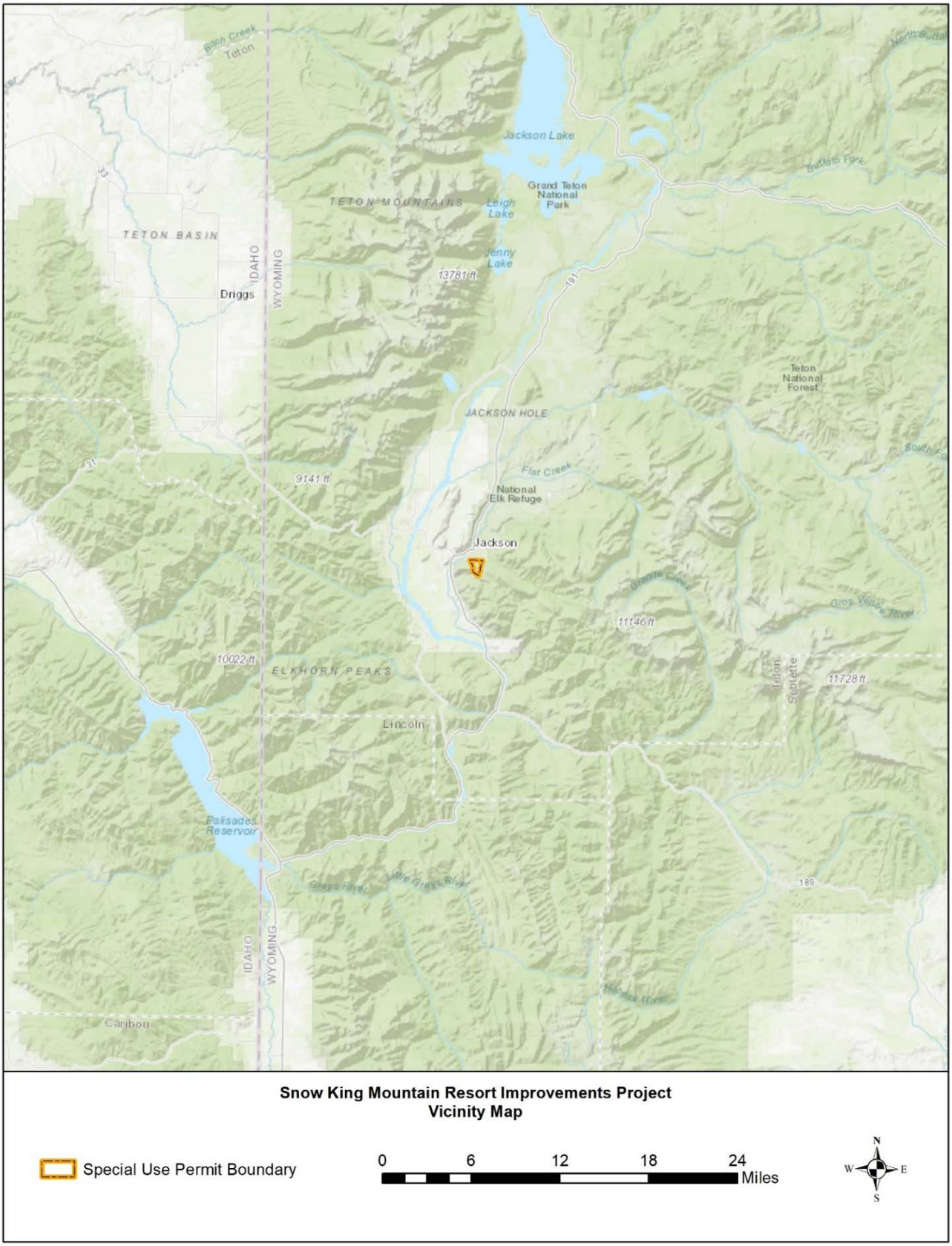

Figure 1-1. Snow King Mountain Resort improvements project vicinity map.

1.2 ORGANIZATION OF DOCUMENT

The Bridger-Teton has prepared this EIS in accordance with NEPA and Forest Service regulations regarding its implementation (36 CFR Part 220). The document is organized as follows:

Chapter 1 – Purpose and Need. This chapter introduces the proposed action and the EIS process. Specifically, it:

- Summarizes the proposed action.
- Outlines the purpose of and need for action.
- Identifies the decisions to be made on the basis of this EIS.
- Discusses the relationship of the proposed action to the Forest Plan.
- Describes the scoping process and the environmental issues addressed in this EIS and those considered but not carried into in-depth analysis.
- Discusses the project record.
- Notes other permits and authorizations that may be required.

Chapter 2 – Proposed Action and Alternatives. This chapter outlines the alternative development process, describes in detail the alternatives carried into in-depth analysis, lists associated design criteria, identifies alternatives considered but not analyzed in depth, then summarizes and compares the environmental impacts of the alternatives analyzed in depth.

Chapter 3 – Affected Environment and Environmental Consequences. This chapter documents the environmental impact analysis. It is organized by resource category, and each resource section begins with the issues addressed, as identified through public scoping and internal, interdisciplinary review. The affected environment is described next to provide context for the discussion of environmental consequences that follows. The direct, indirect, and cumulative effects of the no-action alternative (the analysis baseline), proposed action, and the action alternative are outlined in that order. The section concludes with discussion of other required disclosures.

Chapter 4 – Consultation and Coordination. This chapter describes the public input the agencies and other entities consulted during the development of this EIS.

Chapter 5 – List of Preparers. This chapter identifies the Bridger-Teton and contractor personnel involved in preparation of this EIS.

Chapter 6 – References. This chapter contains an alphabetized list of the documents referenced in this EIS.

Additional documentation is available in the project record available at the Jackson Ranger District Office in Jackson, WY. (See section 1.8 below.)

1.3 PROPOSED ACTION

Snow King's current MDP, *Snow King Mountain 2017 Master Development Plan* (SE Group 2017), was accepted by the Bridger-Teton in March 2018 and subsequently amended in June 2018. The infrastructural improvements on National Forest System lands included in the MDP have the potential to impact National Forest resources, and Bridger-Teton authorization is required for their implementation. These improvements, described in detail in section 2.4, comprise the proposed action addressed in this EIS. They can be summarized as follows:

Permit Boundary Adjustment

- 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.

Terrain Development

- A new ski school/teaching center with beginner and novice terrain on the ridgeline west of the Snow King summit.
- New ski runs on both the front and back side and adjustments to some existing runs totaling 117.8 acres of new terrain. Includes runs 3–14, 16–25, Lift B and C terrain, and modifications of Moose, Belly Roll, Upper Exhibition, and Bearcat.
- Gladed ski terrain and forest health maintenance totaling about 35 acres.

Summit Access Road/Novice Skiway

- A new roughly 2-mile access road from the base area to the top of the summit gondola that would also serve as a novice skiway.

Lifts

- A new gondola replacing the aging Summit lift.
- A new back-side chairlift.
- Two teaching center conveyor lifts.
- A new surface tow or conveyor lift on the back side bringing skiers to the summit.

Facilities

- Summit restaurant/guest services building and ski patrol facility, 20,000–25,000 square-feet. Construction would require removal of the existing Panorama House and the unloading dock of the original Summit lift.
- A 500-square-foot observatory near the summit.
- A temporary ski patrol building at the top of Cougar.
- A year-round yurt camp at the southern point of the permit area, with nine yurts 20-30 feet in diameter and a 1-mile ADA-compliant access trail from the summit.
- A small, open-air wedding venue west of the summit building.

Night Skiing

- 27.3 acres of expanded lighting for night skiing.

Snowmaking Coverage

- 147.7 acres of added snowmaking (with few exceptions, all existing and proposed runs).

Summer Activities

- A 3,900-linear-foot zip line from the summit to the west base area, paralleling the Summit lift.
- About 6.5 miles of front-side mountain bike trails and a 110-acre back-side mountain bike zone with a skills park and trails of various difficulty levels. Detailed plans for this zone have not been developed.
- Hiking trails between the summit and the west base, west of Exhibition run, including an improved 0.6-mile Stairway trail and a 1.5-mile trail in the Bearcat Glades area.

- Obliteration of 1.1 miles of existing service roads made unnecessary by the proposed summit access road/novice skiway and user-created trails.

Comfortable carrying capacity would increase to 2,620.

1.4 PURPOSE AND NEED

Management considerations at three levels underlie the purpose and need for the proposed action. At the national level, 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. Responding to this trend is consistent with our 2012 *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. 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.

At the Forest level, the Bridger-Teton 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."

At the level of the ski area itself, Snow King has been in operation for over 80 years. Locally known as the "Town Hill," it is an integral part of the community. That said, two ongoing constraints limit the ski area's ability to move ahead in accordance with the national and Forest-level direction cited above. First, ski terrain within the current operating boundary is extremely steep. This meets the needs of expert skiers and race-training programs but does not fit the ability-level profile of the broader skier market. There are few options for beginner, novice, and low intermediate skiers within the current ski area boundary at Snow King due to the topography of the site.

Second, while Snow King has developed several summer recreation activities on private and National Forest System land at the base area and around the Rafferty lift mid-station, the upper slopes have been developed mostly for skiers. Aside from a few hiking and biking trails, there is little infrastructure for summer recreation.

Beyond these two constraints, the on-mountain facilities and infrastructure at Snow King are in need of replacement and/or upgrades.

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

- Maintain and improve the winter-sports 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 to achieve these purposes include:

- Improve and increase beginner and intermediate ski terrain, lifts, and facilities to better respond to skier-market demand and to introduce and recruit new skiers to the sport.
- Expand the snowmaking system to enable an early November opening for ski race training, provide coverage to the upper mountain, and aid in fire suppression.

- Introduce high-quality guest service facilities to attract and retain local and destination skiers and serve as an event venue for Jackson residents and visitors.
- Provide access to a wide range of year-round activities catering to the variety of visitors and residents in the Town of Jackson.

The alternative descriptions in Chapter 2 provide additional detail on the need for individual elements of the alternatives.

1.5 DECISIONS TO BE MADE

In consideration of the stated purpose and need and the analysis of environmental effects documented in this EIS, the Responsible Official will review the proposed action and alternatives in order to make the following decisions:

- Whether to authorize the proposed action or an alternative, including the required no-action alternative, all or in part;
- What design criteria to require as a condition of the authorization; and
- What evaluation methods and documentation to require for monitoring project implementation and the effectiveness of design criteria.

The Responsible Official will document her decision and rationale in a Record of Decision (ROD). The Responsible Official is Tricia O'Connor, the Bridger-Teton Forest Supervisor.

1.6 RELATIONSHIP TO THE FOREST PLAN

A vision statement prepared by the Bridger-Teton summarizes management goals as follows: “The Bridger-Teton is home to world-class headwaters, wildlife, Wilderness, and wildlands. Providing for year-round recreation and sustainable uses, while conserving these values is our legacy.”

As indicated in the Forest Plan (Forest Service 1990), Snow King falls within Forest Plan Management Area 41, Jackson Hole South, Desired Future Condition (DFC) 9B, Special Use Recreation Areas (Figure 1-2). A DFC 9B area is defined as:

> An area managed for permitted, private recreation homes, permittees, and others offering services to the public, including related roads and sites. Overall, you find many signs of people. But, you see little or no evidence of resource development other than recreation. Cabins and buildings used by permittees are visible but blend into the surroundings. Roads are generally graveled, but may be paved in higher use areas. Off-highway vehicle use is limited to entry and departure routes. In some locations, you see extensive development associated with ski areas: hotels, buildings, ski lifts, gondolas, and snowcat equipment. In the winter, such areas are often quite crowded with roads clogged and many pedestrians in the area. (Forest Service 1990).

Within this context, the Forest Plan provides direction for management of lands in the Forest to sustain plant, wildlife, water, and soil conditions, contribute to community prosperity, and provide a diversity of recreation opportunities. Three relevant Forest Plan goals for DFC 9B are:

- 1.1(f) “Provide areas for alpine skiing and commercial ski and snowmobile operations,”
- 2.2(a) “retain, improve, and add developed sites,” and
- 2.2(b) “design facilities for all ages and abilities.”

All elements of the proposed action are within the DFC 9B boundary, are consistent with the Forest Plan management prescription for DFC 9B, and implement this Forest Plan direction.

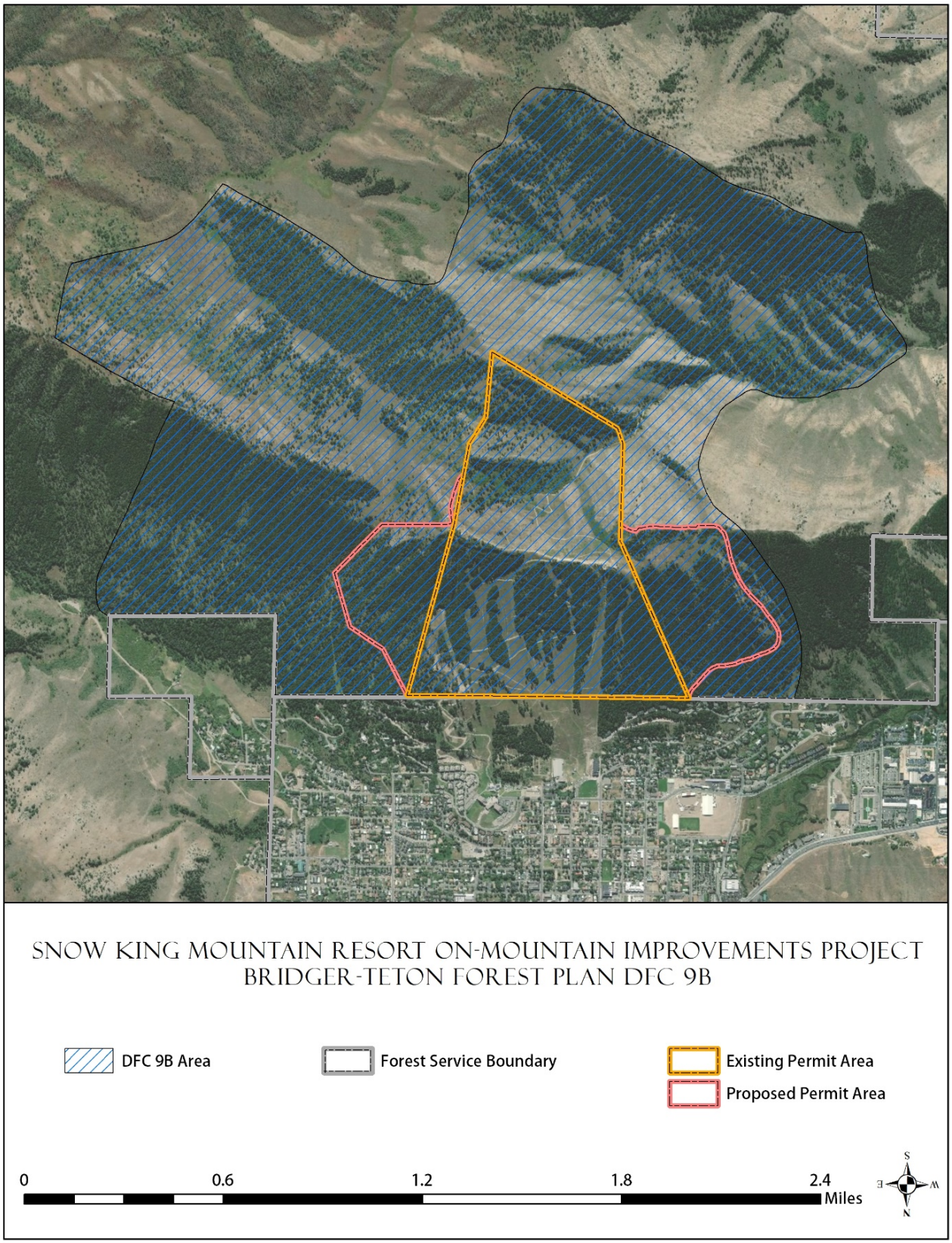

Figure 1-2. Forest Plan Management Area 41, Jackson Hole South, Desired Future Condition (DFC) 9B, Special Use Recreation Area.

1.7 SCOPING AND IDENTIFICATION OF ISSUES

On August 3, 2018, the Bridger-Teton issued a public scoping notice summarizing the proposed action and inviting comments regarding the scope of the associated NEPA review. Information regarding the scoping period and available materials for review was sent to the individuals, organizations, and agencies on the Bridger-Teton mailing list. The scoping notice was posted on the Bridger-Teton project website at https://www.fs.usda.gov/project/?project=54201 and made available in hard-copy form to anyone requesting it.

The scoping period formally began on August 3, 2018, when a Notice of Intent to Prepare an Environmental Impact Statement (NOI) was published in the Federal Register (Vol. 83, No. 150, pp. 38117-38118). The scoping period scheduled to close 30 days later on September 2, 2018. A correction to the project website address and extension of the scoping comment period to September 13, 2018, was published in the Federal Register on August 14, 2018 (Vol. 83, No. 157, pp. 40215-40216). A news release was circulated August 14, 2018, notifying the public of the comment period extension. On September 14, 2018, notice of a second extension of the scoping period was published in the Federal Register (Vol. 83, No. 179, p. 46701), allowing submittal of comments until October 4, 2018.

Comment letters were received from 10 agencies, 11 organizations, and 419 individuals. A scoping report identifying commenters, summarizing comments, and indicating how comments would be incorporated in this NEPA process was prepared and posted on the Bridger-Teton website on June 25, 2019. The scoping notice, NOI, comment letters, and scoping report are included in the project record.

Collectively, scoping and internal, interdisciplinary review identified the following issues to be addressed in this EIS. They begin with the physical environment, move to the biological environment, and conclude with the human environment. The issues may be addressed by analysis and disclosure of effects, development of project design criteria, or alternative development. Issue statements were released to the public on June 24, 2019.

1.7.1 ISSUES CARRIED INTO IN-DEPTH ANALYSIS

These issue statements introduce each resource-specific section in Chapter 3, where they are followed by the indicators used to identify the direct, indirect, and cumulative effects.

1.7.1.1. Physical and Biological Environment

1.7.1.1.1 Climate Change and Snow Quantity

- *How would climate change affect snow quantity and the long-term operation of the proposed infrastructure and uses?*

While no material effect is anticipated, it would be impossible to make a valid quantitative assessment of the proposed action's effect on climate change and snow quantity given the current state of climate-change science. However, a significant reduction in snowfall over time could preclude the need for any additional winter recreation infrastructure or recreational opportunities. The analysis will address that issue.

Indicator: Conclusions drawn from pertinent studies of climate change and its potential effects on snowfall, including the Forest Service, Region 4 report *Climate Change Vulnerability and Adaptation in the Intermountain Region* (Halofsky et al. 2018).

1.7.1.1.2 Air Quality

Protected Airsheds

- *How would construction and use of the proposed infrastructure affect protected airsheds around the project area?*

There are several areas in the vicinity of Jackson with airsheds protected under the Clean Air Act, as amended, and associated programs. These include national parks and designated wildernesses. Slash burning, off-road equipment operation, and soil disturbance could generate smoke and dust, adversely affecting air quality in these protected airsheds.

Indicator: Assessment of the extent of these practices and the efficacy of design criteria available to minimize any adverse effects on Class 1 airsheds.

Snowmaking Cloud

- *How would the proposed increase in snowmaking system coverage affect the "snowmaking cloud" that impacts the neighborhood around the base area?*

On cold winter days, snowmaking can generate a cloud of ice crystals that remains suspended in the air, spreading to surrounding areas and blocking the sun. Increased snowmaking could make this effect more extensive.

Indicator: Assessment of the effect of the proposed system expansion on the frequency and extent of the snowmaking cloud.

1.7.1.1.3 Water, Soils, and Watershed

Hydrology

- *How would the proposed increase in snowmaking and clearing of ski runs affect surface runoff, and groundwater recharge?*

The proposed action would increase snowmaking coverage at Snow King. Most of the proposed coverage is within the current permit boundary (on the north and south sides of Snow King Mountain) with minor amounts in the proposed east and west boundary adjustment areas. No stream channels exist within the current or potentially expanded permit boundary, but the expanded snowmaking coverage would include previously undeveloped drainages. Beyond that, clearing of proposed ski runs would affect the existing pattern of tree cover and could influence snow accumulation and runoff patterns. The combined influence of additional snowmaking and changes in tree cover could impact surface runoff and groundwater hydrology.

Indicator: Primarily qualitative assessment of current conditions, the amount and location of water potentially added to the system, the location and extent of vegetation clearing, the timing of runoff, and the resulting impacts on channel stability and groundwater recharge.

Erosion and Slope Stability

- *How would the ground disturbance associated with construction and use of the proposed infrastructure affect soil erosion and slope stability?*

The project area is characterized by steep slopes and erosive soils, and there is evidence of erosion and historic mass soil movement. Construction-related disturbance and subsequent use could potentially increase erosion and sediment transport to downslope areas. It could also create areas of instability on Snow King's slopes.

Indicator: Use of a connected disturbed area-based approach (CDA; Furness et al. 2000, Forest Service 2006) to assess the risk of erosion, sedimentation, and instability for each proposed project element that entails ground disturbance, both prior to and following implementation of best management practices (BMPs).

Water Quality

- *How would construction and use of the proposed infrastructure affect impaired water bodies in the area?*

Short-term surface disturbance during construction of the proposed infrastructure, and long-term use of the proposed ski runs and expanded snowmaking system, have the potential to introduce pollutants (primarily sediment) into downstream waterbodies. While there are no streams to be affected inside the current permit boundary, the proposed east boundary adjustment area includes part of the Cache Creek watershed. Cache Creek is a tributary of Flat Creek, which is included on Wyoming's 2018 303(d) list of impaired water bodies. Any pollutants entering Cache Creek could contribute to Flat Creek's existing impairment.

Indicator: Primarily the results of the hydrology and CDA-based analyses discussed above, specifically their conclusions regarding surface runoff, erosion, sedimentation, and effectiveness of BMPs in avoiding these issues. Assessment of these conclusions in light of the current impairments in Flat Creek and intervening conditions between Snow King and Flat Creek.

1.7.1.1.4 Vegetation

Noxious Weeds

- *How would construction and use of the proposed infrastructure affect the introduction and spread of noxious weeds?*

The project area supports plant species that are included on the list of noxious weeds maintained by the Wyoming Department of Agriculture, and construction, maintenance, and use of proposed infrastructure could introduce new weed species or spread existing infestations.

Indicator: Identification of weed species that may occur at Snow King based on past observations and reconnaissance completed for this analysis, then assessment of the risk of spreading those species and introducing new ones based on characteristics of each disturbance type.

1.7.1.1.5 Wildlife

Special-status Species

- *How would construction and use of the proposed infrastructure affect special-status wildlife species?*

The US Fish and Wildlife Service's Information for Planning and Consultation database indicates that several wildlife species listed under the *Endangered Species Act of 1973* may occur in the project area, and the Forest Service's list of sensitive species in the Intermountain Region also includes several species potentially found in the area. The *Migratory Bird Species Act of 1918* provides protections to some bird species that may frequent the project area. Construction and use of the proposed infrastructure could affect these special-status species through disturbance, displacement, or habitat impacts.

Indicators: Survey of areas that would be disturbed by construction and subsequent use for appropriate species and habitat-based assessments for more reclusive species, then assessment of impacts on special-status species based on occurrence and type, extent, and timing of disturbance of individuals or habitat. Conclusions determined and expressed as called for in the protocols for federally listed, Forest Service sensitive, migratory bird species.

Specialized Habitats

- *How would construction and use of the proposed infrastructure area affect elk or mule deer winter use?*

Parts of Leeks Canyon and adjacent areas include winter range for elk and mule deer, and there are wildlife migration corridors in the vicinity. To protect these specialized habitats, winter wildlife closure areas have

been established around Snow King. Construction and use of the proposed infrastructure could affect these habitats through disturbance, displacement, or fragmentation.

Indicators: Review of existing data on these specialized habitats, then assessment of potential effects based on the type, extent, and timing of disturbance of individual animals or habitat.

1.7.1.2 Human Environment

1.7.1.2.1 Cultural

Historic Landscape

- *How would construction and use of the proposed infrastructure affect Snow King's historic landscape?*

Snow King is one of the oldest ski areas in the US, with its roots in the 1920s when Jackson residents climbed the "town hill" under their own power. The first lift, a rope tow, was constructed in 1939. While most historic infrastructure has been demolished or upgraded, some evidence of the ski area's history remains. In 2014, part of the ski area was recommended as eligible for listing on the National Register of Historic Places as a historic landscape. The Wyoming State Historic Preservation Office concurred with that determination, but the site has not been formally nominated for listing. Construction of the proposed infrastructure could affect the historic resources on which this recommendation was based.

Indicator: Assessment of potential impacts on the resources supporting the eligibility recommendation. Consultation under Section 106 of the National Historic Preservation Act is an ongoing, parallel process.

Native American Concerns

- *How would construction and use of the proposed infrastructure affect Traditional Cultural Places or other Native American tribal resources?*

The Jackson Hole area has been used for various purposes by Native Americans for millennia. Tribes who frequented the area include the Crow, Eastern Shoshone, Gros Ventre and Assiniboine, Northern Arapaho, and Shoshone-Bannock. Construction and use of new facilities at Snow King could impact resources or uses important to area tribal groups.

Indicator: Government-to-government consultation with tribal groups with interest in area resources, in accordance with Executive Order 13175.

1.7.1.2.2 Land Use

- *How would construction and use of the proposed infrastructure affect grazing?*

The southern expansion area, which is within Snow King's current ski area special use permit boundary, is overlapped by an active grazing allotment, which is also permitted by the Bridger-Teton. Construction and use of the proposed summer infrastructure could affect forage availability, disturb or displace livestock, or otherwise impact the grazing permittee's operation.

Indicator: Review of utilization levels and patterns of livestock use to assess how proposed activities would impact forage availability and grazing operations.

1.7.1.2.3 Noise

- *How would construction and use of the proposed infrastructure affect noise levels around the ski area?*

Snowmaking, explosive avalanche control, and summer activities such as the mountain coaster generate noise that is audible to visitors and residents in areas adjacent to the resort. While some may accept increased noise levels as a consequence of being close to a mountain resort, the noise associated with the proposed snowmaking expansion, zip line, and increased avalanche control activities may be an annoyance to some.

Indicators: Review of noise levels associated with these activities, then a largely qualitative assessment of impacts on area visitors and residents base on the projected noise levels, timing, duration, and frequency.

1.7.1.2.4 Recreation

Terrain Mix

- *How would the proposed ski terrain development affect Snow King's terrain mix?*

Most ski terrain at Snow King is steep, which limits use to advanced or expert skiers. Accordingly, a central element of the purpose and need for action is to develop terrain accessible to lower ability-level skiers. This would be conducive to integrating beginning skiers into the sport and to accommodating families and groups with varying ability levels.

Indicator: Comparison of the terrain mix resulting from proposed development to the mix of ability levels in the skier market.

Existing Ski Runs

- *How would the proposed summit access road/novice skiway affect existing ski runs?*

The proposed access road/novice skiway crosses the major front-side ski runs high on the steeper portions of the slope where substantial cut and fill would be required. Existing access roads/novice skiways including Fast Trail, Slow Trail, and Elkhorn Trail also cross these ski runs, so the added access road/skiway would potentially constitute an additional impediment to smooth skier flow on these runs.

Indicator: Review of preliminary design of the access road/novice skiway, then largely qualitative assessment of its potential impact on skier flow, in conjunction with other features crossing these runs.

Existing Trail System

- *How would the proposed downhill mountain bike trails and zone affect the existing Cache Creek/Game Creek trail system and its users?*

The popular, well-developed and maintained Cache Creek/Game Creek multi-use trail system includes trails that cross or pass near Snow King's permit area. The proposed lift-served mountain biking could adversely affect this trail system and its users by increasing bike traffic inside or outside the permit boundary.

Indicators: Assessment of the likely number of lift-served mountain bikers that would use the existing trail system, the existing system's capacity to absorb any additional use, and the effects of that use on cross-country bikers and hikers. Some variables, such as the number of intersections of proposed and existing trails, will be quantified.

Phil Baux Park

- *How would the proposed summit gondola and zip line affect users of Phil Baux Park?*

Phil Baux Park is an old, well established and well used town park adjacent to Snow King's private-land base area. Under the proposed action, the bottom terminals of the proposed summit gondola and zip line would be located in the park, eliminating the parking lot.

Indicator: Primarily qualitative assessment of the impact of siting these facilities in the park on the recreational uses and users of the park.

1.7.1.2.5 Safety

Safety of Summer Visitors

- *How would the proposed mountain bike trails and mountain bike zone affect the safety of other summer visitors?*

Snow King's permit area supports summer recreational use of various types, including resort infrastructure such as the mountain coaster, alpine slide, and ropes course accessed from the Rafferty lift mid-station, as well as numerous formal and user-created hiking and biking trails throughout the permit area. The proposed mountain bike zone and trail network overlaying these other recreational uses could create collision risks and other safety issues.

Indicator: Review of the integration of existing and proposed summer recreation infrastructure with proposed mountain bike park and trails network to qualitatively assess safety risks.

Skier Safety

- *How would the proposed summit access road/novice skiway affect skier safety?*

This issue has two aspects, the safety of skiers using the skiway, and the safety of skiers crossing the skiway on the front-side runs. In the first case, the steepness of the slope adjacent to the skiway could make it dangerous for beginners or others who skied off the skiway. They could slide down the groomed runs or be trapped in deep snow in the forested patches. For skiers crossing the skiway, the cut and fill slopes necessary to construct it could block smooth skier flow and pose a hazard to skiers attempting to cross it at speed.

Indicator: Generally qualitative assessment of the design of the skiway and the efficacy of measures to minimize these risks, based on experience at Snow King and elsewhere.

Avalanche

- *How would the proposed ski run clearing and summit access road/novice skiway affect avalanche hazard?*

Snow King's steep slopes lie directly above the base area and adjacent commercial and residential development, making avalanche an important concern. The proposed expansion and associated ski run clearing could increase this hazard and the level of effort required to manage it. The steep cut and fill slopes along the proposed summit access road/novice skiway could create new starting zones and add to the problem.

Indicator: Qualitative assessment of the current avalanche situation and snow safety program, followed by analysis of the impact of proposed infrastructure on the hazard level and the effectiveness of the snow safety program to manage it.

1.7.1.2.6 Scenery

Scenic Quality

- *How would the proposed infrastructure affect the scenic quality of Snow King Mountain?*

The front side of Snow King is the southern backdrop of the town, where scenic quality is a widely held value. While the resort is already part of that backdrop, additional infrastructure, individually and collectively, on the front side and the summit could result in an even less natural appearing view from the town.

Indicator: Assessment of the impact of the proposed infrastructure using the methodology established in the Forest Service's Visual Management System (Forest Service 1974).

- *How would the proposed lighting for night skiing and operation of summit facilities affect the nighttime view and dark sky?*

While lighting for night skiing, grooming, and other on-mountain activities has been part of the nighttime setting on the mountain for some time, the proposed expansion of night lighting and addition of summit lighting would constitute a greater departure from the natural setting.

Indicator: Review of the current setting and applicable local regulations regarding lighting, then assessment of the extent, intensity, and duration of the proposed change, in the context of those local regulations.

1.7.2 ISSUES CONSIDERED BUT NOT CARRIED INTO IN-DEPTH ANALYSIS

This section identifies issues that were raised during scoping or internal, interdisciplinary review that were considered not to be relevant to this particular decision or not to require in-depth analysis in order to determine that no significant impact was likely. The rationale for this decision follows each issue. This is consistent with NEPA and CEQ regulations (40 CFR 1501.7[3] and 1909.15 [12.41]).

1.7.2.1 Water, Soils, and Watershed

- *How would expanded snowmaking affect municipal water availability?*

Rationale: The Town of Jackson supplies Snow King's snowmaking water, and the town has identified no impending water shortage. Should municipal water supplies become limited, the town would be under no obligation to meet increase demands for snowmaking. It is also important to note that expanding snowmaking system coverage does not correlate directly with increased water use. Rather, it provides the ski area with the flexibility to use available water for snowmaking where it is needed most. Based on these considerations, in-depth analysis of this issue is not required to determine that there would be no significant impact.

- *How would construction and use of the proposed infrastructure affect wetlands and other jurisdictional Waters of the US?*

Rationale: Scoping and internal, interdisciplinary review raised the issue of potential impacts on any wetlands or other jurisdictional Waters of the US that may occur in the project area. As a first step, we consulted the National Wetlands Inventory (NWI) and National Hydrography Dataset (NHD). The NWI does not show any wetlands within the ski area boundary or the proposed boundary adjustment areas, and the NHD shows only three intermittent stream channel segments. In 2018, the potential wetlands and NHD-mapped stream segments were surveyed in the field for features used by the US Army Corp of Engineers to define jurisdictional Waters of the US such as riparian and wetland vegetation, hydrology and hydric soils, stream channel bed and bank features, and ordinary high-water mark. The survey did not identify any areas meeting the Corps of Engineers requirements for wetlands or relatively permanent waterways. Based on these findings, no Waters of the US exist in the project area, so in-depth analysis of this issue is not required to determine that there would be no significant impact.

1.7.2.2 Vegetation

- *How would construction and use of the proposed infrastructure affect general vegetation and plant communities?*

Rationale: Impacts on general vegetation and plant communities are addressed in the EIS in terms of their effects on other resources values including watershed conditions, wildlife habitat, and scenic values. With these specific effects addressed, this issue does not require further in-depth analysis to determine that there would be no significant impact.

- *How would construction and use of the proposed infrastructure affect special-status plant species?*

Rationale: The US Fish and Wildlife Service IPaC database indicates that no plant species listed as threatened or endangered under the Endangered Species Act occur in the project area. The IPaC database does show that the project area is potential habitat for whitebark pine, a candidate species for listing under the Endangered Species Act. All areas potentially subject to ground disturbance during construction or use of the proposed infrastructure were surveyed in 2018, and no whitebark pine were observed.

The Forest Service's list of sensitive species in the Intermountain Region includes several species potentially occurring at Snow King. The Wyoming Natural Diversity Database and Rocky Mountain Herbarium records were searched for known occurrences of Forest Service sensitive species in the project area, and no occurrences have been reported. The project area does have suitable potential habitat for three sensitive species (crenulate moonwort, puzzling moonwort, and Payson's bladderpod), and those areas were

searched thoroughly on two occasions during the 2018 surveys. No Forest Service sensitive plant species were observed, and the unoccupied habitat was found to be of poor to marginal quality.

Based on these considerations, in-depth analysis of this issue is not required to determine that there would be no significant impact. The biological evaluation being prepared for this project will provide additional discussion.

- *How would the proposed clearing and glading of forest affect the project area?*

Rationale: Forest clearing and glading are addressed in the EIS in terms of their impact on other resources including watershed conditions, wildlife habitat, and scenic values. These analyses will indicate the acreage of forest clearing and grading. With these effects addressed, this issue does not require further in-depth analysis to determine that there would be no significant impact.

- *How would the proposed snowmaking expansion affect vegetation?*

Rationale: While clearing and grading of ski runs obviously affects vegetation, snowmaking has not shown that potential. This is primarily because snowmaking typically involves much less water than natural precipitation and, by definition, is used primarily to offset shortfalls in natural snowfall. Note the EIS does address the impacts of snowmaking on hydrology as well as the effects of snowmaking system construction on vegetation. Based on these considerations, in-depth analysis of this issue is not required to determine that there would be no significant impact.

1.7.2.3 Wildlife

- *How would construction and use of the proposed infrastructure affect general wildlife and wildlife habitat?*

Rationale: As discussed in the introduction to this section, NEPA, the CEQ, and Forest Service regulations direct that an EIS should focus on issues that are relevant to the specific decision to be made and require in-depth analysis to determine whether significant impacts are likely. Accordingly, as discussed above under Issues Carried into In-depth Analysis, this EIS addresses potential impacts on special-status wildlife species and on elk and mule deer winter range. In-depth analysis of impacts on general wildlife species or habitats is not required to determine that there would be no significant impact, as other species are common and lack specialized habitat in the project area.

- *How would construction and use of the proposed infrastructure affect wildlife closure areas in the vicinity of Snow King?*

Rationale: Most winter activities are prohibited in areas around Jackson that have been previously identified as key winter-use or migration areas. The proposed action would not authorize any development or use in these areas, and use of them by ski area visitors would be a violation of the closure regulations, as it is now. Based on these considerations, this issue does not require in-depth analysis to determine that there would be no significant impact.

- *How would the proposed snowmaking and skiing affect subnivean species (those living under the snow)?*

Rationale: As discussed above under Issues Carried into In-depth Analysis, this EIS focuses on special-status wildlife species. Any subnivean species that are federally listed under the Endangered Species Act or identified as Forest Service sensitive species are addressed in the EIS. Beyond that, this issue does not require in-depth analysis to determine that there would be no significant impact.

1.7.2.4 Cultural Resources

- *How would construction and use of the proposed infrastructure affect archaeological resources?*

Rationale: In 2018, the areas subject to disturbance by proposed construction and use (i.e., the area of potential effect) was subject to a Wyoming State Historic Preservation Office (SHPO) records search and

to a pedestrian survey for archaeological resources. None were located, and a "no effect" was reported to the SHPO. As a result, pending SHPO concurrence with this finding, no in-depth analysis of this issue is required to determine that there would be no significant impact.

1.7.2.5 Land Use

- *How would construction and use of the proposed infrastructure affect the snow course on the summit of Snow King Mountain?*

Rationale: Under permit with the Bridger-Teton, the Natural Resources Conservation Service (NRCS) has operated a snow monitoring course on the summit since 1959. The permit was issued in accordance with a nationwide memorandum of understanding (MOU) between the two federal agencies that directs how such facilities are established and managed, and how conflicts are resolved. Development of the proposed summit learning area would eliminate the snow course, requiring the two agencies to work together, as directed in the MOU, to identify and establish a replacement. This is an administrative matter rather than an environmental one, and it does not require analysis in this EIS.

- *How would construction and use of the proposed infrastructure in the southern expansion area affect private landowners and highway users around the mouth of Leeks Canyon?*

Rationale: The specific issues raised included the potential for trespass onto private land near the canyon mouth, the need for access to the expansion area via Leeks Canyon Road, and the potential for mule deer displaced from the expansion area to create a collision hazard on US Highway 191. In regard to trespass, the Forest Service has no authority to keep the public from traveling down Leeks Canyon, but that potential currently exists, and the proposed development would not create any additional incentive for people to do so. It is roughly 1.4 miles to the fenced and posted private property line, and anyone trespassing would be in violation of state law, as they would be now. As to access via the Leeks Canyon Road, the proposed summit access road would preclude that need. Regarding displaced deer becoming a hazard on US 191, the highway is roughly 1.6 miles from the expansion area, with a wildlife closure area for wintering wildlife in between. While deer on the highway are a serious, ongoing concern, this action would not notably alter current conditions. In short, in-depth analysis of these issues is not required to determine there would be no significant impacts.

1.7.2.6 Recreation

- *How would the proposed infrastructure affect Snow King's pass prices?*

Rationale: Concern was expressed during scoping that completion of the proposed improvements would be expensive, so Snow King might be required to raise pass prices. The concern was that this could potentially price some visitors out and reduce affordable access to lift-served skiing in the Jackson area. However, ticket pricing is determined by the permittee's business model and is subject to limited Forest Service authority. As a result, this issue is outside the scope of the EIS and does not require analysis.

- *How would the proposed buildings affect the services available to winter and summer visitors?*

Rationale: Development of the proposed summit learning area and summer recreational infrastructure would create the need for additional skier service facilities on the summit and elsewhere on the mountain. These would include restrooms, food and beverage service, ski and mountain bike instruction, equipment rental, retail sales of essential items, and ski/bike patrol facilities. We have reviewed Snow King's proposal to provide these services, particularly by developing the summit building, and found them to be adequate pending engineering review of detailed plans prior to construction authorization. Accordingly, the proposed action and all action alternatives would provide the same visitor services, so analysis of this issue would provide no information useful in deciding among the alternatives.

- *How would the proposed mountain bike trail system affect public access to the existing Cache Creek/Game Creek trail system?*

Rationale: As noted above, the Jackson area provides a popular, well-developed and maintained system of multi-use trails, several of which cross or pass near Snow King's permit area. Concern was expressed during scoping that development of new mountain bike trails would result in closure of public trails at the resort, or in fees charged for public use. The proposed action does not include plans for either of these actions. Access to the existing Cache Creek/Game Creek trail system would remain unchanged, as would Snow King's ability to charge for public access to the permit area when that public use involves facilities that the resort pays to build or maintain. No such fees have been proposed. Based on these considerations, this issue does not require in-depth analysis to determine that there would be no significant impact.

1.7.2.7 Safety

- *How would the proposed infrastructure in general affect skier safety:*

Rationale: Scoping commenters pointed out several potential safety benefits of the proposed infrastructure, particularly for children. These included a safer summit lift that would also transport emergency personnel, expanded and improved night lighting, and expanded and improved beginner terrain. These effects are inherent in the stated purpose and need for action and do not require in-depth analysis to document their effect.

- *How would the proposed summit access road/novice skiway affect the safety ski area personnel operating groomers or other vehicles on it?*

Rationale: One objective of the proposed access road/novice skiway is to provide safer summit access for mountain operations personnel. The existing route is steeper and narrower, with more switchbacks to negotiate. In-depth analysis is not required to determine that this would improve this aspect of the safety situation.

- *How would the southern expansion affect skier safety?*

Rationale: A commenter raised concerns about the more remote nature of the back-side expansion and the ability of Snow King to respond effectively to accidents and injuries. However, the area would be subject to the same level of ski patrol surveillance as the existing ski runs, and the proposed Lift A would provide ready summit access for injured skiers and accompanying ski patrollers. From there, the gondola would provide fast transport to the base area. In-depth analysis is not required to determine that this issue does not constitute a significant safety risk.

- *Would the proposed zip line constitute a risk to riders?*

Rationale: The proposed zip line would carry riders from the summit to the base area in a single span, at speeds up to 70 miles/hour. Above-ground height could be up to 50 feet. Commenters expressed concern that collisions or falls could result in serious injury or death.

In accepting Snow King's MDP, the Bridger-Teton considered the appropriateness and safety of the proposed summer recreational infrastructure. Zip lines are increasingly common and popular features at permitted resorts and, while there have been injuries and even deaths, they have been extremely infrequent and far fewer than those resulting from skiing. Beyond that, Forest Service engineering review would be required before construction was authorized. In-depth analysis is not necessary to determine that this issue does not constitute a significant safety risk.

- *Would the proposed mountain bike trails and mountain bike zone pose a risk to users?*

Rationale: While downhill mountain biking, like skiing, has inherent risks, the designers of such facilities have extensive experience in how to build and manage them in ways that reduce those risks. Bike parks are an increasingly common and popular feature at permitted resorts and, while there have been injuries and

even deaths, they have been infrequent and fewer than those resulting from skiing. In-depth analysis is not necessary to determine that this issue does not constitute a significant safety risk.

- *Would increased visitation and vegetation change increase the risk of wildfire?*

Rationale: Some commenters expressed concern that more visitors at the ski area could increase the chance of fire starts, and that infestations of weedy plant species, particularly cheatgrass, following soil disturbance could result in increased rates of fire spread. While more people could result in more careless behavior with fire, this has not proved to be an issue at Snow King or other mountain resorts. Fire prevention campaigns have highlighted the problem, and high levels of use increase detection of irresponsible behavior as well as early detection of fire. Beyond that, existing and proposed ski runs constitute fire breaks, fuel reduction efforts are included in Snow King's Vegetation Management Plan (section 2.5.4.4), and the snowmaking system provides water supplies throughout the permit area. Based on these considerations, in-depth analysis is not necessary to determine that this issue does not constitute a significant safety risk.

- *How would mountain bike use affect the safety of dogs on the trails?*

Rationale: Dog safety can be considered a correlate of human safety, and hikers will not be allowed to use the proposed mountain bike trails. In-depth analysis is not necessary to preclude any significant impact.

- *Would the high-frequency radio waves from the towers on the summit pose a risk to visitors and staff?*

Rationale: Snow King visitors and staff have long frequented the summit with no reported ill effects from radio waves. In-depth analysis is not necessary to preclude any significant impact.

1.7.2.8 Socioeconomic

1.7.2.8.1 Town Character

- *How would construction and use of the proposed infrastructure affect the character of the Town of Jackson?*

Rationale: The EIS addresses a number of more concrete effects on the town (e.g., recreation, visual impacts, and noise), but the desired character of the town is a topic of ongoing debate in the community. As a result, people have divergent individual opinions about the impact of the proposed action, as indicated by scoping results. In this context, objectively assessing town character is not possible, and it would not contribute to a better understanding of environmental effects or a more reasoned decision.

1.7.2.8.2 Employee Housing and Utilities

- *How would the proposed action affect employee housing and utility demand?*

Rationale: Increased infrastructure and visitation would increase the number of Snow King employees as well as demands on utilities from local providers. Employee housing is already a major concern in Jackson, and provision of sufficient water, power, sanitation, and other services is a pressing demand on local government.

Addressing these concerns is an ongoing effort on the part of the Town of Jackson and Teton County. The Snow King base area and lower portion of the mountain are on private land within the Town of Jackson, and the town has developed the *Snow King Resort District Master Plan* specifically to address these socioeconomic and related concerns. The master plan is a dynamic document, and the town, the resort, and other stakeholders are involved in the ongoing process of keeping it up to date as conditions change. The plan establishes employee housing requirements and addressing growing utility demands, and it is based on projected growth at Snow King and in the community at large. Snow King is bound by the master plans stipulations. In short, these issues are in the jurisdiction of the town and county, and those entities are managing them effectively. As a result, they are outside the scope of this EIS.

1.7.2.8.3 Resort Viability

- *What would happen if the proposed action did not result in a viable resort?*

Rationale: The economic performance of Snow King is not a Forest Service matter and will not be addressed in the EIS. However, a viable MDP is a requirement of ski area special use permits, in accordance with the *Ski Area Permit Act of 1986*. We reviewed Snow King's MDP and determined that it met this requirement prior to accepting it and initiating this NEPA review of elements involving National Forest resources. Our intent in issuing this special use permit is to provide the public with diverse recreational opportunities on the Bridger-Teton and supporting our local community, and our permit administration will be directed toward meeting that objective. Beyond that, when special use permits are terminated, the permittee is responsible for removal of facilities from the permit area (FSM 2700 – Special Uses Administration, 2716.2[3]). Based on these considerations, this issue is beyond the scope of this EIS and will not be analyzed in this EIS.

1.7.2.8.4 Project-specific Economics

- *What is the projected use level cost: benefit projection for each element of the proposed action?*

Rationale: It is not clear how analysis of this issue would contribute to understanding the potential environmental effects or to a more reasoned decision. It will not be analyzed in this EIS.

1.7.2.9 Traffic and Parking

- *How would the proposed action affect traffic and parking availability around the base area?*

Rationale: Increased infrastructure and visitation would increase the number of Snow King employees and visitors, with associated increases in traffic and demand for parking in and around the base area. As discussed above, the base area and surroundings are within the Town of Jackson and subject to stipulations of the *Snow King Resort District Master Plan*. In addition to addressing various socioeconomic considerations, that plan assesses the traffic and parking situation, identifies any issues warranting attention, stipulates then takes into consideration studies as needed, and lays out responsive plans. Snow King, like other stakeholders, is subject to those plans. In short, these issues are within the jurisdiction of the town and county, and those entities are managing them effectively. As a result, they are outside the scope of this EIS.

1.8 PROJECT RECORD

The project record contains the technical documentation used to support the analysis and conclusions in this EIS. The project record is available for review at the Jackson Ranger District Office, 340 N. Cache St., Jackson, WY 83001.

1.9 OTHER PERMITS AND AUTHORIZATIONS

Table 1-1 lists the permits and authorizations, beyond Bridger-Teton authorization, that may be required in order for Snow King to implement the proposed action or an action alternative.

Table 1-1. Other permits, approvals, and consultations that may be required for implementation of the proposed action or an action alternative.

Agency	Type of Action	Description of Permit or Action
Federal		
USDA-Forest Service	American National Standards Institute, American Society for Testing and Materials, Architectural Barriers Act, Americans with Disabilities Act, and other code compliance review for lifts and structures.	Final designs for approved lifts and structures go through Regional Office-level engineering review to ensure compliance with applicable codes and agency standards. Ski Lifts and zip lines also require post-construction testing and approvals.
US Environmental Protection Agency	Review and comment regarding: Clean Air Act, as amended, 42 USCA. Section 7410-762 (PL 95-604, PL 95-95) Federal Water Pollution Control Act, as amended by the Clean Water Act, 33 USCA. Section 1251-1376 (PL 92-500, PL 95-217) Safe Drinking Water Act, 452 USCA. Section 300F-300J-10 (PL 93-523)	Under NEPA, the Environmental Protection Agency is required to review and comment on "major federal actions that have a substantial impact on the human environment." The Environmental Protection Agency's responsibility and role is to provide scoping comments, review EISs, and provide information and appropriate technical assistance during and following the environmental analysis process. Specific environmental legislation for which the Environmental Protection Agency is responsible, and which may be applicable to this proposed action, is shown to the left. Administrative and enforcement responsibilities have been delegated to the State of Wyoming for all three acts.
US Fish and Wildlife Service	Endangered Species Act, Section 7 Consultation Fish and Wildlife Coordination Act Consultation	If impacts on federally listed species are possible, the Fish and Wildlife Service will consult with the Forest Service, review a biological assessment, and issue a response. The Fish and Wildlife Service also coordinates with the Forest Service in accordance with the Fish and Wildlife Coordination Act to avoid adverse impacts to federally listed species.
State of Wyoming		
Department of Environmental Quality: - Water Quality Division	Wyoming Pollutant Discharge Elimination System (WPDES) permit and Stormwater Pollution Prevention Plan	The Water Quality Division review ensures that state and federal water quality standards are not exceeded. This is achieved through issuance of a 5-year WPDES permit for large construction projects which is updated annually to reflect Snow King's plans for construction each year.
State Historic Preservation Office	Consultation on national Historic Preservation Act, Section 106 compliance process	The Forest Service is required to consult with State Historic Preservation Office on cultural resource survey, site recordation, site eligibility determination, determination of project effects on eligible sites, and protocols for inadvertent discovery of historic properties.

Table 1-1 (cont'd). Other permits, approvals, and consultations that may be required for implementation of the proposed action or an action alternative.

Agency	Type of Action	Description of Permit or Action
Teton County		
Fire Marshal	Electrical and Life Safety Review	As a condition of Forest Service construction authorizations, the Teton County Fire Marshal inspects buildings during construction to ensure that wiring and electrical facilities are properly installed and required safety devices such as smoke alarms and sprinkler systems are in place.
Town of Jackson		
Town of Jackson	Building and Grading Permits	In order to construct the base of the gondola and remove the Cougar lift, the Town of Jackson would need to issue permits to ensure compliance with City codes.

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CHAPTER 2: PROPOSED ACTION AND ALTERNATIVES

2.1 INTRODUCTION

This chapter outlines the alternative development process, describes in detail the alternatives carried into in-depth analysis, lists associated design criteria, identifies alternatives considered but not analyzed in depth, then summarizes and compares the environmental impacts of the alternatives analyzed in depth.

2.2 ALTERNATIVE DEVELOPMENT PROCESS

The alternative development process centered on interdisciplinary review of Snow King's proposal, coupled with public input derived through scoping (section 1.7) and comment on the Draft EIS (section 4.2), to identify which of the environmental concerns to be carried into in-depth analysis in this EIS also warranted consideration in the formulation of alternatives. Four alternatives, including the proposed actions, were developed to address such concerns and standard NEPA requirements. The rationales for development of these four alternatives can be summarized as follows.

- The NEPA-required no-action alternative, Alternative 1, is described first, as it provides the baseline for assessing the impacts of the proposed action and action alternatives (40 CFR 1502.14 [d]). It reflects on-going operations at Snow King without any of the proposed improvements. Accordingly, the effects of this alternative on most resources may not vary appreciably from the EIS's description of the affected environment.
- The proposed action, Alternative 2, is described next. It matches Snow King's June 5, 2018, proposal requesting authorization to implement the first phase of improvements included in their 2017 MDP. This alternative was the subject of public scoping, initiated August 3, 2018. It emphasizes improving recreational opportunities.
- Alternative 3 was developed to balance improved recreational opportunities and resource protection. It addresses concerns regarding the proposed action identified in discussions between the Town of Jackson, a cooperating agency in this EIS process, and Snow King shortly after scoping. Those concerns centered on the recreational and land-use impacts of locating the bottom terminals of the proposed gondola and zip line in town-owned Phil Baux Park. It also addresses effects on the historic landscape at Snow King, which was identified through past analysis as eligible for listing on the National Register of Historic Places, as well as the impacts of lift-served mountain biking on the existing Cache Creek/Game Creek hiking and biking trail system and its users, and the Bridger-Teton's concerns regarding fuel management and fire protection at the wildland/urban interface. Skier-safety, winter big game habitat, visual, and noise impacts identified during scoping were added considerations.
- Alternative 4 was developed to emphasize resource protection rather than full achievement of the recreational opportunity objectives of the proposed action. Relative to Alternative 3, this alternative was designed initially to provide a greater degree of protection to Snow King's historic landscape and the Cache Creek/Game Creek trail system and its users. It also addressed the additional issues of the impact and sustainability of proposed front-side mountain bike trails and effects on goshawks using terrain east of the current ski area boundary.

  In this Final EIS, Alternative 4 has been modified based on internal review of the Draft EIS, completion of consultation under section 106 of the National Historic Preservation Act, comments received on the Draft EIS, new data on goshawk habitat use, and public interest in eBike opportunities. Modifications to Alternative 4 are summarized below and described in detail in section 2.6.

National Historic Preservation Act consultation indicated that new ski runs that did not affect the footprint of the original front-side runs would not substantially affect the historic landscape, so this alternative was modified to provide more terrain development east and west of that footprint.

Comments on the Draft EIS indicated ongoing concern regarding impacts on the Cache Creek/Game Creek trail system and on elk winter habitat in Leeks Canyon, so this alternative was revised to incorporate an adaptive management approach.

Comments on the Draft EIS also indicated strong support for leaving Cougar lift in place to support skiing on the lower mountain, particularly race training. The lift would be retained under this alternative, and the temporary ski patrol structure described under Alternative 2 would be installed.

Tracking data provided by the Teton Raptor Center more accurately documented the movement patterns of the goshawks that nest east of the current permit boundary. This allowed more accurate assessment of potential impacts and revision of proposed protective measures.

Finally, the Bridger-Teton has received numerous inquiries about opportunities to use eBikes (i.e., electronic mountain bikes). A permitted mountain resort like Snow King provides a managed setting for assessment of this form of recreation, if they decided to offer it. This alternative includes eBike use of bike trails within the permit boundary.

These alternatives are described below, starting with the no-action alternative, Alternative 1. To make the alternatives that follow as clear as possible, the proposed action, Alternative 2, is described first, in detail, then the subsequent description of Alternative 3 identifies differences from Alternative 2, and the description of Alternative 4 identifies differences from Alternative 3. This sequential approach serves two purposes. It highlights the differences among the proposed action and action alternatives rather than reiterating similar components, and that in turn provides a guide for the EIS's analysis of environmental effects so that it unambiguously sets the impacts of the alternatives apart, providing a clear comparison for the public and the Responsible Official. This is consistent with NEPA direction (40 CFR 1502.14).

To provide a quick reference on the make-up of each alternative, Table 2-1 lists all elements comprised by the four alternatives, indicates which alternatives include each element, and notes any alternative-specific differences in how a given alternative incorporates that element. An alternative summary document with a draft of Table 2-1 and supporting maps was released to the public on October 2, 2019, in advance of the Draft EIS.

Table 2-1. Summary comparison of elements included in the four alternatives analyzed in depth.

Proposed Improvement	Alternative 1 No Action	Alternative 2 (See Figure 2-1)	Alternative 3 (See Figure 2-2)	Alternative 4 (See Figure 2-3)
Permit Boundary Adjustment				
East Area	No	Yes, 67 acres.	Yes, same as Alternative 2.	Yes, same as Alts. 2 and 3.
West Area	No	Yes, 89 acres.	Yes, same as Alternative 2 except 1 acre less in west-side area due to shifting the southern boundary back to ridge	Yes, same as 3.
Terrain Development				
Teaching Center Terrain	No	Yes	Yes	Yes

Table 2-1 (cont'd). Summary comparison of elements included in the four alternatives analyzed in depth.

Proposed Improvement	Alternative 1 No Action	Alternative 2 (See Figure 2-1)	Alternative 3 (See Figure 2-2)	Alternative 4 (See Figure 2-3)
New and Modified Ski Runs	No. Existing developed terrain would remain, 135.6 acres.	Yes, 117.8 acres across ability levels. Includes runs 3–14 on the front side, 16–25 on the back side, Lift B and C terrain on the ridge, and modifications of existing Moose, Belly Roll, Upper Exhibition, and Bearcat runs. New total 253.4 acres.	Yes, same as Alternative 2.	Yes, same as Alts. 2 and 3 except runs 8 and 10–12 on the front side would be dropped. Runs 1, 2, and 15 would be added on the front side to offset the resulting loss in trail capacity in balance with the new gondola. Total new terrain 133.6 acres, bringing area total to 269.2 acres.
Grading of Existing Runs (see section 2.4.2.2)	No	Yes, grading to smooth terrain irregularities at six locations on the front side, totaling 5.5 acres.	Yes, same as Alternative 2.	Yes, same as Alts. 2 and 3.
Glading (See Figure 2-4)	No	Yes, about 32.7 acres.	Yes, same as Alternative 2.	Yes, same as Alts. 2 and 3.
Summit Access Road/Novice Skiway				
Summit Access Road/Novice Skiway	No. Existing access road would remain in place.	Yes	Yes	Yes
Lifts				
Summit Gondola	No. Existing chairlift would remain in place.	Yes, bottom terminal in Phil Baux Park and top terminal near current location.	Yes, but bottom terminal shifted to current Cougar bottom terminal site, top terminal near current location.	Yes, same as Alternative 3.
Lift A (Back-side Quad Lift)	No	Yes	Yes	Yes
Conveyor Lifts	No	Yes	Yes	Yes
Back-side Surface Tow	No	Yes	Yes	Yes
Removal of Cougar Lift	No	No	Yes	No, but shift bottom terminal 250 feet up alignment.

Table 2-1 (cont'd). Summary comparison of elements included in the four alternatives analyzed in depth.

Proposed Improvement	Alternative 1 No Action	Alternative 2 (See Figure 2-1)	Alternative 3 (See Figure 2-2)	Alternative 4 (See Figure 2-3)
Facilities				
Summit Building	No. Existing summit structures would remain in place	Yes	Yes	Yes
Observatory	No	Yes	Yes	Yes
Removal of Panorama House	No	Yes	Yes	Yes
Removal of Observation Deck	No	Yes	Yes	Yes
Removal of Existing Summit Ski Patrol Building	No	Yes	Yes	Yes
Temporary Ski Patrol Building (at Top of Cougar Lift)	No	Yes	No	Yes
Yurt Camp	No	Yes	Yes	Yes
Wedding Venue	No	Yes	Yes	Yes
Snow King Historical Interpretive Center	No	No	Yes	Yes
Night Skiing				
Expanded Night Skiing	No. Existing coverage of 73.8 acres would remain, covering all existing runs below Slow Trail.	Yes, an additional 27.3 acres, covering Flying Squirrel, Moose, upper Elk, and summit terrain, bringing total to 101.1.	Yes, same as Alternative 2.	Yes, same as Alts. 2 and 3.

Table 2-1 (cont'd). Summary comparison of elements included in the four alternatives analyzed in depth.

Proposed Improvement	Alternative 1 No Action	Alternative 2 (See Figure 2-1)	Alternative 3 (See Figure 2-2)	Alternative 4 (See Figure 2-3)
Snowmaking Coverage				
Additional Snowmaking	No. Existing coverage would remain, approximately 90 acres, including all existing runs below Slow Trail and Elk run to the summit.	Yes, an additional 147.7 acres covering all remaining existing runs, except the S Chutes, and all new runs developed or modified under this alternative, bringing total to 237.1 acres.	Yes, same as Alternative 2.	Yes, an additional 147.2 acres, covering all runs developed or modified under this alternative except runs 1, 2, and upper 15, bringing total to 237.2 acres, virtually the same as Alternatives 2 and 3.
Summer Activities				
Zip Line	No	Yes, paralleling Summit gondola, landing in Phil Baux Park.	Yes, except landing at Rafferty mid-station. Straight and three-segment options.	Yes, same as Alternative 3.
Downhill Mountain Bike System	No. Existing trails would remain in place.	Yes, approximately 6.5 miles on front side with access from Summit gondola and a 110-acre mountain bike zone on back side, accessed from Summit gondola and Lift A. Existing Cache Creek/Game Creek trail system also accessible.	Yes, same as Alternative 2, but with only one trail off the summit to the front side trail system and no lift-served access to the existing Cache Creek/Game Creek trail system. Rider information, trail design/barriers, enforcement, and changes in allowed use of existing trails would be used to restrict lift-served bike use to the dedicated downhill trail system and mountain bike zone	Yes, but with phased development and adaptive management. Front-side trail system shorter (5.6 miles total length) and mostly in the Rafferty area. Access from the Summit gondola, via a single beginner trail off the summit.
Hiking Trails	No. Existing trails would remain in place.	Yes, improved 0.6-mile Stairway trail and new 1.5-mile trail in the Bearcat Glades area.	Yes, same as Alternative 2 except new hiking trail realigned and shortened to 1.2 miles.	Yes, same as Alternative 3.

Table 2-1 (cont'd). Summary comparison of elements included in the four alternatives analyzed in depth.

Proposed Improvement	Alternative 1 No Action	Alternative 2 (See Figure 2-1)	Alternative 3 (See Figure 2-2)	Alternative 4 (See Figure 2-3)
Forest Stand Thinning (for Fire Protection and Fuel Reduction at Wildland/Urban Interface; see Figure 2-4)	No	No	Yes, 154.2 acres, involving most front-side forested areas, including some proposed for glading for skiing purposes.	Yes, same as Alternative 3. Acreage of 147.8 differs from Alternative 3 due to differences in overlapping ski run configuration between Alts 3 and 4.
Road and Trail Obliteration (See Figure 2-5)	No	Yes, 1.1 miles of roads, including all but the top section of Elkhorn Trail and an unnamed service road and user-created hiking trail on the lower front side, made unnecessary by the proposed summit access road/novice skiway.	Yes, with an additional 0.9 miles (2 miles total) of roads/trails, including Slow Trail and Fast Trail, made unnecessary by removal of Cougar lift.	Yes, same as Alternative 3 except Slow Trail would be retained to support Cougar lift.

It is important to note that some elements of Snow King's proposal would be located on land belonging to the Town of Jackson, and their construction would be subject to all pertinent review and permitting requirements of the Town of Jackson, including but not limited to grading and building permits. These elements include the proposed bottom terminal of the gondola under Alternatives 2, 3, and 4 as well as the zip line bottom terminal under Alternative 2.

Beyond that, planning for the base area is ongoing, involving the Town of Jackson, Snow King, and other stakeholders. The analysis documented in this EIS is based on what the Bridger-Teton and cooperating agencies, including the Town of Jackson and Teton County, identified as the most likely scenarios when the analysis was being completed. Elements of Snow Kings proposal that are sited on lands beyond the National Forest boundary could change as a result of this ongoing planning effort.

2.3 ALTERNATIVE 1 – NO ACTION

NEPA requires that an EIS includes a no-action alternative to provide a point of comparison for the impacts of the proposed action and action alternatives (40 CFR 1502.14 [d]). In this case, the no-action alternative is defined as continuation of current operation and maintenance activities on National Forest System lands at Snow King, with no further infrastructural development or operational changes. Any anticipated planning and development on private lands on the lower portion of the mountain and base area that are not subject to Forest Service jurisdiction would proceed. Comfortable carrying capacity would remain at 1,580 people. Existing infrastructure is shown on the maps below illustrating the proposed action and action alternatives.

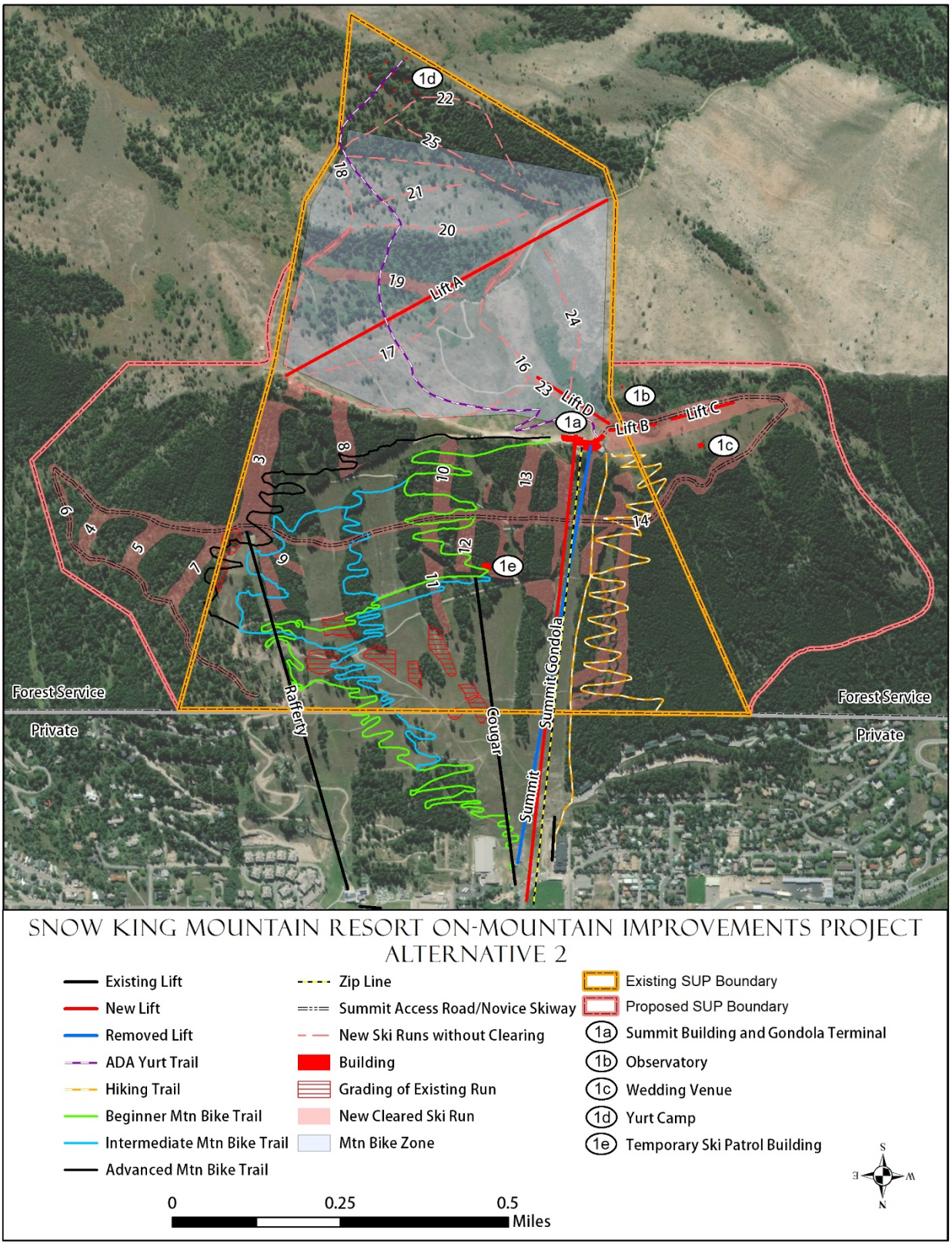

Figure 2-1. Alternative 2 – all elements except snowmaking, night lighting, and glading.

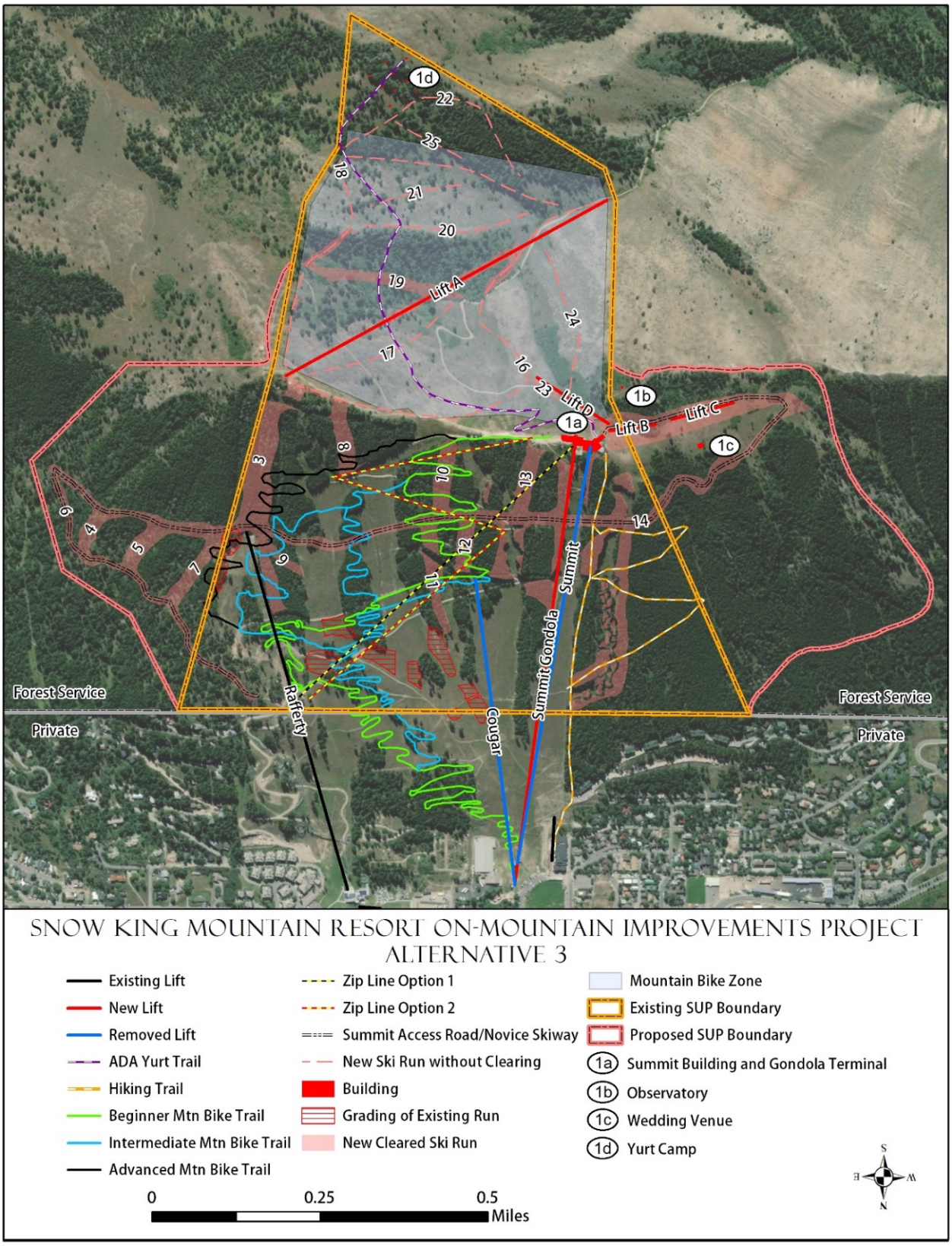

Figure 2-2. Alternative 3 – all elements except snowmaking, night lighting, and glading.

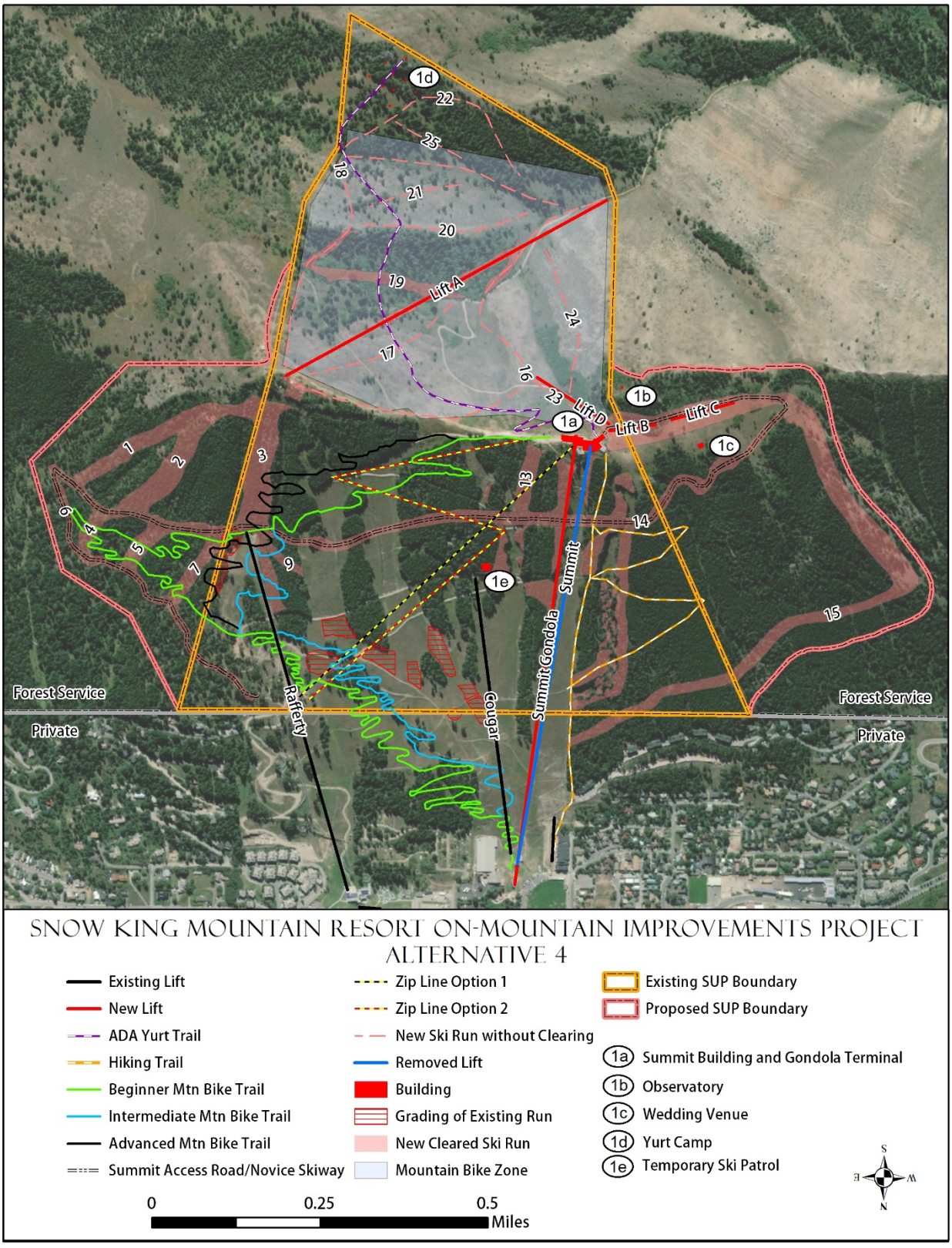

Figure 2-3. Alternative 4 – all elements except snowmaking, night lighting, glading, and thinning.

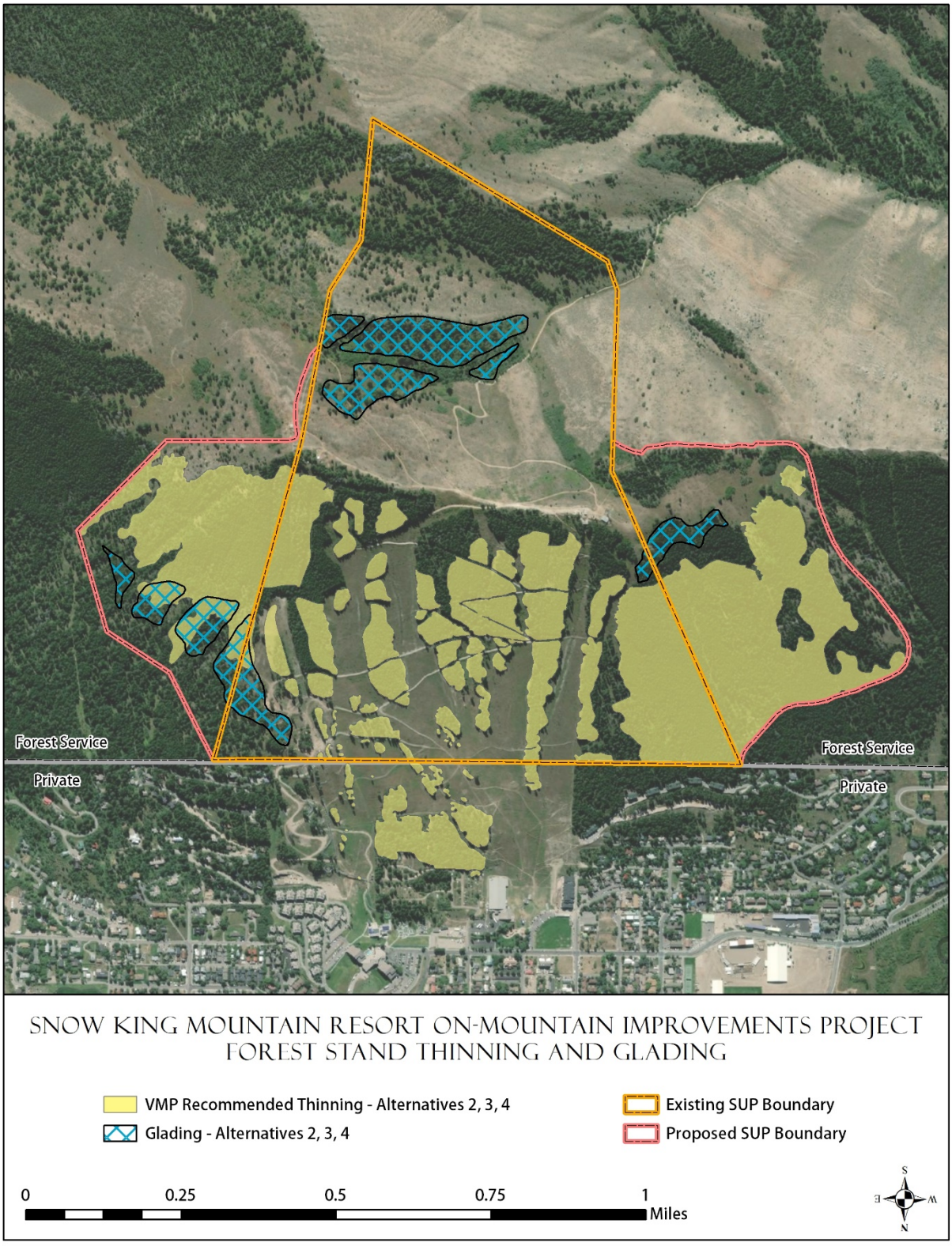

Figure 2-4. Glading and forest stand thinning for fuel fire protection and fuel reduction at the wildland/urban interface.

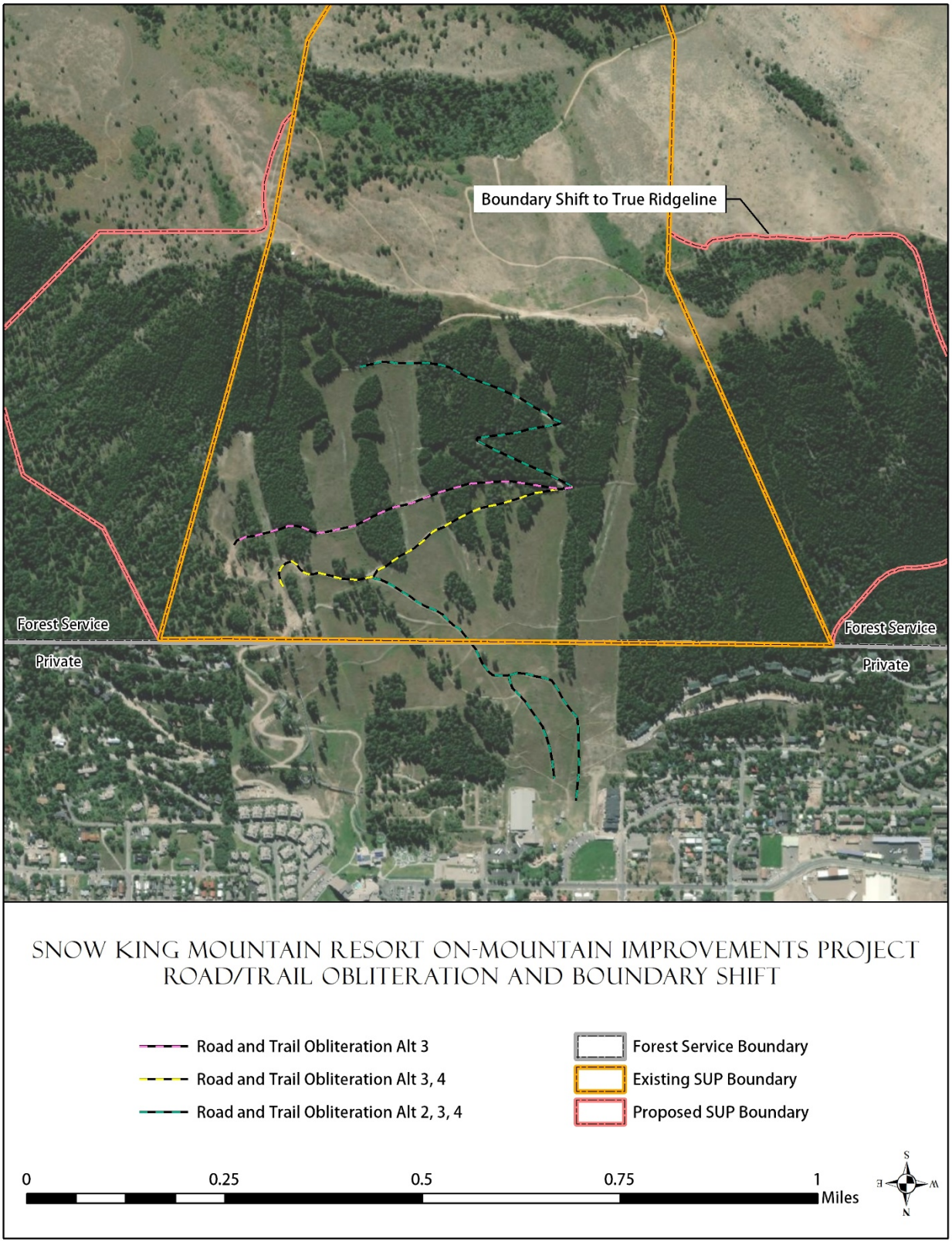

Figure 2-5. Obliteration of existing service roads and user-created trails.

2.4 ALTERNATIVE 2 - PROPOSED ACTION

The elements of the proposed action are described in detail below. Figure 2-1 illustrates proposed winter and summer infrastructure with the exception of lighting for night skiing and snowmaking which are described in text. The proposed permit area adjustments are also displayed. Proposed glading and forest stand thinning are shown on Figure 2-4 and proposed obliteration of existing service roads and user-created trails are shown in Figure 2-5. Construction of authorized elements would begin within 5 years following approval, but full implementation could take longer (see section 2.4.9 Timing, below).

Section 3.2 provides additional detail on the projected disturbance associated with each element of the proposed action. Table 3-1 in section 3.1 shows the basic dimensions of disturbance associated with various types of elements (e.g., lift towers or mountain bike trails). These dimensions were used in calculating element-specific disturbance areas in Table 3-2.

In the descriptions below the terms “run” or “ski run” refer to wider ski routes where the skier is moving primarily down the fall line. The term “skiway” refers to a narrower ski route where the skier is moving primarily across the fall line. The purpose of ski runs is recreation whereas the purpose of a skiway is access from one place to another. The term “trail” refers to a very narrow route that is used for hiking or biking, or both. As the term is used below, recreational use of trails occurs primarily in the summer.

2.4.1 SPECIAL USE PERMIT BOUNDARY ADJUSTMENT

Snow King proposes adjustments to both their operating boundary and their special use permit boundary. These boundary adjustments are necessary to 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 of beginner, novice, and low intermediate terrain. 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 Coombs Outdoors’ 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 increasing 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.

The existing permit boundary includes 142.5 acres south of the Snow King ridgeline which would be added to the operational ski area boundary. The proposed action would expand winter and summer operations, including lifts, ski runs, and a mountain bike park (see details below), into this currently permitted area.

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, glade skiing between these runs, and a beginner route down from the top of Rafferty lift via the summit access road/novice 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/novice skiway. Glading would open the forested area between the westernmost access road/novice 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 369 to 525 acres.

2.4.2 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 – 33.6 acres
- Low Intermediate – 4.1 acres
- Intermediate – 25.2 acres
- Advanced – 24.5 acres
- Expert – 26.5 acres

These new runs would total 117.8 acres (Figure 2-1). They would be cleared of trees and tall shrubs then graded where necessary to remove terrain irregularities and allow winter grooming.

2.4.2.1 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 2-1, Runs Lift-B and Lift-C) on the ridge, 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 33.6 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/novice 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 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 avoid the 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.

2.4.2.2 New and Modified Ski Runs

The next step in skier skill progression requires low intermediate terrain. Runs 4, 5, and 7 would provide 4.1 addition acres of low intermediate terrain in the eastern adjustment area, accessed from the summit or the top of Rafferty lift via the access road/novice 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 24.5 acres, comprising Runs 17, 21, 24 and 25 on the back side and modification of Moose run on the front side.

Additional expert terrain would include new runs 3 and 8–13 as well as modifications to widen and clear Belly Roll, Upper Exhibition, and Bearcat/Bearcat Glades and to improve skier access and circulation in the Summit pod. Collectively, these new runs and modifications of existing runs would comprise 26.5 acres of new expert terrain.

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 acre.
- 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 of 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.

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.

2.4.2.3 Glading

The northern exposure of the front side and extensive forest cover result in excellent opportunities to develop intermediate- 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.

This proposal includes glading on the back side (15.8 acres) and the east and west boundary adjustment areas on the front side (13.3 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 2015 *Snow King Mountain Resort Vegetation Management Plan* (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.

2.4.3 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 lower-level 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 to providing access to and from the summit, the access road/skiway would connect the top of Rafferty lift with the base area. There is currently neither an easy way down from the top of Rafferty for lower ability-level skiers nor road access for maintenance vehicles. The lack of an easy way down limits the utility of the Rafferty pod in offsetting Snow King's shortage of less difficult terrain. The absence of road access hampers effective lift maintenance.

As demonstrated in the MDP, options considered during the planning process attempted to keep the access road/novice 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, i.e., 10 percent or less, 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. (See section 2.7.3 Access Road Alternatives).

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 turns 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 minimizes impact in terms of disturbance area, visual effects, and impacts on existing ski terrain, since it simply crosses the face once, without any switchbacks within the current permit boundary.

2.4.4 LIFTS

2.4.4.1 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 or adjacent to the summit building described below, as would the gondola storage/maintenance shop.

The Summit lift would be upgraded to a 1,500 person-per-hour (pph) gondola. Note that this is maximum design capacity. Actual operating capacity would be managed to match demand by varying lift speed and number of cabins. The new lift 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, into Phil Baux Park, to improve access to the terminal.

2.4.4.2 Lift A

As depicted on Figure 2-1, 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.

2.4.4.3 Conveyor Lifts

Two conveyor carpets (Lifts B and 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.

2.4.4.4 Back-side Surface Tow

Lift D would be a surface tow (e.g., a platter or T-bar type) or carpet 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.

2.4.5 FACILITIES

2.4.5.1 Summit Building

Guest services (e.g., food/beverage service, restrooms, and basic retail sales), ski patrol facilities, 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, 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 set back from the skyline, and it would be designed and built in accordance with the Forest Service's *Built Environment Image Guide* (Forest Service 2007; https://www.fs.fed.us/recreation/programs/beig/) and its stipulations for the Rocky Mountain Province. It would employ dark sky designs and operating practices such as minimal exterior lighting, appropriate bulbs and downcast reflectors, no exterior lights on after operating hours, and non-reflective glass.

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.

Construction of this building would require removal of three existing summit structures: Panorama House, the ski patrol building (formerly the top drive building for the original Summit lift), and the observation deck (formerly the unloading dock for the original Summit lift).

2.4.5.2 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. Stargazing sessions generally would not begin before 10 PM.

2.4.5.3 Temporary Ski Patrol Building

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.

2.4.5.4 Yurt Camp

A new *Americans with Disabilities Act of 1990* (ADA) compliant yurt camp would be constructed on the back side at the far south end of the existing permit boundary. A 1-mile ADA compliant trail connecting to the summit of Snow King would provide access to this facility for construction, maintenance, and visitor entry. The yurt camp would consist of approximately six yurts for sleeping up to 40 overnight guests 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. Restrooms would be provided in the form of vault toilets; no piped water or electric power would be provided.

This year-round camp would serve backcountry skiers, hikers, bikers, and a wide range of groups. No commercial overnight accommodation would be offered, but overnight group activities would be accommodated. 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.

2.4.5.5 Wedding Venue

In conjunction with the summit building, a wedding venue would 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. A trail roughly 400 feet long, spurring off an existing trail, would be constructed to access the wedding venue from the Summit Building.

2.4.6 NIGHT SKIING

At present, Snow King offers 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. 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, Lift B and C terrain, and the proposed access road/novice skiway. At present, night skiing ends between 6:30 PM and 9:00 PM. Night skiing operations would continue to end by 9 PM. No night skiing is proposed on the back side. 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.

2.4.7 SNOWMAKING

Snow King's snowmaking system covers approximately 90 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. 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. This would result in approximately 147.7 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. At some point in the future, Snow King may investigate alternative sources of snowmaking water, including wells. However, this possibility is speculative and not covered in this analysis.

2.4.8 SUMMER ACTIVITIES

The Snow King MDP 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 2-1.

2.4.8.1 Zip Line

Expanding on current summer operations, Snow King proposes a zip line from the summit 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.

2.4.8.2 Downhill Mountain Bike System

Lift-served downhill mountain biking is among the fastest growing summer activities at mountain resorts in the US 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. In addition to these dedicated downhill mountain bike facilities, lift-served bikers would also have access to the existing Cache Creek/Game Creek trail system on National Forest System land within and adjacent to the ski area. They could also access the Forest Service portion of Leeks Canyon road below the permit area.

The front-side trails would include an advanced and a beginner 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. An easy trail connection would be provided from the top of Lift A to direct riders back to the top of the Summit gondola.

The front-side bike trail system would total about 6.5 miles, including approximately 1.8 mile of advanced trail (all on National Forest System land), 2.7 miles of intermediate trail (2.5 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.

The proposed trail designs are conceptual. The exact alignments, lengths, and difficulty levels of trails may change when developed to achieve desired grade and location with respect to existing, site-specific, terrain features. Intersections with existing cross-country trails would be designed to promote the safety of riders on both the existing and new trails (section 3.11).

2.4.8.3 Hiking Trails

Due to Snow King's close proximity to a fairly populated, residential area of the Town of Jackson, there has been long-standing local interest in maintaining an uphill hiking trail at the ski area. 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 a challenging workout ascending the mountain. In the winter months, this route would serve as the designated direct boot-pack ascent route.

In addition, a new approximately 1.5-mile uphill hiking trail to the summit would be developed just west of the Stairway trail in the Bearcat Glades area, extending into the western permit boundary adjustment 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.

2.4.8.4 Road and Trail Obliteration

Several existing mountain access roads and trails would be unnecessary once the summit access road/novice skiway was complete, and they would be obliterated. They include all but the uppermost portion of Elkhorn Trail as well as a lower service road and several user-created hiking and biking trails on the front side that pose resource-management concerns (Figure 2-5). These roads and trails total about 1.1 miles and would be progressively removed as associated elements are completed. Other user-created trails may be identified and obliterated as part of this process. All would be regraded to restore a more natural contour and revegetated.

2.4.9 TIMING

Implementation of these project elements is anticipated to begin within 5 years following authorization, but full implementation may take longer.

2.5 ALTERNATIVE 3

This alternative was developed to address the following environmental concerns associated with the proposed action while still meeting the proposed action's recreational opportunity objectives:

- The recreational effects of locating the bottom terminals of the proposed gondola and zip line in Phil Baux Park.
- The effects of lift-served mountain bike access to the summit of Snow King Mountain on the recreational experience of hikers and bikers using the existing Cache Creek/Game Creek trail system.
- The effects of proposed improvements on the eligibility of Snow King's historic landscape for listing on the National Register of Historic Places.
- The Bridger-Teton's concerns regarding fire protection within with fuel management and fire protection at the wildland/urban interface.

- The impact on skier safety of an additional road–the proposed summit access road/novice skiway–crossing the front-side ski runs.
- The impact on big game winter habitat on the back side of Snow King Mountain.
- The visual effect of additional infrastructure on the already highly developed front side of Snow King Mountain.
- The quality and sustainability of proposed Bearcat Glades hiking trail in terms of alignment, maintenance, and erosion control.
- The noise the proposed zip line might generate at the base area.

In response to these concerns, Alternative 3 alters elements under the headings of boundary adjustment, lifts, facilities, and summer activities relative to Alternative 2. Terrain development, summit access road/novice skiway, night skiing, and snowmaking coverage would remain the same as Alternative 2.

2.5.1 BOUNDARY ADJUSTMENTS

This alternative would shift the southern boundary of the western boundary adjustment area to the actual ridgeline (Figure 2-2) to reduce the amount of potential human activity visible to deer and elk wintering on the south-facing slopes of Leeks Canyon, west of the proposed back-side development. This would reduce the western adjustment area by 1 acre. An intervening sub-ridge visually screens the rest of the proposed back-side development from view. Under Alternative 2, this boundary extends about 100 feet further south, to the other side of the Snow King Mountain ridgeline.

2.5.2 LIFTS

2.5.2.1 Summit Gondola

The gondola bottom terminal would be moved from Phil Baux Park to the site of the current Cougar lift bottom terminal. Beyond this change, the gondola would remain as described above under Alternative 2, other than being slightly shorter in the shifted alignment. Access and utilities are already in place at the Cougar bottom terminal site. The site was previously disturbed. No further clearing would be required, as the minor widening of Exhibition run near the top on the east side, which would occur under Alternative 2, would accommodate the revised alignment.

This modification is intended to reduce adverse impacts on recreation at Phil Baux Park. Accessing the gondola from the parking lot would require a slightly longer walk.

2.5.2.2 Cougar lift

The Cougar lift would be removed and may be reinstalled on the back side as Lift A. Top and bottom terminals and lift towers would be removed. Tower bases would be demolished to below ground level. The top terminal and tower sites would be backfilled and restored. The Cougar lift would be configured to match the specifications outlined above under Alternative 2 if it were reinstalled as Lift A.

Access to the ski terrain currently served by the Cougar lift would be via the proposed gondola, which would provide a shorter ride time (4 minutes v. 7 minutes), in a warmer cabin, with increased safety and access to the Cougar terrain via the proposed summit access road/novice skiway. Once the existing access road to the top of Cougar was obliterated (discussed below under Summer Activities), the Cougar terrain would not be crossed by the road, providing uninterrupted runs and improved racecourses for the ski club.

Removal of the lift and access road are intended to reduce the visual effect of infrastructure on the front side of the mountain. Obliterating the existing access road is also intended to improve skier safety.

2.5.3 FACILITIES

A historic cabin built by the Civilian Conservation Corps near the summit of Snow King Mountain lies adjacent to the proposed ski school/teaching center on the ridgeline west of the summit. Under this alternative, the cabin would be developed as an interpretive center showcasing Snow King's history with photographs and other materials dating back to the early days of the ski area. The displays would include photographs of the historic layout of ski runs on the front side, helping to minimize the impact of the new runs in the historic landscape area proposed under this alternative.

If necessary to protect its historic integrity, the building would be moved to a site adjacent to the proposed observatory (see Alternative 2). The intent is to preserve this historic building as well as documenting the ski area's past. This building may be used as an interpretive facility to inform the public about the ski area's historic past. The proposed summit building may also include interpretive displays of the ski area's history.

2.5.4 SUMMER ACTIVITIES

2.5.4.1 Zip-line

The bottom terminal of the zip line would be moved from Phil Baux Park to the Rafferty mid-station area. Two options are proposed (Figure 2-2). The first is a straight line, single span from the summit to the mid-station. This would offer a similar experience to the zip line under Alternative 2, though somewhat less extreme. This realignment would change the total length of the zip line from 3,900 linear feet to 3,200 feet and the overall grade from 40 to 32 percent. The top terminal would be in the same summit location as under Alternative 2. The bottom terminal would be constructed on a previously cleared and disturbed site near the Rafferty mid-station, entailing about 0.15 acre of disturbance. Some tree clearing or topping would be necessary to meet clearance requirements on roughly the upper third of the alignment. No other infrastructure or disturbance would be required between the top and bottom terminals.

The second option would reflect a gentler, canopy-tour experience. This option was included in Snow King's MDP as a complement to the more extreme summit-to-base zip line, but it was not included in the proposed action. It would include three separate segments with a combined length of about 5,200 feet. Two intermediate terminals would connect the first segment to the second and the second to the third. Riders would move more slowly and at lower elevation through the forest canopy.

The top and bottom terminals would be as described above for the first option. The two intermediate terminals between the summit building and the Rafferty mid-station would each entail about 0.15 acre of clearing and disturbance. Additional tree clearing or topping may be required to meet clearance requirements along a substantial portion of the alignment. Construction of the intermediate terminals would entail the use of an excavator, and both sites are adjacent to roads. No infrastructure would be required between the paired terminals.

These options are intended to avoid adverse impacts on recreation at Phil Baux Park and reduce noise in the base area. The zip line experience would be less intense than under the proposed action.

2.5.4.2 Downhill Mountain Bike System

The front- and back-side downhill mountain bike trail system would remain basically the same under this alternative, but mountain bikers using the gondola to get to the summit would not be allowed access to the existing Cache Creek/Game Creek trail system or to Leeks Canyon road below the permit boundary. Methods used to implement this restriction within the downhill trail system would include:

1. Rider Information: Lift tickets for bikers would clearly state that access was restricted to the downhill trail system. Trail maps would clearly identify the downhill trail system and include clear warnings prohibiting lift-served bikers from leaving the downhill system. Signage at the top and

bottom of the lift and at trail intersections would identify designated downhill trails and repeat the warning that downhill bikers must stay on the downhill trail system.

2. Trail design: Downhill trail design would incorporate features to make it difficult for lift-served bikers to physically get onto existing cross-country trails. These would include providing only a single downhill mountain bike trail off the summit down the front side, resulting in only one access point to manage in order to keep lift-served bikers on the downhill trail system. An advanced downhill trail would spur off the beginner trail after it dropped from the ridge. Below that point, intersections with cross-country trails would be designed with approach angles and grades that made it difficult to leave the downhill trail. Intersections would be located in open, visible areas so infractions were more easily detected, and bridges or underpasses would be used as necessary to physically separate downhill trails at intersections.
3. Enforcement: Snow King's bike patrol and other operations personnel would enforce the closure and have the authority to pull the lift passes of bikers who violated the prohibition on leaving the downhill trail system.
4. Proactive change in allowed use of upper Skyline and Josie's Ridge trails: Upper Skyline trail between Ferrin's saddle and Snow King and Josie's Ridge trail would be closed to bike use in order to provide a clear separation between the intensive bike activity within the ski area and the desired less-intensive, more nature-based experience outside of the ski area. Barriers would be installed to clearly establish this closure.

The ski area, with assistance from the Bridger-Teton and partner groups, would monitor the effectiveness of these measures in avoiding user conflicts and trail damage in the Cache Creek/Game Creek trail system and identify additional measures as necessary. Snow King would be responsible for repair of any damage to Cache Creek/Game Creek trails caused by lift-served bikers leaving the downhill trail system.

2.5.4.3 Hiking Trails

Under this alternative, the new hiking trail included in Alternative 2 in the Bearcat Glades area would be realigned to start at the junction of Sink or Swim trail and Stairway trail then climb at 18 to 20 percent for about 1.2 miles, tying into Stairway trail at alternate switchback points (Figure 2-2). Rather than including a series of tight, stacked switchbacks, this alternative alignment would extend this trail out at grade further and follow more natural contours, with less excavation required, to provide the main hiking access to the summit. The intent is to reduce the amount of new construction, erosion potential, and visual impact of the trail.

2.5.4.4 Forest Stand Thinning

In accordance with the *National Forest Ski Area Permit Act of 1986*, permitted ski areas must maintain a vegetation management plan documenting how forest vegetation in the permit area will be maintained to provide for safe recreation, fire protection and fuel management, and forest health. In 2016, Snow King prepared a vegetation management plan (Western Bionomics 2016), and it was accepted by the Bridger-Teton. The plan breaks the forest vegetation in and around the ski area into five strata and identifies appropriate management treatments for each stratum. For strata 1, 2, and 5, which cover a substantial portion of the permit area, thinning of trees is recommended (Figure 2-4). These thinning recommendations would be implemented under Alternative 3 and comprise 154.2 acres (includes 6.2 acres that overlap proposed glading).

Note that the thinning prescriptions are similar to what would be done to complete the glading described above (section 2.4.2.3) and that thinning would overlap 6.2 acres slated for grading. The distinction between these elements is maintained because they stem from two different needs (i.e., the ski area's desire to provide additional tree skiing and the vegetation management plan's broader objectives including improved forest health, skier safety, and reduced fire hazard).

In terms of fire hazard reduction, the ski area lies within the designated Teton County wildland/urban interface zone, and the *Teton County, Wyoming, Community Wildfire Protection Plan* (CWPP; Teton Area Wildfire Protection Coalition 2014) was developed to help manage wildfire threat in the interface zone. Snow King's permit area falls within Priority Areas 2 and 3 designated in the CWPP, and thinning dense tree stands, as well as removal of dead and down fuel, is recommended as a fuel reduction treatment in these zones. Accordingly, the proposed thinning would help meet CWPP objectives.

2.5.4.5 Road and Trail Obliteration

Alternative 3 would allow another 0.9 mile of service roads to be obliterated, in addition to the 1.1 miles proposed under Alternative 2 (Figure 2-5). These would include all of Fast Trail and most of Slow Trail. These roads and trails would no longer be necessary once the Cougar lift was removed as proposed. They would be regraded to restore a more natural contour and revegetated. Other user-created trails may be identified and obliterated as part of this process.

These efforts are intended to reduce the visual effect of infrastructure on the front side of the mountain and improve skier safety by reducing road and trail crossings.

2.6 ALTERNATIVE 4

This alternative was initially developed to emphasize resource protection rather than full achievement of the recreational opportunity objectives of the proposed action. As described in the Draft EIS, it addressed more aggressively the concerns driving Alternative 3, particularly impacts on Snow King's historic landscape and the existing Cache Creek/Game Creek trail system and its users. This alternative also responded to the following, additional concerns identified through scoping, community input, and internal, interdisciplinary review:

- The impact and sustainability of proposed biking trails on the front side in terms of location, maintenance, and erosion control.
- The effects of development in the eastern boundary adjustment area and associated infrastructure and use on goshawk habitat.

As modified in this Final EIS, Alternative 4 maintains its initial focus, but it reflects these additional inputs: the outcome of consultation on the historic landscape regarding the effect of new ski runs; ongoing concern expressed in comments on the Draft EIS regarding management of lift-served mountain biking, protection of specialized elk and deer habitat in Leeks Canyon, and Cougar lift removal; new data on goshawk habitat use; and public interest in eBiking opportunities.

In response to these concerns, Alternative 4 alters specific elements under the headings of terrain development, lifts, snowmaking coverage, and summer activities relative to Alternative 3, as described below. Boundary adjustment, summit access road/novice skiway, facilities, and night skiing would remain the same as Alternative 3.

2.6.1 TERRAIN DEVELOPMENT

As developed in the Draft EIS, this alternative would drop development of all proposed runs within or adjacent to the eligible historic landscape (i.e., runs 3 and 8–12; 13.8 acres) with the exception of the proposed widening of Bearcat and Belly Roll runs and development of the new run 13 (Figure 2-3). These proposed runs were kept in this alternative to provide sufficient run capacity from the top of the new Summit lift, but the overall intent was to reduce impacts on the eligible historic landscape. To provide needed access down the front side from the top of proposed Lift A, runs 1 and 2 from the accepted MDP would be developed, dropping from near the top terminal of Lift A to the proposed summit access road/novice skiway, well outside the historic landscape.

This alternative also added another run, included in Snow King's accepted MDP as run 15, which roughly follows the outside boundary of the western boundary adjustment area. Run 15 is intended to provide a route back to the base area for skiers taking advantage of the thinned forest in the boundary adjustment area (see thinning discussion under Alternative 3, Summer Activities above). It would also provide a safe and reliable egress route for ski patrol evacuations; support the Bridger-Teton's fuel reduction and fire protection efforts at the wildland/urban interface by providing a fire break between the National Forest and adjacent parts of the Town of Jackson; and reduce intrusions onto private property adjacent to the ski area by skiers continuing too far down the slope.

The alignment of Run 15 was shifted slightly up slope from what was depicted in the MDP to minimize crossings of existing trails (i.e., one crossing of Sink or Swim, and no crossings of Shade Monkey) and to further buffer adjacent private property. The trail would add 13.7 acres to the new, developed ski terrain.

Alternatives 2 and 3 also call for clearing of three conventionally cleared ski runs (Runs 4, 5, and 7, comprising 4.1 acres of low intermediate terrain) in the eastern boundary adjustment area, connecting the two legs of the summit access road/novice skiway. Under Alternative 4 in the Draft EIS, this terrain would have been gladed rather than cleared. The intent was to reduce impacts on post-fledging goshawk habitat and the visual impacts of terrain development adjacent to Snow King's historical landscape.

Terrain development under this alternative has been modified as follows in this Final EIS. As discussed in section 3.7, National Historic Preservation Act consultation addressing impacts on Snow King's historic landscape indicated that new ski runs that did not change the basic configuration of the historic front-side runs would not adversely affect the historic landscape. In light of this determination, runs 3 and 9, east of the historic landscape, have been added to this alternative to improve access down the front side from the top of proposed Lift A and reduce avalanche risk to Rafferty lift through skier compaction of snow above the lift.

Also, new data has allowed more in-depth analysis of potential impacts on the goshawk pair that has historically nested in or near the eastern boundary expansion area. This analysis (section 3.6.2.2.9) indicates that both core nesting habitat and post-fledging habitat for these goshawks are far more extensive than previously believed. As a result, runs 4, 5, and 7 would affect a much smaller percentage of these key habitats than indicated in our initial analysis. Since these three runs provide important low intermediate terrain on the front side, accessible from both Rafferty lift and the summit access road/novice skiway, this alternative was modified to allow clearing rather than glading of these runs.

In summary, as modified, this alternative would develop runs 1–7, 9, and 13–25. With Lift B and C terrain and modifications of Moose, Belly Roll, Upper Exhibition, and Bearcat, this would bring the amount of new, developed ski terrain to 133.6 acres.

2.6.2 LIFTS

Based on comments on the Draft EIS, this alternative has been modified to retain the Cougar lift in place to provide access to lower-elevation terrain on Snow King's front side that is used for race training programs as well recreational use by those who choose not to ski from the summit. This would require shifting the Cougar bottom terminal up the lift alignment approximately 250 feet (Figure 2-3) to avoid interference with the new gondola bottom terminal.

2.6.3 SNOWMAKING COVERAGE

Reflecting terrain-development modifications described above (section 2.6.1), this alternative would add snowmaking on the lower, east-west running portion of run 15 (6.5 acres) and eliminate the need for snowmaking coverage on runs 8, 10, 11, and 12, which would not be developed. These runs total 6.4 acres. These changes would bring the total new system coverage to 147.2 acres, virtually the same as Alternative 3.

2.6.4 SUMMER ACTIVITIES

2.6.4.1 Downhill Mountain Bike System

As developed for the Draft EIS, this alternative would have included Alternatives 3's stipulation that mountain bikers using the gondola to get to the summit would not be allowed access to the existing Cache Creek/Game Creek trail system or to Leeks Canyon road below the permit boundary. It would also have eliminated the mountain bike trail system proposed under Alternatives 2 and 3 and replaced it with a front-side-only trail system totaling about 5.6 miles, including approximately 1 mile of advanced trail (all on National Forest System land), 1.3 miles of intermediate trail (0.9 miles on National Forest System land), and 3.3 miles of beginner trail (2.1 miles on National Forest System land; Figure 2-3). These trails would be accessed from the Summit gondola and end near the gondola base, passing through mostly forested terrain. There would be only one crossing of the popular Sink or Swim hiking and biking trail. Similar to Alternative 3, lift-served mountain bikers would not be allowed access to the existing hiking and biking trail system, but there would be no change in allowed use of upper Skyline and Josie's Ridge trails.

The beginner trail would run east through the eastern boundary adjustment area then cross west under the Rafferty lift and drop to the bottom of Rafferty lift. The intermediate trail would generally follow the fall line down Rafferty then parallel the beginner trail to the bottom terminal of the gondola. The advanced trail would branch off the beginner trail below the summit, then run above the beginner trail to near the top of Rafferty lift. At that point, it would drop down to join the intermediate trail above the Rafferty mid-station. The back-side mountain bike zone was not included.

This alternative mountain bike system was intended to: 1) address concerns associated with lift-served mountain biking from the summit, 2) reduce the number of intersections with existing front-side hiking and mountain-biking trails, and 3) reduce the construction, maintenance, and visual impact of the new front-side mountain bike trails by developing fewer trails and constructing them on lower-angled terrain in forested areas. If experience indicated that the downhill trail system could be managed without adverse effects on recreation and other resources, the back-side mountain bike park could be proposed and potentially authorized, subject to NEPA review.

Overall, the Bridger-Teton was not satisfied that the alternatives addressed in the Draft EIS effectively addressed the potential effects of lift-served mountain biking from the summit on the existing Cache Creek/Game Creek trail system and its users (section 3.10.3.3). The analysis identified both positive and negative impacts of lift access on the existing trail system, so it was unclear whether lift-served bikers should be confined to Snow King's downhill trail system or not (section 3.10.3.3.2). Beyond that, it was not possible to predict whether measures such as rider information through various means, trail design, bike patrol enforcement, or changes in allowed use of existing trails (section 3.10.3.3.3) would be effective in avoiding adverse effects on the trail system outside the ski area boundary or if more definitive measures such as elimination of the back-side mountain bike zone (section 3.10.3.3.4) would be necessary.

Based on these considerations, Alternative 4 was modified to include an adaptive management approach, incorporating the range of management options considered under all action alternatives addressed in the analysis. This approach centers on phased development guided by ongoing monitoring and implementation of responsive management actions. Specific terms are as follows.

- Access to the existing trail system: Emphasis would be on minimizing adverse effects on the existing Cache Creek/Game Creek trail system by managing rather than precluding lift-served bike access to it. Management would prioritize engineering and design of Snow King's downhill mountain bike infrastructure, then rider education, and then enforcement if necessary. The existing trail system would not be closed to lift-served riders unless experience demonstrated that was necessary.
- Back-side mountain bike zone: Development of mountain bike infrastructure on the back side would be authorized within the framework of adaptive management.

- Phasing: Development of mountain bike infrastructure would occur incrementally. Snow King would prepare an agency-approved trails master plan addressing the construction and operation of these trails. The scope of subsequent development phases would be determined by Snow King and the Bridger-Teton on the basis of experience to date.
- Monitoring: Snow King would work with the Bridger-Teton and local stakeholders to identify and monitor objective indicators of adverse effects on the existing trail system and users. These indicators could include, but not be limited to, type and magnitude of trail damage, numbers of bike lift passes sold, numbers of users of Snow King's downhill trail system, number of users of the existing cross-country trail system, and number of user conflicts and injuries reported on the existing trail system. Snow King would be responsible for conducting monitoring or arranging for other parties to assist.
- Operating Plans: Snow King and Bridger-Teton representatives would meet prior to the first operating season and annually following each subsequent season to develop and then revise annual operating plans. Planning would be based on review of monitoring data to identify management issues then identification of responsive management actions to address those issues in the subsequent year's operating plan.
- Management actions: Actions to be considered would include, but not be limited to, passive actions (e.g., trail design, signage, rider notifications on tickets and trail maps), more active measures (e.g., bike patrol enforcement, ticket confiscation, barrier construction, changing authorized use of existing trails), or revocation of Snow King's mountain bike trail system authorization.

2.6.4.2 eBike Use

This alternative would allow the use of eBikes (electronic mountain bikes) on trails within Snow King's permit boundary that are open to mountain bikes if Snow King requested that authorization in the future. Use would be subject to the same operating terms as mountain bikes. eBikes are growing rapidly in popularity, and the Forest Service is in the process of developing policy on their use on trails where motorized vehicles are not authorized. Their use at Snow King would provide an additional summer recreational opportunity in a limited, controlled setting that allowed assessment of their impacts and management options.

2.6.4.3 Road and Trail Obliteration

Under this alternative, the same roads and trails would be obliterated as under Alternative 2, and Fast Trail would also be obliterated. Slow Trail would be retained to support Cougar lift operations, as it would be left in place. This would result in 1.5 total miles of road and trail obliteration.

2.6.5 WINTER BOUNDARY MANAGEMENT

Comments on the Draft EIS expressed on-going concern regarding the potential for lift access on the back side to affect elk wintering in Leeks Canyon west of the ski area permit boundary. Specifically, because Lift A would offer a shorter hike out, more skiers may leave the ski area from the ridge, along the southern edge of the western boundary adjustment area, to ski down into Leeks Canyon. As discussed in section 3.6.2.4.1, this area includes elk winter range and a winter wildlife closure area.

To address this concern, this section of the permit boundary would be shifted to the actual ridgeline, as under Alternative 3, to provide a buffer between summit development and use and the winter habitat lower on the slope. The permit boundary would be marked and signed with language noting the sensitive wildlife habitat below.

2.7 ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DEPTH

The following alternatives were suggested in scoping comments but will not be carried into in-depth analysis for the reasons noted. It is important to note that, in accordance with our NEPA regulations (FSH 1909.15, sec. 14.4), these alternatives are part of the range of alternatives considered in this analysis.

2.7.1 NO BOUNDARY ADJUSTMENT OR LIMITED BOUNDARY ADJUSTMENT ALTERNATIVES

Numerous scoping commenters requested an alternative the precluded any boundary adjustment or alternatives that dropped the south or west adjustment. These included "net-zero" alternatives and detailed "balanced" and "wildlife" alternatives suggested by the Jackson Hole Conservation Alliance.

These alternatives were considered but not carried into in-depth analysis because of the fundamental purpose and need for the proposed action, which can be outlined as follows:

- The ski area needs high-quality beginner and intermediate terrain to meet the needs of the current skier market;
- The only suitable location for developing sufficient terrain of this type is the summit and the back side of Snow King Mountain;
- The lift serving this terrain must be easily downloadable to get beginner skiers to and from the summit;
- Given the distance between this new terrain and base-area skier services, new service facilities are required on the summit;
- Construction and maintenance of those facilities requires an access road and an "easy way down" from the summit for beginner skiers in the event of a lift failure is a necessity. The access road and novice skiway have similar design requirements and are logically collocated;
- The ski area has comprehensively identified and assessed options for the necessary access road/novice skiway, and the proposed alignment was identified as the only viable option; and finally;
- Industry wide, mountain resorts are developing summer recreation options in response to visitor expectations, climate change, and generation of sufficient operating income, and Snow King is no exception.

In terms of a no-adjustment or limited adjustment alternative, the east and west boundary adjustments are necessary to accommodate the access road/novice skiway, which would otherwise have to switchback continuously up the front side, within current permit and historic landscape boundaries, causing significant impacts in terms of soil disturbance, habitat fragmentation, skier safety, and visual quality. Beyond that, as a result of the continuous switchbacks it would not function well as either an access road or a novice skiway.

The southern addition, which involves land already within Snow King's special use permit boundary, is necessary to provide intermediate terrain – the next step up for beginners using the summit terrain. The main reason commenters cited for an alternative with no southern addition was concern over impacts on specialized wildlife habitat, particularly deer and elk winter and fawning/calving habitat and wildlife migration routes. However, initial investigations indicated that while specialized habitat does occur in the vicinity, the actual area proposed for development does not include any. The EIS does address potential impacts on specialized habitats in the area, but we concluded that was not an issue warranting a no-southern-expansion alternative.

In short, the suggested no-boundary-adjustment or limited-adjustment alternatives were not carried into in-depth analysis because they do not meet the purpose and need for action in terms of providing lower-level ski terrain and summit egress and, in the case of the southern addition, there is no alternative-driving issue.

2.7.2 ACCESS ROAD ALTERNATIVES

2.7.2.1 No New Road

Several commenters suggested an alternative with no new road, generally in conjunction with improving the existing road and down-sizing the summit building. These alternatives were not carried into in-depth analysis because, in addition to being inconsistent with purpose and need as outlined above, the existing road does not meet the need for an "easy way down" from the summit or from the top of Rafferty lift and is too steep for construction traffic. In addition, the erosion potential and maintenance costs of the existing road are high.

2.7.2.2 Use of Leeks Canyon Road

Many commenters suggested using the existing Leeks Canyon road, with improvements as necessary, to access the summit. This alternative was not carried into in-depth analysis because the Leeks Canyon road does need meet the need for an "easy way down" from the summit to the base area and because it crosses private land not owned by Snow King, so use could not be ensured.

2.7.2.3 "Briggs Road" Alternative

A number of commenters suggested extending the existing service road (Slow Trail) from near the top of Cougar lift up to Scotty's Ridge, where two steep switchbacks would merge it into the alignment of the proposed summit access road/novice skiway just below the ridge. This alternative, known as the Briggs Road, was considered but not carried into in-depth analysis in the Draft EIS; our initial review indicated that due to the topography an alignment at 10 percent grade, which is required for a novice skiway, could not be achieved.

Comments on the Draft EIS indicated substantial public interest in the Briggs Road alternative remained, so we took a harder look at it. The primary benefit cited by those suggesting this alternative was eliminating the need for the eastern boundary adjustment.

Snow King engaged an engineering firm to evaluate this alternative alignment (Nelson Engineering 2020). A Bridger-Teton engineer reviewed that evaluation then conducted a site visit to validate its findings (Forest Service 2020). The Nelson Engineering evaluation, which also addressed a straight-line alignment to the ridgeline without the two switchbacks, concluded:

> In Nelson Engineering's opinion, neither route provides a reasonable means to access the summit due to the impacts at each switchback that would be required, the severity of the slopes east of Scotty's Ridge, and because the profile of the routes will not meet the goal of meeting 8-12% grade for intermediate skier use as a means to ski down from the summit. Neither route was designed to a final construction level but our study and analysis revealed to us that the routes are impractical.

Our engineer, whose background is in road engineering, concurred with this determination following his site visit.

Nelson Engineering's evaluation also noted that retaining walls up to 40 feet high would be required above and below each of the two switchbacks. This would make the project extremely expensive to design and construct. Beyond that, the retaining walls would be a visually striking human-made feature on the currently natural landscape of the eastern boundary adjustment area, visible at valley viewpoints from the Wilson junction to Moran Junction to the Elk Refuge.

The evaluation determined that the Briggs Road alignment would require grades up to 15 percent. This would be steeper than proposed alignment (average 10 percent but up to 12 percent on steepest section), and a number of commenters questioned the safety of novice skiers on that skiway. This grade would also be challenging for construction and maintenance vehicles.

The other safety concern raised by commenters was the impact on skiers crossing the proposed summit access road/novice skiway on the expert, front-side runs. This was also a recreational concern. However, while the Briggs Road alignment would cross these runs somewhat lower on the slope, it would not reduce the number of crossings.

In terms of functionality, the Briggs Road alignment would not provide vehicle access to the top terminal of Rafferty lift, so maintenance would continue to be difficult. It would also not provide an easy way down for beginner and novice skiers, which is an ongoing constraint to effective use of the Rafferty pod. To meet these functions, the proposed alignment, and thus the eastern boundary adjustment, are necessary.

In summary, the Briggs Road alternative would not meet the purpose and need for summit access and a novice skiway because of its steepness, nor would it provide needed maintenance access to–or an easy skier route down from–the top of Rafferty lift. It also would not notably reduce many of the resource impacts of concern to commenters who suggested the alternative. Finally, the expense of building the required switchbacks would likely be prohibitive. Based on these considerations, the Briggs Road does not constitute an alternative warranting further analysis.

2.7.2.4 Other Alignments

Some commenters suggested an alignment within the current permit boundary, including options identified in past master plans. These options were not carried into in-depth analysis because, as noted above and in the scoping notice, we assessed such alternatives and concluded that alternative routes within the existing permit boundary did not provide appropriate grades for both construction access and a novice skiway. Beyond that, they would generate the adverse environmental effects noted above (section 2.7.2).

One commenter asked for an alternative that included limiting uses of the access road/novice skiway and identification of avalanche control measures to be used where it crosses new terrain. This alternative was not carried into in-depth analysis because the proposed action already limits motorized vehicle use of the proposed access road/novice skiway to the purposes outlined in the scoping notice. The EIS does address avalanche hazard (see section 3.11).

Some commenters suggested using Leeks Canyon Road for construction and improving the existing front-side road as a skiway. This alternative was not carried into in-depth analysis because, as discussed above, the existing road does not meet the need for an “easy way down” from the summit or from the top of Rafferty lift.

2.7.2.5 Skiing Between Switchbacks

Commenters suggested authorizing the proposed summit access road/novice skiway but not allowing skiing between the switchbacks in the east and west boundary adjustment areas. This alternative was not carried into in-depth analysis because closing this terrain would create substantial boundary management issues and because the proposed runs in the eastern area would provide much of the needed lower intermediate ski terrain necessary to meet purpose and need.

2.7.3 GONDOLA ALTERNATIVES

Most of the gondola alternatives identified through scoping are addressed by Alternatives 3 and 4’s removal of the Cougar lift and relocation of the bottom gondola terminal to the current location of the Cougar lift bottom terminal. Other alternatives suggested were as follows.

One commenter suggested including a mid-station on the gondola to provide easy access to the lower slopes. This alternative was not carried into in-depth analysis because, given the steepness of the slope, the amount of earthmoving necessary to construct a mid-station would be prohibitive.

Some commenters suggested a high-speed quad, perhaps with covered chairs, rather than a gondola. This alternative was not carried into in-depth analysis because a high-speed quad would not accommodate non-skiing riders, diverse weather, and night use as well as a gondola, and these are important functions of the proposed lift.

Other commenters suggested a tram rather than a gondola. This alternative was not carried into in-depth analysis because no clear benefits were cited or are evident to us, and trams typically require longer wait times, have lower capacity, and cost more.

2.7.4 Lift A Alternatives

Commenters suggested a shorter T-bar lift, without snowmaking, used only when natural snow was sufficient, with existing roads providing a return route to the "Saddle." This alternative was not carried into in-depth analysis because a T-bar would not accommodate mountain bikes, and it would not provide access to the desired beginner and intermediate terrain. The need for snowmaking is addressed in the description of the proposed action.

Commenters also suggested not building Lift A and allowing only human-powered activities on the back side. This alternative was not carried into in-depth analysis because it would not provide the lower-level ski terrain necessary to meet purpose and need.

2.7.5 Mountain Bike Trail Alternatives

Commenters suggested an alternative mountain bike trail system beginning at the Rafferty mid-station, and internal review identified a potential alternative trail system from the top of Rafferty. These alternatives were not carried into in-depth analysis for three reasons. First, we believe a mountain bike trail system starting at the Rafferty mid-station would be too short to be a viable attraction. Second, the mid-station area is already highly developed and heavily used due to the siting of the ropes course, alpine slide, and mountain coaster. Third, as a result of those summer activities at the mid-station area, most Rafferty lift riders unload there, requiring the lift to slow or stop. Accordingly, lift capacity and ride time would both preclude the lift being able to support an added mountain bike trail system.

2.7.6 Zip Line Alternatives

Commenters suggested alternative zip line alignments, specifically adjacent to the proposed gondola on the east side, and adjacent to the Rafferty alignment. In negotiations with the Town of Jackson, Snow King agreed to avoid the western base area entirely, precluding the alignment east of the gondola. The terrain traversed by the Rafferty alignment is not suitable for a single-span zip line due to topography. There would not be sufficient ground clearance along the middle of the alignment.

2.7.7 Beginner Area Alternatives

Some commenters suggested locating the beginner area in Rafferty pod or elsewhere on the lower front side rather than on the summit, particularly because of concerns about wind, other inclement weather, and snow accumulation at the summit. Examples include the Rafferty area, the Turnpike run, or vacant land behind the Snow King Resort Hotel. These alternatives were not carried into in-depth analysis because the summit area offers more appropriate topography on the wide, gently sloped area west of the summit, a longer season with good snow conditions due to elevation, more warmth and sun exposure, and better separation from more advanced skiers than lower-elevation, front-side options.

The front-side alternatives are limited in area, too steep (e.g., the Rafferty area), and intermixed with more advanced terrain which would create safety issues. The fact that base-area infrastructure was built on potential beginner terrain in the past is really not relevant to current needs.

2.7.8 SUMMIT BUILDING ALTERNATIVES

Some commenters suggested a smaller summit building, including an upgraded Panorama House. These alternatives were not carried into in-depth analysis because they are not consistent with the rationale for the proposed facility as presented in the proposed action description (section 2.4.5.1), and because of the small size and deteriorated condition of the Panorama House.

Commenters also suggested that a park be provided at the summit building site, with picnic tables. This use would be consistent with proposed functions for the summit building and would not require additional infrastructure. As a result, this suggestion was not carried into in-depth analysis.

2.7.9 OBSERVATORY ALTERNATIVE

One commenter suggested an alternative observatory site on East or West Gros Ventre Butte. This alternative was not carried into in-depth analysis because we did not believe that these locations would complement or be supported by proposed development on the summit of Snow King.

2.7.10 WILDLIFE PROTECTION ALTERNATIVES

2.7.10.1 Obliteration of Leeks Canyon Road

Some commenters suggested decommissioning and obliterating the portion of Leeks Canyon Road that is on the National Forest to reduce the likelihood of skiers leaving the ski area and traveling down canyon, disturbing wintering wildlife and finding no legal egress at the bottom. This alternative was not carried into in-depth analysis because the road serves on-going uses, particularly providing access to an important communications site on the ridge. The site operator has a road easement across private and National Forest System land.

2.7.10.2 Fencing Wildlife Closure Boundaries

Also, to protect wintering wildlife, some commenters suggested installing permanent fences where the ski area permit is in close proximity to established wildlife closure areas. This alternative was not carried into in-depth analysis because hard fencing is not a normal Forest Service practice when there are alternative ways to control access. Permitted ski areas typically use rope lines, signage, and ski patrol to keep skiers away from closed areas, and we believe these measures will provide sufficient protection in this situation.

2.7.11 LYNX ALTERNATIVE

The US Fish and Wildlife Service spelled out an alternative based on reducing potential effects on Canada lynx:

> Due to the potential impacts to lynx and lynx habitat as a result of implementation of the proposed recreation activities, we recommend the EIS include at least one alternative implementing the following the NRLMD human use guidelines for developed recreation: HU Gl (maintaining inter-trail islands), HU G2 (providing lynx nocturnal foraging opportunities), HU G3 (lynx movement and habitat effectiveness), and HU G10 (maintaining security habitat when expanding ski areas and trails). Adopting these guidelines would ensure the proposed activities are designed to minimize the fragmentation of lynx foraging and denning habitat. Reducing the number of new graded/cleared areas, ski runs, bike trails, hiking trails, and buildings within currently contiguous lynx foraging and denning habitats would also reduce the fragmentation of lynx habitat. Alternatively, these Project-related activities could be moved to areas that do not contain lynx

> habitat. In addition, we recommend the Forest minimize the footprint of new lighted, night ski areas, especially in or adjacent to blocks of contiguous lynx habitat to give lynx the opportunity to forage at night. By implementing these measures, the Forest will appreciably reduce the impacts to lynx, lynx denning and foraging habitat, as well as, designated lynx critical habitat within in the Project area.

The EIS and associated biological assessment address lynx impacts in accordance with established lynx management protocols, and Northern Rockies Lynx Management Direction (NRLMD) is addressed as appropriate regardless of the alternative. We appreciate this information but do not believe that a lynx-specific alternative is necessary to incorporate it.

2.7.12 TERRAIN PARK EXPANSION

Commenters suggested expanding the existing terrain park into the Rafferty and Old Man's Flats areas. This alternative was not carried into in-depth analysis because neither Snow King's proposal nor internal agency review indicated a need for such expansion, and the commenters did not provide any rationale for the suggestion.

2.7.13 ALTERNATIVE MANAGEMENT

Some commenters suggested that the Town take over management of the resort and design their own, taxpayer-funded improvements. This alternative was not carried into in-depth analysis because Snow King operates on National Forest System land, under Forest Service special use permit, issued to the current permittee. As a result, this alternative is outside the scope of this EIS.

2.7.14 STAKEHOLDER GROUP DEVELOPMENT SCENARIOS

In spring of 2018, a local stakeholder group conducted six working sessions to develop several scenarios for the future of Snow King Mountain that balanced community interests. The group included 16 representatives of the Town of Jackson, Snow King, and the community. Four scenarios were developed, and each was intended to be a comprehensive, integrated package. "Cherry picking" from them to develop other scenarios was discouraged. These scenarios involved on-mountain as well base-area development; seven of the 14 elements included in these scenarios fell in each of these categories (Snow King Mountain Stakeholder Group 2018).

Based on the on-mountain elements of these scenarios, Snow King amended their 2017 master plan then formulated their June 5, 2018, proposal. We accepted the amendment (Forest Service 2018) and subsequently considered these on-mountain elements in formulating alternatives for this EIS.

As noted, there were seven on-mountain elements in these scenarios. Three of these elements did not vary across the four scenarios:

- A summit gondola landing in Phil Baux Park.
- A multi-function summit building accommodating the needs of locals and visitors.
- Front-side trails, including the re-constructed Staircase trail and the new summit hiking trail as well as mountain bike zone accessed from the Rafferty lift mid-station.

The gondola bottom terminal was located in Phil Baux Park under the proposed action but shifted uphill onto private land to avoid impacts on the park under Alternatives 3 and 4. The proposed action and all action alternatives include the same multi-function summit building. As explained below (section 2.7.5), a mountain bike trail system accessed from the Rafferty mid-station was considered but not carried into in-depth analysis.

The remaining four on-mountain elements differed among the four stakeholder scenarios as follows:

- Zip line. Scenarios A and B include no zip line. Scenario C calls for a zip line paralleling the gondola, on the east side. Scenario D includes a zip line adjacent to the Rafferty lift.
- Summit access road/novice skiway and associated boundary adjustment. Scenarios A–C include the proposed access road/skiway and east and west boundary adjustments but without the proposed front-side ski terrain development. A and C allow skiing between the switchbacks. B does not. D calls for a new access road/skiway within the current boundary, without boundary adjustments.
- Summit teaching center terrain. Scenarios A and C provide for minimal expansion to accommodate a carpet lift and "facilities." B and D do not include any expansion on the summit.
- Back-side development. Scenarios A, C, and D match Snow King's proposal. B includes the proposed development but only for human-powered activities and the yurt camp.

With the following exceptions, all elements of these scenarios were reflected in alternatives analyzed in depth, including the no-action alternative. The exceptions were considered but not carried into in-depth analysis because they did not meet purpose and need or were not feasible: a zip line adjacent to Rafferty (section 2.7.6); prohibiting skiing between switchbacks in the access road/skiway (section 2.7.2.4); no development of beginner terrain on the summit (section 2.7.7); and allowing only human-powered activities on the back side (section 2.7.4).

However, no alternatives carried into in-depth analysis in this EIS match the specific configuration of on-mountain elements spelled out in the four scenarios. This is primarily because each scenario includes at least one of the elements discussed above that was not analyzed in depth. Beyond that, there was no apparent natural resource-based rationale for configuring on-mountain elements as they were in the four scenarios.

In short, while all the on-mountain elements of the stakeholder group scenarios are considered in this analysis, the scenarios themselves were not carried into in-depth analysis.

2.7.15 JACKSON HOLE CONSERVATION ALLIANCE ALTERNATIVES

Scoping comments from the Jackson Hole Conservation Alliance included two alternatives, a Balanced Alternative and a Wildlife Alternative. The Balanced Alternative was introduced as follows: "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." (emphasis added) The alternative included:

- An observatory, as proposed.
- A summit building employing green technology, designed to limit visual impact, and built "within or close to the existing Panorama House footprint…"
- A zip line in the Rafferty area that employed noise cancelling technology "so that constant screaming doesn't disrupt wildlife and people."
- Development of in-bounds ski terrain by removal of deadfall, selective thinning, cutting narrow runs, and using natural topography to avoid the need for boundary adjustments.
- Developing new beginner and intermediate terrain in the Rafferty area, served by a new carpet or T-bar lift.
- Expansion of the terrain park in the Rafferty/Old Man's Flats area because the opportunities for this activity are limited in the area.
- Preservation of current, free, unfettered public access to public trail system, including linkages across the ski area.
- No back-side development or east/west boundary adjustments.
- Summit access via the existing Leeks Canyon road.

The observatory is included in all action alternatives. Section 2.4.5.1 describes how green technology and design considerations to limit visual impact would be incorporated into the proposed summit building, which is also included in all action alternatives. As to its size, section 2.7.8 explains why a smaller building would not meet the stated needs for the building. Section 3.12 addresses the building's scenic effects.

All action alternatives also include a zip line, and Alternatives 3 and 4 offer two optional alignments running from the summit to the Rafferty mid-station. Section 3.9 assesses the noise impacts of the zip line, noting that most sound would be generated by the mechanisms involved rather than the riders, and that human noise would be less with the two options ending at Rafferty due to their shorter length and less steep angle. Employing noise cancelling technology at the source would not be feasible due to the mobile and highly variable nature of the sound generated, the other noise sources in the area, and the range of locations from which the sound could be audible.

In terms of developing more ski terrain within the current ski area boundary, Figures 2-1 and 2-2 illustrate the substantial amount of terrain proposed for development within the current ski area boundary under Alternatives 2 and 3, respectively, and Figure 2-3 shows new terrain under Alternative 4. Figure 2-4 illustrates the even greater acreage slated for glading, thinning, and cleanup, primarily for fuel reduction but with skiing benefits as well. As discussed in section 3.10.31.1, the proposed boundary adjustments and particularly the back-side development are necessary to increase the amount of essential lower ability-level terrain to better meet the demands of the skier market.

Section 2.7.7 below explains why the Rafferty area does not provide suitable terrain and other conditions for development of a beginner area. Snow King does routinely build terrain parks in the Old Man's Flats area. Section 1.7.2.6 explains that the issue of continued public access to existing trails within the permit area would not change under any action alternative. Section 2.7.2.2 discusses several reasons why the Leeks Canyon road would not meet the needs served by the proposed summit access road/novice skiway.

The suggested Wildlife Alternative "prioritizes and protects the wildlife and wildlife habitat on Snow King." This alternative was not fully defined but included no boundary expansion, no development on the back side, recreation development that is sensitive to wildlife, and new closures for critical wildlife habitat. Section 2.7.1 explains why the front-side boundary adjustments and back-side development are necessary to meet the stated purpose and need for action. Section 3.6 addresses potential wildlife impacts in detail and does not identify the need for additional wildlife closures.

2.8 DESIGN CRITERIA

Design criteria are measures to avoid or reduce adverse environmental effects. Some are standard practice and identified prior to NEPA review, and others were identified in the course of the review. All design criteria applicable to a given resource are discussed as necessary and listed in Chapter 3, resource-specific analysis sections.

2.9 SUMMARY AND COMPARISON OF ENVIRONMENTAL EFFECTS

Table 2-2 summarizes and compares the direct and indirect environmental effects of the alternatives. The full, in-depth analysis that this summary is based on is provided in EIS Chapter 3.

Table 2-2. Summary and comparison of environmental effects.

Issue	Alternative 1 No Action	Alternative 2	Alternative 3	Alternative 4
Climate Change and Snow Quality				
Issue 1: How would climate change affect snow quantity and the long-term operation of the proposed infrastructure and uses?	No change in snowmaking (90 acres) or summer recreation opportunities. Winter recreational use and the long-term operation of Snow King would remain vulnerable to the effects of climate change.	Snowmaking system coverage would increase by 147.7 acres, for a total of 237.1 acres, and additional summer recreational opportunities including mountain bike and hiking trails, a zip line, a summer scenic lift rides to the summit, would be provided. These changes would effectively offset the impact of reduced snowfall due to climate change on Snow King's winter recreational use and long-term operation.	Same as Alternative 2.	This alternative would be slightly less effective in offsetting the impact of reduced snowfall on Snow King's winter recreational use and long-term operation. Snowmaking coverage would increase by the same amount. The front-side mountain bike system would be shorter. Adaptive management could limit the mountain-bike program's contribution to summer recreation as an offset to climate change.
Air Quality				
Issue 1: How would construction and use of the proposed infrastructure affect protected airsheds around the project area?	No notable change in Snow King's impact on visibility or particulate concentrations in Teton National Park or other area Class I airsheds.	A temporary increase in emissions and dust would occur during construction due to grading and excavation (68.1 acres). Glading would increase by 32.7 acres, with associated slash burning. With the design criteria identified through this analysis in place, Alternative 2 is unlikely to have a discernible effect on visibility or particulate concentrations in Grand Teton National Park or other Class I airsheds in the area.	Same as Alternative 2 but with 4.6 acres less excavation and grading and 154.2 acres of additional thinning and associated slash burning. However: there is a wide margin between current visibility and particulate ratings; slash burning is a minor contributor of particulates; burning would comply with Wyoming Air Quality Division Smoke Management Program requirements; and burning would take place in late fall, when air quality is good. Based	Grading and excavation would decrease by 0.2 acres relative to Alternative 3. This minor change would not alter the conclusion drawn under Alternative 3.

Table 2-2 (cont'd). Summary and comparison of environmental effects.

Issue	Alternative 1 No Action	Alternative 2	Alternative 3	Alternative 4
			on these considerations, slash burning could be increased substantially without causing a poor visibility rating in the Park or exceeding Wyoming or national particulate standards in Class I airsheds.	
Issue 2: How would the proposed increase in snowmaking system coverage affect the "snowmaking cloud" that impacts the neighborhood around the base area?	No change from current snowmaking practices. The frequency and duration of snow cloud formation would remain unchanged.	Some increase in the frequency and duration of snowmaking cloud formation would result from increased water use. However, most of the increase in snowmaking coverage would be at higher elevations where wind would dissipate the cloud or on the back side where the cloud would not affect Jackson.	Same as Alternative 2.	Same as Alternatives 2 and 3. Minor changes in the location of snowmaking system additions would not alter the conclusion drawn under Alternative 2.
Water, Soils, and Watershed				
Issue 1: How would the proposed increase in snowmaking and clearing of ski runs affect surface runoff, and groundwater recharge?	No change from current conditions in terms of snowmaking (90 acres) or run clearing (135.6 acres). Surface runoff currently does not leave the ski area boundary but infiltrates to groundwater.	Snowmaking system coverage would increase by 147.7 acres and cleared ski terrain would increase by 117.8 acres. Snowmaking system coverage would not necessarily correspond to a proportional increase in water. Any change in snowmelt runoff, infiltration, and groundwater recharge would remain within the current range of variability in volumes and rates.	Same as Alternative 2.	Slightly less snowmaking system coverage would be added (0.5 acres less than Alternatives 2 and 3), and minor changes in run clearing would occur. These changes would not alter the conclusion drawn under Alternative 2.

Table 2-2 (cont'd). Summary and comparison of environmental effects.

Issue	Alternative 1 No Action	Alternative 2	Alternative 3	Alternative 4
Issue 2: How would the ground disturbance associated with construction and use of the proposed infrastructure affect soil erosion and slope stability?	No change from current infrastructure. Erosion would continue at existing rates, and conditions that influence soil erosion and slope stability would remain unchanged.	Temporary erosion and stability impacts could occur during and immediately following construction within the 144.5-acre disturbance area. Of the 31 separate project elements, 13 would have a high erosion/sedimentation risk rating before BMPs were applied, and 13 would have a moderate risk rating. With BMPs in place, risk ratings for all project elements would fall to low, and no measurable long-term change in erosion, sediment transport, or slope stability would result.	Disturbance area would increase by up to 154 acres relative to Alternative 2, due to forest stand thinning. Of 32 project elements, up to 15 would have high risk ratings before BMPs were applied, and up to 14 would have moderate ratings. These changes would not alter the conclusion drawn under Alternative 2.	Disturbance acreage would increase 3.6 acres relative to Alternative 3, but there would be no change in project element risk ratings compared to Alternatives 2 and 3. These changes would not alter the conclusion drawn under Alternative 2.
Issue 3: How would construction and use of the proposed infrastructure affect impaired water bodies in the area?	No change from current water quality conditions in Cache Creek or Flat Creek would occur.	Construction activities would result in disturbance and short-term opportunities for erosion and surface runoff. Due to the distance between proposed disturbance and creek channels, the BMPs that would be in place, and the naturally high filtration rates, no long-term or short-term impacts on water quality in Cache Creek or Flat Creek would occur.	Same as Alternative 2. Alteration of disturbance acreage would not affect the conclusion drawn under Alternative 2. See Issue 2 above.	Same as Alternatives 2 and 3. Alteration of disturbance acreage would not affect the conclusion drawn under Alternative 2. See Issue 2 above.

Table 2-2 (cont'd). Summary and comparison of environmental effects.

Issue	Alternative 1 No Action	Alternative 2	Alternative 3	Alternative 4
Vegetation				
Issue 1: How would construction and use of the proposed infrastructure affect the introduction and spread of noxious weeds?	No change from current noxious weed conditions. Seventeen noxious weed species have been reported within or adjacent to the ski area boundary. The ski area would continue to treat existing and new weed infestations, consistent with the terms of their vegetation management plan.	This alternative would result in 80.4 acres of glading and clearing, with limited potential to increase weed introduction or spread, and 64.1 acres of grading and excavation, with higher potential to create conditions favorable to weeds due to high levels of soil disturbance and equipment operation. Recreational use during the spring, summer, and fall months would increase, potentially expanding this vector for the spread of weeds. Implementation of the integrated weed management program identified as a design criterion in this analysis should preclude any substantial increase in weed introduction and spread.	Glading and clearing acreage would increase by up to 154.6 acres due mostly to stand thinning, and grading and excavation would decrease by up to 0.6 acre. Increased efforts to obliterate unnecessary roads and trails would help concentrate increased recreational use on established routes. These changes would not alter the conclusion drawn under Alternative 2.	Gladed and cleared acreage would increase by 3.4 acres relative to Alternative 3, and grading and excavation would increase by 0.2 acres. Decreasing the extent of front-side bike trails would reduce the potential for weed introduction and spread through recreational use. Overall, relative to Alternatives 2 and 3, this alternative would have similar potential for the introduction and spread of noxious weeds.

Table 2-2 (cont'd). Summary and comparison of environmental effects.

Issue	Alternative 1 No Action	Alternative 2	Alternative 3	Alternative 4
Wildlife				
Issue 1: How would construction and use of the proposed infrastructure affect special-status wildlife species?	Since there would be no change from current habitat and disturbance conditions under this alternative, there would be no change in Snow King's effect on threatened and endangered species, Forest Service sensitive species, migratory birds, or specialized habitats.	Alternative 2: - Has the potential to negatively impact 122 acres of suitable Canada lynx habitat but is consistent with the *Northern Rockies Lynx Management Direction* and its amendment to the Forest Plan. - Would have no impact on the grizzly bear, wolverine, bald eagle and peregrine falcon. - May impact individuals but is not likely to result in a measurable impact on bighorn sheep population numbers. - May impact individuals but is not likely to cause a trend toward federal listing or loss of viability for: fisher, spotted bat, Townsend's western big-eared bat, boreal owl, flammulated owl, great gray owl, northern goshawk, and three-toed woodpecker. - May impact migratory birds but not substantially given design criteria and the large amount of alternative habitat available.	Relative to Alternative 2: - Disturbance of suitable lynx habitat would increase to 261 acres, but the determination would remain the same. - The amount of forested habitat impacted would increase from 93 acres under Alternative 2 to 230 acres, but the determinations for the fisher, boreal owl, flammulated owl, great grey owl, and northern goshawk would remain the same. - Impacts on bighorn sheep, spotted bat, Townsend's western big-eared bat, bald eagle, peregrine falcon, three-toed woodpecker, and migratory birds would be the same.	Relative to Alternative 3: - Disturbance of suitable lynx habitat would increase slightly to 264 acres, but the determination would remain the same. - The amount of forested habitat impacted would increase slightly to 234 acres, but the determinations for the Fisher, boreal owl, flammulated owl, great grey owl, and northern goshawk would remain the same. - Impacts on migratory birds would be the same.

Table 2-2 (cont'd). Summary and comparison of environmental effects.

Issue	Alternative 1 No Action	Alternative 2	Alternative 3	Alternative 4
Issue 2: How would construction and use of the proposed infrastructure affect elk or mule deer winter use?	No change from current elk or mule deer winter habitat conditions would occur, as there would be no back-side development.	No designated winter or parturition range for elk or mule deer would be directly affected, with exception of the lightly used northeast corner of the permit area on the front side. Localized displacement of elk and mule deer in and around the project area due to disturbance from expanded recreation would occur but would not result in a measurable impact on population numbers due to the abundant surrounding habitat, relatively low levels of habitat loss, and low level of current use in both the ski area permit boundary and its zone of visual influence.	Shifting the southern boundary of the western boundary adjustment up to the ridgeline above Leeks Canyon would provide minor benefit to wintering, but the conclusion drawn for Alternative 2 would remain the same.	The changes in infrastructural development and use under this alternative would not alter the effects on winter elk and deer use described under Alternative 2.
Cultural				
Issue 1: How would construction and use of the proposed infrastructure affect Snow King's historic landscape?	The remaining resources contributing to the eligibility of Snow King's historic landscape would be unaffected.	Fourteen of the 15 remaining contributing resources would be adversely affected: the 12 historic ski runs by modification and/or alteration of their visual signature through construction of intermingled new runs, and the Panorama House and unloading platform/observation deck by removal. The CCC Summit Shelter would not be affected. Consultation under Section 106 of the Historic Preservation Act resulted in stipulations to mitigate adverse effects on the historic landscape.	Impacts on contributing resources would be the same as under Alternative 2, but Snow King would develop an interpretive program focusing on the history of the ski area to offset these adverse effects.	Impacts on contributing resources would be the same as under Alternatives 2 and 3, except for the 12 historic ski runs. Most of the proposed new ski runs in and adjacent to the historic landscape would be eliminated to protect the visual integrity of the historic runs.

Table 2-2 (cont'd). Summary and comparison of environmental effects.

Issue	Alternative 1 No Action	Alternative 2	Alternative 3	Alternative 4
Issue 2: How would construction and use of the proposed infrastructure affect Traditional Cultural Places or other Native American tribal resources?	No change from current effects on Native American concerns would occur.	Tribal consultation identified no Native American concerns, and no significant Native American sites have been identified within the project area. As a result, no impacts on this resource are anticipated under this alternative. Design criteria would protect any undiscovered heritage resources or sites encountered during construction. Stipulations from the July 2020 Memorandum of Agreement resulting from consultation under Section 106 of the National Historical Preservation Act would be in force under this or any action alternative authorized.	Same as Alternative 2.	Same as Alternatives 2 and 3.
Land Use				
Issue 1: How would construction and use of the proposed infrastructure affect grazing?	No back-side development would occur, so impact on the Leeks Canyon grazing allotment would not change and utilization rates would be unchanged.	A minor reduction in forage availability and some disturbance or displacement of livestock would occur within the ski area boundary. Beyond the ski area boundary, mountain bike traffic down Leeks Canyon Road could increase, potentially disturbing and displacing horses in lower portion of the canyon. However, additional use would be limited due to steepness of road and the private property boundary near the bottom. The allotment is of sufficient size to ensure adequate amounts of forage for the number of livestock involved, even if some displacement of animals	Mountain bikers would be restricted to the dedicated downhill mountain bike trail system, precluding any new impact on livestock in lower Leeks Canyon. Otherwise, impacts would be the same as under Alternative 2. Compared to Alternative 2, potential effects on utilization rates outside the ski area would be reduced.	Adaptive management of the mountain bike program would initially allow bikers to use lower Leeks Canyon road, potentially impacting livestock or livestock management. However, this impact would be addressed in development of annual operating plans, resulting in effects similar to Alternative 3.

Table 2-2 (cont'd). Summary and comparison of environmental effects.

Issue	Alternative 1 No Action	Alternative 2	Alternative 3	Alternative 4
		occurred. Increased levels of utilization could occur in some areas of the allotment, but annual standards would be met.		
Noise				
Issue 1: How would construction and use of the proposed infrastructure affect noise levels around the ski area?	No change from current noise levels would occur. Avalanche explosive use may temporarily exceed the Town of Jackson's 65 dBa property-line noise limit (used as a threshold in this analysis though the ordinance does not apply to National Forest System land).	A short-term increase in equipment noise during construction and a long-term increase in noise due to increased avalanche control explosives, mechanical noise from the zip line trolley, and zip line rider noise would occur. All new snowmaking would be higher on the mountain than current activities and would generally not lead to increased noise. Helicopter staging on private land during gondola construction, if authorized by the Town of Jackson, may temporarily exceed 65 dBa.	Moving the bottom zip line terminal to the Rafferty mid-station would reduce noise at Phil Baux Park. Otherwise, noise impacts would be similar to Alternative 2.	The addition of run 15 would result in an increase in temporary construction noise, including chainsaw operations, and long-term noise due to snowmaking within 200 feet of homes adjacent to the ski area. Both noise sources would be substantially reduced by distance and vegetation screening. It is unlikely the Town of Jackson noise standard would be exceeded by these activities. Otherwise, noise impacts would be the same as outlined under Alternative 3.
Recreation				
Issue 1: How would the proposed ski terrain development affect Snow King's terrain mix?	The current terrain mix would be unchanged, limiting Snow King's ability to meet the needs of the broader skier market and bring new skiers into the sport.	An additional 117.8 acres of new ski terrain, including 39.8 acres of beginner, novice, and low intermediate and 20.8 acres of intermediate terrain. Terrain mix would remain heavily skewed toward advanced and expert terrain but would be substantially closer to the skier	Same as Alternative 2.	The effects would closely match Alternatives 2 and 3.

Table 2-2 (cont'd). Summary and comparison of environmental effects.

Issue	Alternative 1 No Action	Alternative 2	Alternative 3	Alternative 4
		market profile and provide a better progression in terrain for lower skier ability levels.		
Issue 2: How would the proposed summit access road/novice skiway affect existing ski runs?	Current ski run conditions would not change because no new ski runs or skiways would be constructed. Upper mountain runs would cross skiways nine times.	The number of skiway crossings would increase to 15, reflecting the new summit access road/novice skiway and construction of new front-side runs. However, skiway crossings are a common and manageable issue at ski areas. The impact on skier flow would vary by run.	Obliteration of more existing skiways would eliminate six crossings of existing runs and bring the net number of crossings to five. That would be a notable improvement in skier flow over existing conditions. Nine total skiway crossings.	Retaining Slow Trail would maintain three crossings of existing runs relative to Alternative 3. For new trails, run 2 may merge onto run 4, creating a new crossing of the summit access road/novice skiway. Eliminating run 11 would reduce crossings by one, resulting in a total of 12.
Issue 3: How would the proposed downhill mountain bike trails and zone affect the existing Cache Creek/Game Creek trail system and its users?	No change from current use of the Cache Creek/Game Creek trail system (about 1,526 people per day during summer peak) beyond the 1–3% annual increase associated with population growth in Jackson.	Lift-served mountain bike access to the summit is projected to result in an estimated increase of 58 cyclists daily in the number of trail system users, but a major shift in use patterns. Higher-elevation, more distant trails would be much more accessible to mountain bikers, resulting in roughly two to four times more use on trails such as Skyline, Ferrin's, Wilson Canyon, and Josie's Ridge. This could increase user conflicts, trail damage, and resource impacts. Traffic on currently heavily used lower trail segments would be correspondingly reduced, decreasing crowding and trail damage. These effects may remain consistent with the Roaded Natural Recreational Opportunity Spectrum classification,	A combination of rider information, trail design, enforcement, and changes to allowed use of existing trails (closure of upper Skyline and Josie's ridge to bicycles) that would be employed under this alternative to restrict lift-served bike use to the dedicated downhill trail system and mountain bike zone. This should preclude notable adverse effects on the Cache Creek/Game Creek trail system and its users described under Alternative 2.	An adaptive approach to developing and operating the downhill mountain bike program would be implemented, making all of the management options included in Alternatives 1–3 available to be applied as appropriate through annual operating plans based on monitoring. The front-side downhill mountain bike trail system would be shifted largely to the Rafferty area and downsized in terms of trail miles and ability level. Overall, this alternative is projected to be more effective in protecting the

Table 2-2 (cont'd). Summary and comparison of environmental effects.

Issue	Alternative 1 No Action	Alternative 2	Alternative 3	Alternative 4
		but they could degrade the recreational opportunity provided by the Cache Creek/Game Creek trail system.		Cache Creek/Game Creek trail system and users than Alternative 3, mostly due to its flexibility in matching management options to observed issues to efficiently avoid adverse direct and indirect effects.
Issue 4: How would the proposed Summit gondola and zip line affect users of Phil Baux Park?	Recreational opportunities for park users would remain unaltered.	Construction of the gondola and zip line bottom terminals would result in the loss of the Phil Baux Park parking lot and a change in the recreational opportunities it currently provides. Open green space available for recreational activities would increase.	No new infrastructure would be sited in Phil Baux Park. The gondola bottom terminal would be located nearby but far enough away to maintain the park's current recreational opportunities. The parking lot would remain intact.	Effects would be the same as outlined under Alternative 3.
Safety				
Issue 1: How would the proposed mountain bike trails and mountain bike zone affect the safety of other summer visitors?	The safety of other summer visitors would not change because there would be no development of additional mountain bike trails under this alternative.	Use of trails within the Snow King boundary would increase, with most of this increase occurring on the new downhill mountain bike trails. A combination of design criteria requiring adequate sight lines around intersections, signage warning users of both trails that they were approaching an intersection, features designed to slow riders on the downhill trails, and bridges or underpasses where necessary would preclude any substantial change in safety risk.	Same as Alternative 2.	The number of trail crossings would be reduced relative to Alternatives 2 and 3, reducing impacts marginally. Otherwise, changes in visitor safety would be similar.

Table 2-2 (cont'd). Summary and comparison of environmental effects.

Issue	Alternative 1 No Action	Alternative 2	Alternative 3	Alternative 4
Issue 2: How would the proposed summit access road/novice skiway affect skier safety?	The summit access road/ novice skiway would not be constructed, so there would be no change in skier safety.	The risk of beginner skiers without adequate skills using the summit access road/novice skiway would be reduced by design of the teaching center terrain and the skiway and by signage. The risk posed for skiers crossing the summit access road/novice skiway is discussed above under Recreation Issue 2. Neither risk is unique to Snow King or this alternative, and neither presents safety hazards beyond the industry norm, with standard safety practices in place.	Same as Alternative 2.	Same as Alternatives 2 and 3.
Issue 3: How would the proposed ski run clearing and summit access road/novice skiway affect avalanche hazard?	No additional ski runs would be developed, so there would be no change from current avalanche hazard conditions. Avalanche risk is generally low due to low elevation and low average snowfall, even though the slopes are generally steep. Some small wet-slide avalanches have occurred. Over the long term, climate change may cause conditions.	The increase in skiable terrain where avalanches could occur in proximity to in-bounds skiers would result in a slight increase in avalanche hazard. All new terrain would be subject to Snow King's standard avalanche hazard reduction practices in place. New avalanche starting zones would be at least 1,500 feet away from any structures below the ski area, an unprecedented movement distance for an avalanche at Snow King.	Marginal decrease in risk associated with unsupported slabs forming above skiways, due to obliteration of the Slow and Fast Trail skiways. Otherwise same as Alternative 2.	Retention of Slow Trail would slightly increase risk associated with unsupported slabs forming above skiways. Otherwise same as Alternative 3.

Table 2-2 (cont'd). Summary and comparison of environmental effects.

Issue	Alternative 1 No Action	Alternative 2	Alternative 3	Alternative 4
Scenery				
Issue 1: How would the proposed infrastructure affect the scenic quality of Snow King Mountain?	The existing landscape would not change. Snow King would continue to appear as a small ski area, adjacent to a town, consistent with the visual quality objectives (VQOs) of modification and partial retention assigned by the Forest Plan.	New ski runs would occupy substantially more of the Snow King landscape, but with prescribed design criteria would maintain compliance with VQOs. The proposed buildings would comply with the Forest Service Built Environment Image Guide and Jackson/Teton County Comprehensive Plan direction regarding skyline construction.	Forest stand thinning, removal of Cougar lift, realignment of the Summit gondola and zip line, and other minor changes under this alternative would not alter the conclusions drawn for Alternative 2.	Elimination of several proposed runs in the central part of the ski area and the addition of runs to the east and west would disperse ski terrain expansion across a wider area and retain more of the existing character in the central portion of the front side most visible from Jackson. Otherwise, the same conclusions drawn for Alternative 2 and 3 would hold.
Issue 2: How would the proposed lighting for night skiing and operation of summit facilities affect the nighttime view and dark sky?	The current night lighting situation would not change, except for planned night lighting development on Lower Elk.	This alternative would result in an increase in light sources, area illuminated, and possibly extend hours of illumination in the ski area. New lighting sources would employ dark sky designs and operating practices to minimize visual impact while complying with Jackson/Teton County Comprehensive Plan direction.	Same as Alternative 2.	Same as Alternatives 2 and 3.

2.10 AGENCY'S PREFERRED ALTERNATIVE

Based on the results of this NEPA review process, Alternative 4, as modified in this Final EIS, has been identified as the Bridger-Teton's preferred alternative. This alternative meets the purpose and need for action while addressing the substantive environmental issues raised through public involvement and internal, interdisciplinary review.

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CHAPTER 3: AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 INTRODUCTION

This chapter documents the environmental impact analysis. Following introductory information that is common to all resources, the chapter is organized by resource category. Each resource section begins with the issues addressed, as identified through public scoping and internal, interdisciplinary review. The affected environment is described next to provide context for the discussion of environmental consequences that follows. The direct, indirect, and cumulative effects of the no-action alternative (the analysis baseline), Alternative 2 (the proposed action), and the action alternatives are outlined in that order. The section concludes with discussion of other required disclosures.

3.1.1 DISTURBANCE TYPES AND AREAS

Table 3-1 provides basic dimensions of physical disturbance (i.e., to soil and vegetation) associated with various types of project elements. These dimensions were used in calculating disturbance areas for each project element. Tables 3-2, 3-3, and 3-4 show the amount of disturbance for Alternatives 2, 3, and 4. Disturbance types, from least intensive to most intensive, are as follows:

- Glading and thinning – selective removal of trees to achieve vegetation management or Wildland Urban Interface goals in the case of Forest Stand Thinning under Alternatives 3 and 4 (see section 2.5.4.3 for additional detail), or to achieve a target spacing of 15 – 18 feet in the case of Glading as described under Alternative 2 (see section 2.4.2.3 for additional detail). May involve hand tools or equipment such as feller-bunchers. Trees chipped or stacked and burned on site or collected and removed to an off-site location.
- Clearing – removal of all trees and tall shrubs using tracked or wheeled equipment. Trees and slash chipped or burned on site or collected and removed to an off-site location.
- Grading – recontouring and smoothing the soil surface using caterpillars or other heavy equipment.
- Excavation – subsurface soil work using excavators or other heavy equipment, generally to construct building or tower foundations.

Note that the disturbance amounts presented in Tables 3-1, 3-2, 3-3, and 3-4 indicate only the highest intensity of disturbance occurring at any given location. For example, a site would be cleared before being excavated, but reporting it as being both cleared and excavated would over-represent the area of disturbance.

The total disturbance of 144.5 acres under Alternative 2 represents 29 percent of the total adjusted permit area of 525 acres. The total disturbance of up to 298.5 acres under Alternative 3 represents 57 percent of the total adjusted permit area. The total disturbance of up to 302.1 acres under Alternative 4 represents 56 percent of the total adjusted permit area.

Table 3-1. Typical disturbance dimensions by project element type.

Project Element Type	Disturbance Dimensions[1]	Disturbance Type[2]
Buildings/Facilities	Footprint plus 50-foot buffer	Excavation
Conveyor Lifts	25-foot width	Grading
Chairlifts		
Alignment Clearing	60-foot-width	Clearing
Terminals	0.5 acre rectangular disturbance area	Excavation
Towers	28-foot-diameter circle	Excavation
Ski Run	Actual width plus 10-foot buffer	Clearing
Existing Ski Run Grading	Actual width plus 10-foot buffer	Grading
Summit Access Road/Novice Skiway	Actual width plus 10-foot buffer	Excavation
Utility Lines (snowmaking, power, sewer, and utility)	15-foot-width	Excavation
Trails	6.5-foot width	Grading
Glading and Thinning	Footprint plus 10-foot buffer	Glading
Yurt Camp	40-foot-diameter circle	Grading
Zip-line		
Alignment Clearing	30-foot-width	Clearing
Terminals	0.15 acre rectangular disturbance area	Excavation

[1]These are the dimensions of construction-related disturbance, not the finished dimensions of projects.

[2] Indicates maximum disturbance intensity (e.g., excavation disturbance also includes clearing and grading).

Table 3-2. Disturbance types and acres disturbed under Alternative 2.

	Disturbance Category and Acres Disturbed[1]				
Project Element	**Glading**	**Clearing**	**Grading**	**Excavation**	**Project Element Total**
Terrain Development					
Teaching Center Terrain	--	--	6.1	--	6.1
New and Modified Ski Runs	--	38.2	6.3	--	44.5
Glading	32.7	--	--	--	32.7
Summit Access Road/Novice Skiway					
Summit Access Road/Novice Skiway	--	--	--	15.6	15.6

Table 3-2 (cont'd). Disturbance types and acres disturbed under Alternative 2.

	Disturbance Category and Acres Disturbed[1]				
Project Element	**Glading**	**Clearing**	**Grading**	**Excavation**	**Project Element Total**
Lifts					
Summit Gondola	--	4.4	--	0.5	4.9
Lift A	--	2.5	--	1.2	3.7
Conveyor Lifts (B&C)	--	--	--	0.3	0.3
Back-side Surface Tow (Lift D)	--	0.3	--	0.1	0.4
Facilities					
Summit Building	--	--	--	1.8	1.8
Observatory	--	--	--	0.4	0.4
Temporary Ski Patrol Building	--	--	0.2	< 0.1	0.2
Yurt Camp and Access	--	--	1	--	1
Wedding Venue	--	--	< 0.1	0.4	0.4
Night Skiing	--	--	--	6.4	6.4
Snowmaking	--	--	--	7.8	7.8
Summer Activities					
Zip Line	--	2.3	--	0.5	2.8
Downhill Mountain Bike System	--	--	13.9	--	13.9
Hiking Trails	--	--	1.6	--	1.6
Total Disturbance	32.7	47.7	29.1	35	144.5

[1]Acreages include a disturbance buffer; the amount of actual ground disturbance may be less than the buffered distance. Areas of overlap, such as where the disturbance buffers for two different elements coincide, have only been counted one time. Disturbance acres have been rounded to the nearest tenth acre.

Table 3-3. Disturbance types and acres disturbed under Alternative 3.

	Disturbance Category and Acres Disturbed[1]				
Project Element	**Glading**	**Clearing**	**Grading**	**Excavation**	**Project Element Total**
Terrain Development					
Teaching Center Terrain	--	--	6.1	--	6.1
New and Modified Ski Runs	--	38.2	6.3	--	44.5
Glading	32.7	--	--	--	32.7
Summit Access Road/Novice Skiway					
Summit Access Road/Novice Skiway	--	--	--	15.6	15.6
Lifts					
Summit Gondola	--	4.2	--	0.7	4.9
Lift A	--	2.5	--	1.2	3.7
Conveyor Lifts (B&C)	--	--	--	0.3	0.3
Back-side Surface Tow (Lift D)	--	0.3	--	0.1	0.4
Facilities					
Summit Building	--	--	--	1.8	1.8
Observatory	--	--	--	0.4	0.4
Yurt Camp	--	--	1.0		1.0
Wedding Venue	--	--	< 0.1	0.4	0.4
Night Lighting	--	--	--	6.4	6.4
Snowmaking	--	--	--	7.8	7.8
Summer Activities					
Zip Line 1	--	1.7	--	0.1	1.8
Zip Line 2	--	2.9	--	0.4	3.3
Downhill Mountain Bike System	--	--	13.9	--	13.9
Hiking Trails	--	--	1.1	--	1.1

Table 3-3 (cont'd). Disturbance types and acres disturbed under Alternative 3.

	Disturbance Category and Acres Disturbed[1]				
Project Element	**Glading**	**Clearing**	**Grading**	**Excavation**	**Project Element Total**
Forest Stand Thinning	154.2	--	--	--	154.2
Total Disturbance (Option 1)	186.9	46.9	28.4	34.8	297.0
Total Disturbance (Option 2)	186.9	48.1	28.4	35.1	298.5

[1]Acreages include a disturbance buffer; the amount of actual ground disturbance may be less than the buffered distance. Areas of overlap, such as where the disturbance buffers for two different elements coincide, have only been counted one time. Disturbance acres have been rounded to the nearest tenth acre.

Table 3-4. Disturbance types and acres disturbed under Alternative 4.

	Disturbance Category and Acres Disturbed[1]				
Project Element	**Glading**	**Clearing**	**Grading**	**Excavation**	**Project Element Total**
Terrain Development					
Teaching Center Terrain	--	--	6.1	--	6.1
New and Modified Ski Runs	--	53.2	6.3	--	59.5
Glading	32.4	--	--	--	32.4
Summit Access Road/Novice Skiway					
Summit Access Road/Novice Skiway	--	--	--	15.6	15.6
Lifts					
Summit Gondola	--	4.2	--	0.7	4.9
Lift A	--	2.5	--	1.2	3.7
Conveyor Lifts (B&C)	--	--	--	0.3	0.3
Back-side Surface Tow (Lift D)	--	0.3	--	0.1	0.4
Facilities					
Summit Building	--	--	--	1.8	1.8

Table 3-4 (cont'd). Disturbance types and acres disturbed under Alternative 4.

	Disturbance Category and Acres Disturbed[1]				
Project Element	**Glading**	**Clearing**	**Grading**	**Excavation**	**Project Element Total**
Observatory	--	--	--	0.4	0.4
Temporary Ski Patrol Building	--	--	0.2	< 0.1	0.2
Yurt Camp	--	--	1.0	--	1.0
Wedding Venue	--	--	< 0.1	0.4	0.4
Night Lighting	--	--	--	6.4	6.4
Snowmaking	--	--	--	8.7	8.7
Summer Activities					
Zip Line 1	--	1.7	--	0.1	1.8
Zip Line 2	--	2.9	--	0.4	3.3
Downhill Mountain Bike System	--	--	13.0	--	13.0
Hiking Trails	--	--	1.1	--	1.1
Forest Stand Thinning	142.9	--	--	--	142.9
Total Disturbance (with Zip Line Option 1)	175.3	61.9	27.7	35.7	300.6
Total Disturbance (with Zip Line Option 2)	175.3	63.1	27.7	36.0	302.1

[1]Acreages include a disturbance buffer; the amount of actual ground disturbance may be less than the buffered distance. Areas of overlap, such as where the disturbance buffers for two different elements coincide, have only been counted one time. Disturbance acres have been rounded to the nearest tenth acre.

3.1.2 CUMULATIVE ACTIONS

Cumulative actions considered in the analysis are shown in Table 3-5.

Table 3-5. Cumulative actions considered in this analysis.

Project Name	Project Description
Past Projects	
Anchor Ranch Sign Permit Authorization	Location: 3100 N. Fish Creek Road, Wilson, Wyoming. Description: Issuance of a special use permit for a sign for use associated with an existing easement. The sign is necessary for emergency services and mail delivery to efficiently recognize the property. Implementation Date: 05/2019
Big Munger Trail Reroute	Location: Snake River canyon south of Jackson, Wyoming. Description: Reroute of Big Munger Trail (#4205) to create a sustainable multi-use trail to the top of Munger Mountain (7.2 miles). Implementation Date: 07/2019
Permit Reissuance for Wyoming Game and Fish Department Facilities at Horse Creek	Location: Horse Creek area south of Jackson, Wyoming. Description: Authorization of use and maintenance of an existing cabin, 9,000 feet of access roadway, 2,000 feet of fencing, and 6.6 acres of sub-irrigated hayfield. Implementation Date: 06/2019
Snow King Mountain Rafferty Lift Replacement and Ski Trail Construction	Location: Snow King Mountain Resort. Description: Replacement and realignment of the Rafferty lift and construction of a mid-load/unload station and two intermediate ski trails from the top of the realigned lift. The realigned lift was extended 1,000 feet upslope. The fixed-grip double chairlift was replaced with a fixed-grip quad chairlift to improve operational efficiencies, reliability, and increased capacity. The mid-station provided easy accessibility to the alpine slide and other important summer recreation amenities. An additional 3.8 acres of challenging intermediate terrain was created. This project improved both winter and summer recreation opportunities. Implementation Date: 01/2015
Snow King Mountain Communications Services	Location: Snow King Mountain Resort. Description: Installation, maintenance, and operation of approximately 3,800 feet of fiber optic cable within conduit along the Snow King Summit chairlift to the top of the chairlift, then buried in the ground in a 70-foot x 10-inch x 10-inch ditch from the top of the chairlift to the Panorama House to provide 4G communication services. Implementation Date: 04/2013

Table 3-5 (cont'd). Cumulative actions considered in this analysis.

Project Name	Project Description
Snow King Mountain Snowmaking Infrastructure	Location: Snow King Mountain Resort. Description: Installation and operation of infrastructure to support snow making, including buried water lines, electrical cable, communication conduit (without fiber optic cable) and ancillary facilities, electric transformers, hydrants, and snow guns. Two trenches 6-feet wide, 4 to 5-feet deep were excavated, one about 4,160 linear feet and one about 1,000 linear feet on National Forest System land. A booster pump house (400 square-feet) was installed to aid in conveying water uphill to the summit. Implementation Date: 06/2014
Snow King Resort Vault Toilet	Location: Snow King Mountain Resort. Description: Installation of a double vault toilet at the top of the Summit lift within the existing permit boundary. The vault toilet is utilized during winter and summer operations by the general public. Implementation Date: 05/2018
Snow King Mountain Aerial Adventure Course	Location: Snow King Mountain Resort Description: Construction and operation of an Aerial Adventure Course consisting of six segments and a zip line. The installation includes ropes courses and treetop challenges such as swinging bridges, nets, and zip lines. Implementation Date: 04/2015
Wyoming Game and Fish Department Game Creek Ditch Permit	Location: Game Creek Road in Teton County, Wyoming. Description: To authorize a special use permit for an irrigation water ditch for an existing use that is tied to water rights from 1910 and associated with a horse pasture that is located on WGFD land. Implementation Date: 06/2019
Current Projects	
Invasive Plant Management	Location: Bridger-Teton National Forest All Units. Description: Ongoing control of noxious and other invasive plants through the integration of manual, mechanical, biological, and ground and aerial herbicide control methods. Implementation Date: 09/2019
Jackson Hole Mountain Resort Lower Valley Energy Power Line Installation	Location: Jackson Hole Mountain Resort. Description: The existing primary power system feeding the snowmaking compressor building was near capacity. LVE and JHMR are installing an additional buried power line from a building at the base to the existing air compressor building near Antelope Flats run. Implementation Date: 10/2019

Table 3-5 (cont'd). Cumulative actions considered in this analysis.	
Project Name	**Project Description**
Jackson Hole Mountain Resort Tram Snow Drift Mitigation	Location: Jackson Hole Mountain Resort. Description: To reduce the size and height of the snow drift that forms under the travel path of the tram, JHMR is removing vegetation from less than 1 acre, harvesting weathered rocks, recontouring the terrain, disposing excess material and reclaiming the site. Implementation Date: 10/2019
Snow King Lower Elk Lighting	Location: Snow King Mountain Resort. Description: Snow King Resort is finishing its 2015 project designed to reduce light pollution in the sky with energy efficient magnetic induction lights that are also less impactful on wildlife. Project includes additional 80 lights and 15 poles. Implementation Date: 10/2019

3.2 CLIMATE CHANGE AND SNOW QUANTITY

3.2.1 SCOPE OF ANALYSIS

- *How would climate change affect snow quantity and the long-term operation of the proposed infrastructure and uses?*

While no material effect is anticipated, it would be impossible to make a valid quantitative assessment of the proposed action's effect on climate change and snow quantity given the current state of climate- change science. However, a significant reduction in snowfall over time could preclude the need for any additional winter recreation infrastructure or recreational opportunities. The analysis will address that issue.

Indicator: Conclusions drawn from pertinent studies of climate change and its potential effects on snowfall, including the Forest Service, Region 4 report *Climate Change Vulnerability and Adaptation in the Intermountain Region* (Halofsky et al. 2018).

3.2.2 AFFECTED ENVIRONMENT

Extensive analysis addressing climate change within the Greater Yellowstone Ecosystem (Chang and Hansen 2014) and the Rocky Mountain Region (Halofsky et al. 2018) provides the best projections currently available on climate change and its effects on precipitation, and thus on snowpack. While these broad studies do not provide detailed data to support in-depth, site-specific analysis and conclusions, they do provide meaningful insight into this issue.

Halofsky et al. (2018) divided the Rocky Mountain Region into subregions, including the Southern Yellowstone ecosystem, which includes Grand Teton National Park, the Caribou-Targhee National Forest, and the Bridger-Teton. While these areas are characterized by cold winters with high levels of precipitation, the Teton Range has a large impact on where precipitation falls within the subregion. Average precipitation on the west side of the Teton Range can be nearly triple the precipitation that falls on the eastern side of the range (Davey et al. 2007). The Bridger-Teton is located on the east side of the range, and thus receives lower levels of precipitation compared to other areas of the subregion.

Some precipitation models predict a slight increase in precipitation for the Southern Yellowstone Ecosystem, while others show no clear long-term trend in precipitation. Temperature models predict an

increase from 6 to 12 degrees Fahrenheit in median minimum temperature by the year 2100 for the same region (Halofsky et al. 2018). The increase in temperature will result in warmer winters with less snow and more rain, likely reducing snowpack (Chang and Hansen 2014).

In terms of winter recreation, Halofsky et al. (2018) cites several sources who conclude that overall warming is expected to reduce season length and the likelihood of reliable winter recreation seasons. However, practical adaptations can be implemented to offset the potential for decreased snowfall and maintain the long-term viability of mountain resorts in the Intermountain West. To increase the operational season length for winter recreation, Scott and McBoyle (2007) and Halofsky et al. (2018) suggest utilizing snowmaking. Since 1952, snowmaking has become one of the most common adaptations to climate change, with approximately 89 percent of ski resorts in the Rocky Mountains currently utilizing snowmaking (Scott and McBoyle 2007). In eastern North America, ski resorts that utilized snowmaking extended their average ski season up to 120 days (Scott et al 2006).

Currently, approximately 90 acres of Snow King have snowmaking coverage, primarily on the lower portion of the mountain. This helps maintain coverage on lower-angle terrain that is lit for night skiing and used for race programs. Higher elevation terrain currently does not have snowmaking, with the exception of upper Elk run and the skiway to it from Summit lift. Snowmaking is needed less frequently at higher elevations, but the elevation on the ridge, at the top of the Summit lift, is just 7,808 feet, so lack of natural snow can be limiting at times.

In addition to snowmaking, Scott and McBoyle (2007) and Halofsky et al. (2018) suggest developing new runs at higher elevations on north facing slopes. Higher elevation terrain on north facing slopes retain snowpack longer, allowing for extended ski seasons (Scott and McBoyle 2007). Currently, the ski resort is located entirely on the north facing slope of Snow King.

The other climate change adaptation suggested by Halofsky et al. (2018) is utilizing resort land and infrastructure for summer recreation to increase the operating season and thus the long-term viability of mountain resorts. Increasing summer recreational opportunities provides additional revenue year-round for mountain resorts, decreasing their dependence on winter recreation. It is also consistent with the expectations of the recreating public and with Forest Service regulations and policies intended to meet those expectations, as discussed in section 1.4, Purpose and Need.

Currently, summer recreation opportunities at Snow King include several multi-use trails, most of which are part of a larger local trail network; an alpine slide, a mountain coaster, and a ropes course accessed from the Rafferty mid-station; and scenic rides to the top of Snow King Mountain on the Summit lift. These opportunities have proven popular, and summer use levels are high.

3.2.3 DIRECT AND INDIRECT EFFECTS

3.2.3.1 Alternative 1

Climate change models predict increases in temperature across the subregion, including the Jackson area and Snow King. As a result, Snow King is projected to experience reduced snowpack and a shorter winter recreation season.

Under this alternative, snowmaking would not be expanded to cover any additional ski terrain. Coverage would continue to be limited to the lower front-side terrain. To the extent that natural snowfall decreased, higher-elevation terrain would be affected. Without added snowmaking coverage, use of this terrain could decrease over time. The result would be a shrinking winter operation, with no option to address it through increased snowmaking or development of higher-elevation terrain.

No new summer recreational opportunities would be developed. The existing opportunities described above would be maintained but not expanded, and new off-season opportunities would not be pursued. As a result, this adaptation also would not be an effective offset to decreasing winter recreation at Snow King.

In short, natural snowfall would likely decrease, and Snow King would not implement any new adaptations to offset this critical element of climate change.

3.2.3.2 Alternative 2

Under this alternative, the expansion of snowmaking coverage and development of high elevation terrain would help offset the effects of climate change at Snow King. Snowmaking would be expanded to 147.7 acres to cover existing runs as well as newly developed terrain. Much of the newly developed terrain is located at higher elevations, where snow is retained longer than at lower elevations. While much of this higher elevation development is located on the south facing slope, it would have complete coverage by snowmaking.

Furthermore, summer recreation would be expanded to provide additional recreation opportunities outside of the winter season. The existing Stairway hiking trail would be improved, and a new 1.5-mile hiking trail is proposed in the Bearcat Glades area. An additional 6.5 miles of mountain biking trails would include lift-served mountain biking, the fastest growing form of recreation at mountain resorts nationwide. There would also be a mountain biking zone on the back side of the mountain accessed via the Summit Gondola and Lift A. Lastly, a new zip line is proposed parallel to the Summit Gondola.

Overall, based on these considerations, Alternative 2 would effectively offset the impact of reduced snowfall due to climate change on Snow King's winter recreational use and long-term operation.

3.2.3.3 Alternative 3

This alternative would incorporate the same climate change adaptations as Alternative 2 in most respects. In terms of snowmaking expansion and development of higher-elevation terrain it would be exactly the same. The changes in summer recreational infrastructure would probably not noticeably affect potential off-season use. Either of the zip line options would likely be less appealing than the longer, faster alignment under Alternative 2 but would still be an important attraction. Eliminating one of the front-side mountain bike trails off the summit would have little impact on the appeal of the trail system, and the proposed hiking trail realignment would marginally increase its attraction.

Overall, based on these considerations, Alternative 3 would also effectively offset the impact of reduced snowfall due to climate change on Snow King's winter recreational use and long-term operation.

3.2.3.4 Alternative 4

This alternative would incorporate less climate change adaptation than Alternative 3. Of the three alternatives, this alternative would have the least snowmaking coverage at 147.2 acres. This reduction is not substantial.

For summer recreation, this alternative would introduce an adaptive management approach to development and operation of the mountain-bike program. This could slow or conceivably stop growth of the program and thus its contribution to Snow King's summer recreational opportunities.

This alternative would also reduce the front-side mountain biking trails to 5.6 miles and emphasize lower ability levels. This would marginally decrease the capacity of the trail system and narrow the range of mountain bikers it would attract compared to Alternative 3. These changes may further reduce the potential contribution of mountain biking to Snow King's summer recreational offerings.

Overall, based on these considerations, Alternative 4 would be somewhat less effective in offsetting the impact of reduced snowfall on Snow King's long-term operation.

3.2.4 CUMULATIVE EFFECTS

With regard to climate change and the continued operation of the ski area, two of the recent Snow King projects described in section 3.1.2 helped the ski area adapt winter operations to counter climate change. The 2015 Rafferty lift replacement developed and provided access to higher-elevation ski terrain. The 2014 snowmaking infrastructure project upgraded the ski area's snowmaking system, resulting in improved efficiency and expanded coverage. Two other recent projects, the 2015 aerial adventure course and the new toilets installed at the top of the Summit lift in 2018, added to the variety and accessibility of Snow King's summer recreation opportunities. Collectively, the cumulative effects of these collective adaptations to climate change and potentially reduced snowfall are reflected as appropriate in the preceding description of the affected environment (section 3.2.2).

Beyond that, the improvements made by the Big Munger trail re-route could interact with the addition of summer activities included in each of the alternatives to promote the continued operation of the ski area. The improved trail conditions could marginally increase the number of summer visitors, helping to build a critical mass of recreational opportunities and retain more summer visitors in the Jackson area.

3.2.5 DESIGN CRITERIA

This analysis of potential climate change impacts did not identify the need for any design criteria, beyond the terms of the alternatives, to avoid or reduce adverse effects.

3.3 AIR QUALITY

3.3.1 SCOPE OF ANALYSIS

3.3.1.1 Protected Airsheds

- *How would construction and use of the proposed infrastructure affect protected airsheds around the project area?*

There are several areas in the vicinity of Jackson with airsheds protected under the Clean Air Act, as amended, and associated programs. These include national parks and designated wildernesses. Slash burning, off-road equipment operation, and soil disturbance could generate smoke and dust, adversely affecting air quality in these protected airsheds.

Indicator: Assessment of the extent of these practices and the efficacy of design criteria available to minimize any adverse effects on Class 1 airsheds.

3.3.1.2 Snowmaking Cloud

- *How would the proposed increase in snowmaking system coverage affect the "snowmaking cloud" that impacts the neighborhood around the base area?*

On cold winter days, snowmaking can generate a cloud of ice crystals that remains suspended in the air, spreading to surrounding areas and blocking the sun. Increased snowmaking could make this effect more extensive.

Indicator: Assessment of the effect of the proposed system expansion on the frequency and extent of the snowmaking cloud.

3.3.2 AFFECTED ENVIRONMENT

3.3.2.1 Protected Airsheds

Clean air designations were established under the Clean Air Act, Title I, part C, Prevention of Significant Deterioration. Two classifications were initially created. Class I areas included international parks, national parks exceeding 6,000 acres, and national memorial parks and wilderness areas exceeding 5,000 acres. All other areas were designated Class II areas.

Class I areas are given special air quality and visibility protection under the Clean Air Act and managed by the National Park Service, US Fish and Wildlife Service, US Forest Service, and several Native American Tribes. Five Class I airsheds are located in Teton County and include Grand Teton and Yellowstone National Parks, and the Bridger, Gros Ventre, and Teton wildernesses. The Gros Ventre Wilderness and Grand Teton National Park are closest to Snow King and thus most susceptible to any adverse air quality effects. Since visibility and air quality are not monitored in the Wilderness, the Park, which is located approximately 8 miles from Snow King, provides the best baseline for addressing this issue.

The National Park Service monitors air quality and visibility in most Parks across the country. National Parks and Monuments in the West tend to exhibit better air quality and visibility conditions than those in the Mid-west and eastern US. However, only Alaska has National Parks identified with good visibility conditions, and all Parks in the Lower 48 have fair to poor air quality ratings.

Visibility is the main air quality concern for National Parks, including Grand Teton, and particulates are the main constituents generated by this project that could affect visibility. Accordingly, this analysis focuses on visibility and particulates.

The National Park Service monitors air quality in National Parks and provides Park-specific summaries on their website (NPS 2018). The results for Grand Teton National Park cover the last 5 years and indicate that air quality is rated as fair, with nitrogen and sulfur pulling the rating down.

Visibility is rated as fair, but the 5-year average is only slightly under the good rating threshold (5-year average 4.8 deciviews compared to a good threshold of 4.5 and a poor threshold of 10.5). Deciviews are a haze index corresponding to uniform incremental changes in visual perception, across the entire range of conditions from pristine to highly impaired. The trend is rated “relatively unchanging.”

For particulates, PM10 is rated good (48 microgram/cubic meter compared to fair threshold of 54 and poor threshold of 155). PM2.5 is rated fair (4.8 microgram/cubic meter compared to fair threshold of 4 and poor threshold of 12.5). National and Wyoming Department of Environmental Quality standards for PM10 are 150 micrograms/cubic meter, 24-hour average.

Overall, for the constituents of concern in this analysis, air quality in Grand Teton’s Class I airshed is fair but very close to the good threshold, and it would take a 2-to-3-fold increase in particulates or reduction in deciviews to exceed the poor threshold or, in the case of PM10, the Wyoming and national standard. The haziest conditions are typically in the summer, when there is more fine particulate matter in the atmosphere that scatters or absorbs light. The clearest days occur during the winter.

Emissions from vehicles driving through the Park area constitute a substantial percentage of particulate matter emitted in the area. Estimates for Teton County in 2018 indicate 834,907 miles are driven daily by passenger cars and 57,090 miles by trucks (WYDOT 2019). Using Environmental Protection Agency estimates of 0.0041 and 0.0045 grams/mile of PM2.5 pollutants for cars and light trucks (EPA 2008), over 8 pounds of PM2.5 are emitted into the atmosphere daily from vehicle traffic in Teton County. This equates to about 3,000 pounds annually.

In addition to vehicular sources, PM10 and PM2.5 emissions are produced from a wide range of industrial, diffuse, and natural sources. Rock quarrying, wood stoves, road dust, forest fires, and other emissions are

all examples of sources for inhalable particulate matter. Emissions such as dust, dirt, soot, or smoke are often visible.

It is important to note that air quality monitoring and standards, including those cited above, are expressed as concentrations (e.g., micrograms of PM2.5 per cubic meter) while emissions from a given source are typically expressed as a mass quantity (e.g., pounds of PM2.5). The relationship between emissions and concentrations is extremely complex and variable.

In terms of Snow King's contribution of particulates, vegetation management (primarily thinning and cleanup of dead and down trees) occurs annually at Snow King at rate of 5 to 10 acres annually (Stanley 2019a). Downed timber and slash are collected, piled, and burned in October and November as conditions permit. Piles are burned according to the *Bridger-Teton National Forest Industrial Fire Precautions Plan* and methods outlined in the ski area's Vegetation Management Plan. Snow King's slash burning is included in annual updates to the programmatic burn plan for the North Zone of the Bridger-Teton and complies with Wyoming Air Quality Division Smoke Management Program requirements (WDEQ 2004). Before burning, Bridger-Teton fire dispatch and local authorities are contacted to check atmospheric conditions and notify authorities as required.

Typically, 50 to 100 piles of slash are burned at Snow King each fall. The ski area burns from three to 10 piles a day, depending on conditions, with an estimated average slash pile size of 10 feet by 10 feet (Stanley 2019a). Using the *Piles Fuels Biomass and Emissions Calculator* developed by the Forest Service's Fire and Environmental Research Application Team, this equates to an estimated 24 to 48 tons of slash burned annually, with a maximum of 5 tons burned on a single day (FERA 2019).

Based on the same emissions calculator, an estimated 277 and 318 pounds, respectively, of PM2.5 and PM10 are being produced if 50 slash piles are burned per season, increasing to 555 and 637 pounds, respectively, if 100 piles are burned.

For comparison, a traditional wood-burning stove burning one cord of wood emits approximately 16 pounds of PM2.5 and 18 pounds of PM10. Based on these figures, the annual slash burning emissions at Snow King are comparable to 17 to 35 homes burning a cord of wood per year.

In terms of dust as a source of particulates, Snow King operates maintenance vehicles routinely on unpaved service roads. Smaller, PM2.5 particulates can remain suspended and potentially affect visibility in the Park and other Class I airsheds. Dust emissions are difficult to accurately project because of the number of variables involved, but one study in the Pacific Northwest (Roberts 1973) provided an emission factor of 0.1 pounds of PM2.5 per vehicle mile at 10 miles/hour speeds. Using that factor and an estimated 5,000 vehicle miles per season on Snow King's service roads (100 days when roads are passable, and five vehicles traveling 10 miles each per day) yields a gross estimate of 500 pounds of PM2.5 generated each year, or roughly the same amount as generated by slash burning.

3.3.2.2 Snowmaking Cloud

Snowmaking machines create snow by shearing water into very small water particles to create a nucleating site or by injecting a nucleator. The nucleating sites ranges in size from 30 to 70 micrometers and can consist of several different materials. Nucleating sites in nature can consist of tiny bits of dirt, bacteria, or other floating material. Water droplets condense onto the nucleator, which becomes a snow crystal that settles to the ground.

Relative humidity and temperature are the driving conditions for machine-made snow to form. Conditions too warm and high in relative humidity result in heavier slushy snows or rain. Conditions too cold and dry may produce fine snow or freeze water droplets before adhesion to the nucleator. Because weather and atmospheric conditions are always changing, snowmaking machines are often adjusted to correct mixture of air and water to get good adhesion to the nucleating site to form snow.

Colder and drier conditions are more effective for snowmaking, which makes most western resorts optimal for snowmaking. However, these colder dryer conditions can freeze water droplets before they attach to a nucleator. These frozen particles can be small enough to stay aloft under certain atmospheric conditions and form a snow cloud.

Snow King lies at the edge of town, and the majority of current snowmaking occurs on the lower portion of the mountain adjacent to the town. When snowmaking is underway, there is a chance for machine-made snow to remain in suspension and drift from the mountain into town. This occurs most often with machines at lower elevations during inversion weather events. In these circumstances, fine snow particles form a cloud over the valley causing a reduction in sunlight reaching the ground and lower felt temperatures at ground level. Wind direction, elevation, atmospheric conditions, weather, type of snowmaking machines, and the volume of water used for snowmaking affect the likelihood of this occurring.

3.3.3 DIRECT AND INDIRECT EFFECTS

3.3.3.1 Protected Airsheds

3.3.3.1.1 Alternative 1

Under the no-action alternative, emissions would remain the same as existing conditions and past output. Air quality impacts from annual slash burning associated with vegetation management and maintenance vehicle dust would be minor. These emissions would not constitute a notable impact on visibility or particulate concentrations in Teton National Park or other area Class I airsheds.

3.3.3.1.2 Alternative 2

As discussed above (section 3.3.2.1), the relationship between concentrations of air quality constituents and emissions from specific sources is extremely variable and complex, and this analysis correctly focuses on emissions. Beyond that, quantifying projected emissions is a complicated analytical process that would be undertaken in a NEPA review only if it were necessary to determine whether an air quality impact was significant or not. In this case, as discussed in section 3.3.2.1, there is a wide margin between the current visibility and particulate ratings for Grand Teton National Park and the poor rating threshold. As a result, this analysis can take a broader, less quantified approach and provide a sufficient basis for the significance determination.

Under this alternative, 32.7 acres of glading would occur to increase tree skiing opportunities. If Snow King continued their current program as planned, the acreage treated, and the volume of slash burned per season, would not increase relative to existing conditions (section 3.3.2.1). Particulate emissions would remain unchanged, though the additional acreage to be treated would extend the impact for roughly 3 to 6 years. These particulate emissions would continue to be generated in October and November, when visibility and particulate concentrations in the Class I airsheds are good. Burning would continue to be conducted in compliance with applicable plans and regulations, including those provided under Wyoming's Smoke Management Program (WDEQ 2004; see section 3.3.2.1).

Under Alternative 2, construction of a new summit access road/novice skiway, various facilities, biking and hiking trails, ski runs, gondola, and lifts has the potential to increase dust emissions. The proposed improvements require grading or excavation of 64.1 acres that would temporarily generate dust during construction. Projects such as the new summit access road/novice skiway, ski run grading, and facilities are likely to generate larger amounts of dust. Ski lift, hiking and biking trail construction will generate minor amounts.

Construction dust is impossible to accurately quantify given the wide range of heavy equipment and construction methods involved, the inherent variability in site conditions, and weather conditions. Nevertheless, the potential for substantial dust production is high. To offset this risk, the dust management

BMPs listed in section 3.3.5 should be implemented. These are standard practices that have proven effective in reducing fugitive dust emissions across a wide range of construction projects.

Overall, with the design criteria identified in section 3.3.5 in place, Alternative 2 is unlikely to have a discernible effect on visibility or particulate concentrations in Grand Teton National Park or other Class I airsheds in the area.

3.3.3.1.3 Alternative 3

Under Alternative 3, the acreage disturbed by grading and excavation would not change appreciably, but 154.2 acres of forest stand thinning to reduce fuel loads in the wildland/urban interface zone would occur over time. As discussed under Alternative 2, if Snow King maintained their current glading/thinning operation, the air quality effects on a year-to-year basis would remain similar to what they are today, but they would extend further into the future, roughly for another 15 to 30 years.

Given the pressing need to complete fuel reduction treatments (section 2.5.4.4), it is likely that the Bridger-Teton would accelerate the thinning program. The rate of slash burning would likely increase proportionately. To assess the likely impact, a couple of key points from section 3.3.2.1 need to be considered. First, it would take a 2-to-3-fold increase in particulates and other airborne constituents to decrease the Park's visibility rating to poor. Second, the particulate pollution generated by slash burning is a small proportion of that associated with vehicle traffic, wildfire, and other sources. Third, burning would comply with Wyoming's Smoke Management Program requirements (WDEQ 2004). Fourth, burning would continue to occur in late fall, when air quality in the Class I airsheds is good, which would minimize its impact. Based on these considerations, and with the design criteria noted in section 3.3.5 in place, the pace of forest stand thinning and slash burning could be increased substantially without causing a poor visibility rating in the Park or exceeding Wyoming or national particulate standards in Class I airsheds.

From another perspective, a 135-acre wildfire in this region would be considered relatively small. It would produce far more emissions than burning the slash from a 135-acre thinning project. All the emissions would be generated in a matter of days, and it would likely occur during the summer when ambient air conditions were at their worst.

3.3.3.1.4 Alternative 4

Under Alternative 4, impacts from grading and excavation relative to Alternative 3 would decrease by 0.2 acre. While impacts on air quality may be reduced, the difference would be negligible.

3.3.3.2 Snowmaking Cloud

3.3.3.2.1 Alternative 1

Under this alternative, snowmaking at Snow King would remain unchanged at 90 acres. No additional water would be used to create snow. The frequency and duration of snow cloud formation would remain unchanged.

3.3.3.2.2 Alternative 2

Under this alternative, snowmaking coverage would increase substantially, by 147.7 acres. With all variables held equal, the amount of snow produced, and thus the potential for snow cloud formation, is directly proportional to the amount of water used. Under Alternative 2, Snow King could increase water consumption up to a maximum of 60 million gallons seasonally (section 3.4.2.1.2), more than double what is currently being used. Newer, more efficient, snowmaking machines may reduce actual water use.

This increase in water use does not necessarily translate into a proportional increase in snow cloud formation for several reasons. Most of the snowmaking system expansion is at higher elevations where snowmaking would be required less frequently. It would also be spread across a wider area and be exposed

to more winds, and both of these factors would increase dispersion. Snowmaking on the back side would not affect Jackson.

Overall, some increase in the frequency and duration of snowmaking cloud formation affecting Jackson is possible. To limit this potential, Snow King could limit front-side snowmaking during valley inversion conditions.

3.3.3.2.3 Alternative 3

Under Alternative 3, impacts would be the same as described under Alternative 2.

3.3.3.2.4 Alternative 4

Under this alternative, added snowmaking coverage would be 147.2 acres, relative to the 147.7 acres under Alternative 3. This small reduction in acreage of snowmaking would not noticeably change the impacts described under Alternative 2.

3.3.4 CUMULATIVE EFFECTS

All of the cumulative actions identified in section 3.1.2 involve some combination of equipment operation and ground disturbance and thus have the potential to interact cumulatively with these alternatives in affecting air quality. However, these projects are generally small, implemented over a wide time span, and subject to various design criteria to reduce and eventually eliminate dust and emissions. As a result, the potential for significant cumulative effects is negligible.

In regard to the snowmaking cloud, the 2014 project to improve snowmaking infrastructure increased both the efficiency and extent of snowmaking coverage, resulting in a net gain in water use. The cumulative impact on formation of the snowmaking cloud is reflected in the preceding description of the affected environment (section 3.3.2.2).

3.3.5 DESIGN CRITERIA

1. Fugitive Dust Control best management practices (BMPs):
    - To the extent feasible, plan construction to reduce the potential for fugitive dust emissions. Minimize the area of grading, and complete grading in segments.
    - Water all active grading areas, including roadways, building sites, and lift terminal locations, to minimize dust. Under dry conditions, water sites twice daily with complete coverage, preferably in late morning and after work is completed for the day.
    - Limit vehicle speeds on service roads and construction sites to 10 miles/hour.
    - Construct wind breaks or use natural vegetation to control stockpiles of earth.
2. Slash Burning BMPs:
    - Follow existing *Bridger-Teton National Forest Industrial Fire Precautions Plan* guidelines.
    - Comply with requirements of Wyoming's Smoke Management Program (WDEQ 2004).
    - Notify Bridger-Teton fire dispatch and local authorities prior to any slash burning.
    - Avoid slash burning during valley inversions, when possible.
3. Snow Cloud BMPs:
    - Limit snow production on the front side during valley inversions, as feasible.

3.4 WATER, SOILS, AND WATERSHED

3.4.1 SCOPE OF ANALYSIS

3.4.1.1 Hydrology

- *How would the proposed increase in snowmaking and clearing of ski runs affect surface runoff, and groundwater recharge?*

The proposed action would increase snowmaking coverage at Snow King. Most of the proposed coverage is within the current permit boundary (on the north and south sides of Snow King Mountain) with minor amounts in the proposed east and west boundary adjustment areas. No stream channels exist within the current or potentially expanded permit boundary, but the expanded snowmaking coverage would include previously undeveloped drainages. Beyond that, clearing of proposed ski runs would affect the existing pattern of tree cover and could influence snow accumulation and runoff patterns. The combined influence of additional snowmaking and changes in tree cover could impact surface runoff and groundwater hydrology.

Indicator: Primarily qualitative assessment of current conditions, the amount and location of water potentially added to the system, the location and extent of vegetation clearing, the timing of runoff, and the resulting impacts on channel stability and groundwater recharge.

3.4.1.2 Erosion and Slope Stability

- *How would the ground disturbance associated with construction and use of the proposed infrastructure affect soil erosion and slope stability?*

The project area is characterized by steep slopes and erosive soils, and there is evidence of erosion and historic mass soil movement. Construction-related disturbance and subsequent use could potentially increase erosion and sediment transport to downslope areas. It could also create areas of instability on Snow King's slopes.

Indicator: Use of a methodology based on the connected disturbed area approach (CDA; Furness et al. 2000, Forest Service 2006) to assess the risk of erosion, sedimentation, and instability for each proposed project element that entails ground disturbance, both prior to and following implementation of best management practices (BMPs).

3.4.1.3 Water Quality

- *How would construction and use of the proposed infrastructure affect impaired water bodies in the area?*

Short-term surface disturbance during construction of the proposed infrastructure, and long-term use of the proposed ski runs and expanded snowmaking system, have the potential to introduce pollutants (primarily sediment) into downstream waterbodies. While there are no streams to be affected inside the current permit boundary, the proposed east boundary adjustment area includes part of the Cache Creek watershed. Cache Creek is a tributary of Flat Creek, which is included on Wyoming's 2018 303(d) list of impaired water bodies. Any pollutants entering Cache Creek could contribute to Flat Creek's existing impairment.

Indicator: Primarily the results of the hydrology and CDA-based analyses discussed above, specifically their conclusions regarding surface runoff, erosion, sedimentation, and effectiveness of BMPs in avoiding these issues. Assessment of these conclusions in light of the current impairments in Flat Creek and intervening conditions between Snow King and Flat Creek.

3.4.2 AFFECTED ENVIRONMENT

3.4.2.1 Hydrology

Snow King Mountain is part of the Gros Ventre mountain range. These mountains are in the greater Rocky Mountain range that covers much of western Wyoming (Omernik and Griffith 2014). Mountain ranges are generally oriented in the north-south direction and perpendicular to the prevailing regional wind patterns. Although Wyoming is far from moisture sources such as the Pacific Ocean, the increased elevation forces westerly air currents to rise and release precipitation on Jackson Hole and other areas of western Wyoming (WRCC 2019).

3.4.2.1.1 Natural Snowfall

Precipitation as snow in the Jackson Hole area typically begins in early October and persists through most of June, although snow falls for a few days even in July during some years (NRCS 2019a). As a result, snow accumulation and snowmelt runoff have a major influence on the hydrologic cycle in Jackson Hole and most of the greater Snake/Salt River Basin.

Snow accumulation at Snow King can be characterized with data from a snowpack telemetry (SNOTEL) station located 8 miles northeast on Phillips Bench (NRCS 2019a) and a snow survey course near the peak of Snow King Mountain (NRCS 2019b). Mean monthly snow depths on Snow King Mountain are 30–44 inches from December through May, with peak depths typically occurring in March (NRCS 2019b). The lower 10th percentile of monthly snow depth at Snow King Mountain ranges 11–33 inches. Elevations below the snow survey course receive less snow than this during the ski season.

Local factors that influence snow accumulation include aspect, elevation, and vegetation cover. The majority of ski slopes in the permit area face north towards the Town of Jackson. Less sunlight occurs on these slopes during the winter season, compared to slopes on the south side of Snow King Mountain. As a result, snow cover typically remains on north facing slopes after snow has disappeared from south facing slopes.

Elevation in the permit area has an influence on air temperature and subsequently snow accumulation. This influence is illustrated by precipitation events that sometimes produce rain at the base area and snow above the top of Cougar lift, midway up the mountain (Stanley 2019b).

Forest cover can also influence how snow accumulates and melts by interacting with radiation, sublimation, wind, and snow density (Boon 2012, Lundquist et al. 2013, Svoma 2017). The relationship between forest cover and snow processes is complex and can be influenced by site-specific conditions, some of which include magnitude of snowfall, slope, windspeed, canopy geometry, and size of clearings between forest cover (Varhola et al 2010).

Falling snow can accumulate in response to air turbulence created by trees or where wind velocity drops, such as at the edge of forest clearings. Snow captured in areas of tree cover is shielded from solar radiation and generally lasts longer than snow that collects in open areas. Based on existing vegetation mapping, approximately 134 acres (39 percent) of the existing permit area is covered by trees islands interspersed by clearings. The remaining permit area is covered by a mix of shrubs and grass, including most of the south side of Snow King Mountain.

3.4.2.1.2 Snowmaking

Artificial snow is used to develop early season snow cover and then to supplement natural snow accumulation in the permit area as needed. The existing snowmaking systems covers 90.4 acres, primarily in the Rafferty and Cougar pods as well as Elk ski run up to the ridge. Water used for snowmaking is supplied by the Town of Jackson from the same sources used for municipal purposes (Ryan 2019). The annual volume of water used by Snow King for snowmaking is about 25 million gallons and varies each year depending on natural snow accumulation. Recent annual totals (2015-2019) range 22.5–30.5 million

gallons (Stanley 2019b). The high cost of making artificial snow provides an incentive to limit application to areas where additional snow is needed to maintain a safe and desired skier experience.

Snowmaking at Snow King generally begins the first week of November at lower elevations and ends early in January. The opportunity to begin making artificial snow depends largely on daily air temperature. If air temperatures are low and natural snow is plentiful, then ski runs are covered quickly, and snowmaking ends earlier compared to a relatively warm and dry winter.

During a high snowfall year, little snowmaking occurs above the top of Cougar lift. In general, artificial snow is first applied to areas below the top of the Cougar lift and downslope of Slow Trail including beginner terrain, terrain parks, and the Tube Park. Priority areas for snowmaking during the season include the lower Elk ski run, Cougar lift to the base, Rafferty lift from mid-station to base, and the Tube Park.

3.4.2.1.3 Runoff and Groundwater Recharge

Snowmelt in Jackson Hole typically begins in April and extends through the month of June (NRCS 2019a). During these 3 months, melting snow produces surface runoff and groundwater recharge through infiltration. Surface runoff in the permit area is directed by topography. The majority of the permit area is located in the Lower Flat Creek subwatershed, including slopes that drain north towards the Town of Jackson, or south into upper Leeks Canyon. A small portion of the permit area (22 acres) is in the Cache Creek subwatershed.

Although limited snowmelt runoff occurs at Snow King, no stream channels are found in the permit area, including perennial, intermittent, or seasonal streams. Two intermittent stream channels are noted on US Geological Survey maps on the north face of the permit area (USGS 2017, USGS 2018). One mapped stream terminates in the base area, approximately 120 feet upslope of East Snow King Avenue, and the other stream appears as a tributary to Cache Creek. A third intermittent channel is mapped on the back side of Snow King Mountain in the Leeks Canyon watershed (USGS 2017). Field surveys did not identify bed and bank features or riparian vegetation at these mapped stream locations. Neither stream channel features nor wetlands have been identified at any location in Snow King's permit area.

Little runoff from the permit area enters the municipal stormwater system, even during winters with high snow accumulation (Lenz 2019). Snowmelt runoff from business lots along East Snow King Avenue is collected and diverted to a wetland in Karns meadow that removes suspended sediment and other pollutants before entering Flat Creek (Nelson Engineering 2001, TOJ 2013). Accordingly, the majority of snowmelt on Snow King Mountain infiltrates to recharge groundwater.

Groundwater recharge plays a critical role in the local hydrologic cycle by capturing and storing runoff from snowmelt and rain in the Snake/Salt River Basin including Jackson Hole (Lines and Glass 1975, WWDC 2007). Groundwater recharge along the valley floor of Jackson Hole is typically 5–6 percent of annual precipitation but can reach 60 percent in the surrounding mountains (Taboga et al. 2014).

Direct measurements of groundwater recharge from the permit area are not available. Recharge rates in the Snake/Salt River basin are estimated to range from 1–35 inches/year with higher recharge occurring in mountain and foothill areas (Taboga et al. 2014). Recharge primarily occurs in unconsolidated alluvium, fault zones, and historic landslide debris found along the margins of Jackson Hole (Love and Albee 1972, Nolan and Miller 1995, Taboga et al. 2014) including lower elevations of the permit area and adjacent private land. Groundwater recharge is particularly important to the Town of Jackson, which depends on groundwater for municipal use due to the abundance, quality, and low treatment cost of this resource (Nelson Engineering 1993, Ryan 2019).

Most surface runoff in the permit area from rain and melting snow (including snow melt from natural and artificial snow) infiltrates into the lower slopes of Snow King Mountain, providing groundwater recharge.

3.4.2.2 Erosion and Slope Stability

3.4.2.2.1 Erosion Hazard

Most of the project area is characterized by steep slopes and soils with moderate or high erosion potential. Portions of lower elevations in the project area are covered by historic landslides. Disturbance created by construction activities has the potential to accelerate erosion and reduce ground surface stability and soil productivity. Many areas of Teton County experience minor earthquakes on a regular basis (USGS 2019a). The potential for surface erosion and instability to occur can be assessed on the basis of characteristic soil properties, landslide mapping and classification, and earthquake monitoring data.

Soil properties for this analysis were drawn from a soil survey of the Bridger-Teton completed by the Soil Conservation Service (SCS 1985) and the national SSURGO database maintained by the Natural Resources Conservation Service (NRCS 2017). Figure 3-1 and Table 3-6 identify all soil mapping units in the project area and provide this information for each.

Seven soil map units occur in the project area (Table 3-6). Soil texture in most locations is skeletal, indicating a lack of well-defined soil layers and a mixture of imperfectly weathered and coarse fragments in the upper profile that generally exceeds 35 percent of the total profile (SCS 1985, Miller and Donahue 1990). As a result, the soil profile is typically well-drained in the project area.

The north face of Snow King Mountain and the Snow King base area include four soil map units. Soil unit 391 covers the majority of this area and extends upslope from the permit boundary to Snow King summit on 40–70 percent slopes. The other three, soil units 14, 46, and 59, are all located downslope of the permit area on private land owned by Snow King and the Town of Jackson (NRCS 2017, Teton County 2019). Soil unit 14 has 0–5 percent slopes and underlies small portions of Snow King base area facilities and most of the Town of Jackson. Soil unit 46 is found to the east and west of soil unit 59 on slopes ranging 30–70 percent. Soil unit 59 includes most of the base area, on 30–60 percent slopes that extend up to the permit boundary. All soil map units on the north side of the permit have a high erosion hazard with the exception of unit 14 which has a low erosion hazard. The high erosion hazard in and around the project area is due primarily to slope.

The back side of the ski area includes three soil map units. Soil units 372 and 484 are located south of Snow King ridge on steep slopes that elevate the potential erosion hazard to high. Soil unit 392 has a low erosion hazard. This soil unit covers a small section of the project area with moderate slopes near the far southern boundary.

Table 3-6 identifies several soil map units with a limited ability to support revegetation in the absence of BMPs and other actions that enhance growth. “Revegetation limitation” is an inherent soil characteristic that describes the ability of a soil to respond to revegetation efforts. Ratings range from slight to very severe and indicate a response to revegetation efforts from acceptable to poor (SCS 1985). Five of the seven soil map units in the permit area have either a slight or moderate revegetation limit (Table 3-6).

3.4.2.2.2 Slope Stability

Teton County has recently identified risks from landslides as one of several hazard events that could potentially impact property and infrastructure in the county (TCEM 2016). That assessment notes that if landslides near the Town of Jackson were to become active, damage could occur to structures and roads that are built in these areas. Furthermore, Cache Creek and Flat Creek could also be dammed if landslides near these creeks reactivated. Rupture of a landslide dam could ultimately cause flooding in Jackson (TCEM 2016).

Slope stability is indicated by historical landslide activity and the probability of mass movement. Mass movement, whether accelerated by anthropogenic activities or naturally occurring, can result in erosion and decreased soil productivity. Mass stability can range from stable–unstable (SCS 1985). Six of seven soil map units in the permit area have a mass stability rating of either stable or marginally unstable (Table 3-6).

Historical landslides within the project area cover 14 acres on slopes ranging up to 48 percent. Landslides were identified through aerial photo interpretation collected in the 1980s and 1990s (Wittke 2019) and described using the Wyoming Landslide Classification Scheme (Varnes 1978, WSGS 2019a). These features overlap the north permit boundary at lower elevations and extend into the Town of Jackson (Figure 3-1). The mapped landslide areas in the Town of Jackson have been developed for homes and roads, including areas along Upper Cache Creek Drive, Snow King Loop, Upper Redmond Drive, and Redmond Street.

Mapped landslides in and near the project area are categorized as slump or flow features containing debris, earth, and bedrock. Slump landslides are also referred to as rotational slides that occur as a block of material moves a limited distance along a concave surface. A flow landslide, also known as debris flow, includes a mass of loose, water-laden rock, soil, and mud that moves down a slope in response to gravity (WSGS undated). The cause of mapped landslides in the project area is currently unknown (Wittke 2019). With the exception of road failure due to poor construction, soil movement and surface instability have not been a concern in the project area (Stanley 2019c, Lenz 2019). Recent field surveys of mapped landslides in the project area did not identify evidence of past or recent surface movement and instability.

Landslides generally start from three causes including geology that is weak, weathered or sensitive; surface morphology responding to uplift or erosion; and human activities that create instability (USGS 2004). Earthquakes can be a trigger as well. Due to their historic nature, mapped landslides in and near the permit area likely occurred in response to geology or surface morphology.

The Budge Drive slide is the most recent slide to occur near the Town of Jackson (Jackson Hole Daily 2014). It originated on East Gros Ventre Butte near the west side of the town. The landslide is believed to be primarily a response to human activity following quarrying and excavation, fracture development, and water infiltration (GOJH 2014). The most significant slide in Teton County (in terms of size and damage) is the Gros Ventre slide, located about 16 miles northeast of Jackson. The slide occurred in 1925, and some people believed that seismic activity might have precipitated it (Forest Service 2016, Case et. al. 2002). Several other factors are now considered to have influenced the slide including heavy rains and rapidly melting snow, erosion created by the Gros Ventre River, and saturated soils at the top of the mountain indicated by numerous pools (Forest Service 2016).

Earthquakes in Teton County are common and occur almost every day throughout Wyoming, with the majority occurring in the northwest corner near Yellowstone Park (WSGS 2019a). However, most of these quakes go unnoticed due to their small magnitude (< 3 on the Richter scale) and few have resulted in damage in Teton County (Case et. al. 2002). In 2003 there was a 3.5 magnitude earthquake near the top of the Summit lift (USGS 2019a). No structural damage or surface instability was created by the earthquake (Stanley 2019c). Furthermore, existing ski resort infrastructure meets industry standards for structural integrity and state and local building codes for the area. Although earthquakes can produce short-term surface instability, no instability or damage due to earthquakes has occurred in the permit area or in downslope areas by rocks or other material moving from the resort (Lenz 2019).

Potential sources for earthquakes are the thrust faults in and around Jackson, including the project area (WSGS 2019a). The Jackson Thrust Fault intersects the lower portion of Snow King from east to west near the base area. The fault begins near the intersection of Highways 89 and 22 and extends just past the Rafferty lift. This is an inactive fault due to the absence of movement during the past 10,000 years and buried position (i.e., subsurface) in the geologic stratigraphy (USGS 2019b, WSGS 2019b).

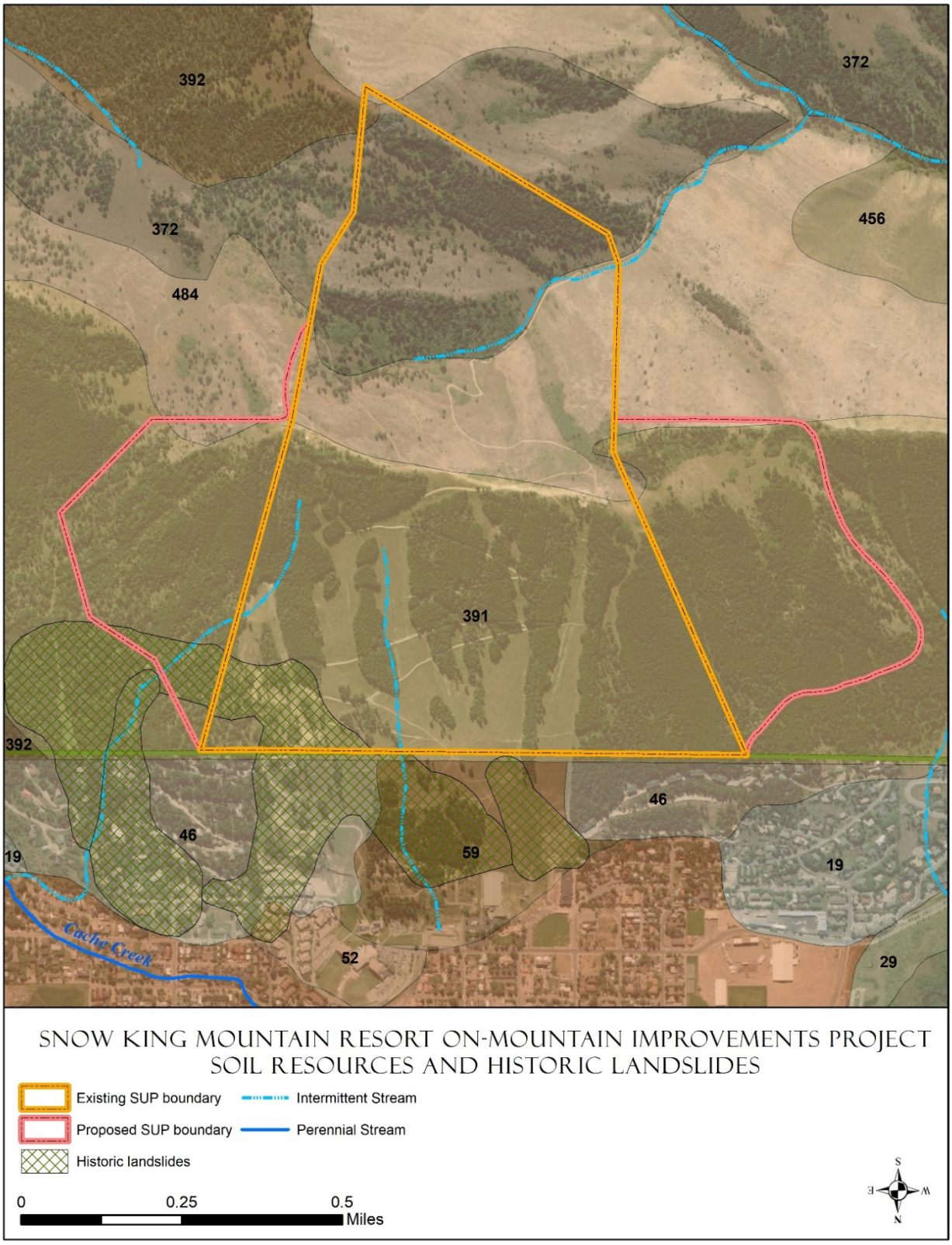

Figure 3-1. Soil resources and historic landslides.

Table 3-6. Characteristic soil properties in the Snow King Mountain Resort permit area.

Map Unit 372: Loamy to skeletal, mixed, and well-drained soil. Surface layers are commonly gravely loam to very cobbly loam 6–10 inches thick. Rock fragment content in surface soil is 15–40%. This map unit covers the north face slope south of Leeks Canyon road.

Erosion Hazard:	Revegetation Limitation:	Stability Rating:	Slope (%):
High	Slight	Marginally Stable	30–60

Map Unit 391: Fine-loamy to loamy-skeletal, mixed, and well-drained soil. Surface layers are loam–gravelly loam about 5–10 inches thick. Rock fragments in surface soil are pebbles and cobbles and comprise 0–40%. This map unit is found north of Snow King ridge.

Erosion Hazard:	Revegetation Limitation:	Stability Rating:	Slope (%):
High	Severe	Marginally Stable	40-70

Map Unit 392: Fine-loamy to coarse-loamy, mixed, and well-drained soil. Surface layers are commonly loam, gravelly loam, sandy loam, or silt loam about 7–8 inches thick. Rock fragments in surface soils include pebbles, cobbles, and comprise 0-25%. This map unit is found in the southeast corner of the permit area.

Erosion Hazard:	Revegetation Limitation:	Stability Rating:	Slope (%):
Low	Moderate	Stable	10–40

Map Unit 484: Loamy-skeletal, mixed, and well-drained to excessively drained soil. Surface layers are commonly gravelly sandy loam–extremely cobbly loam 3–6 inches thick. Rock fragments are pebbles and cobble scattered throughout the profile and comprise 15–70 percent. This map unit extends south from Snow King ridge to Leeks Canyon road.

Erosion Hazard:	Revegetation Limitation:	Stability Rating:	Slope (%)
High	Very Severe	Marginally Unstable	50-75

Map Unit 14: Gravelly loam to very gravelly loamy sand and somewhat excessively drained soil. Surface layers are commonly gravelly loam 5 inches thick. Rock fragments in surface soils include up to 15 percent cobble. This map unit extends north from Phil Baux Park to the Elk Refuge.

Erosion Hazard:	Revegetation Limitation:	Stability Rating:	Slope (%)
Low	Slight	Stable	0-5

Map Unit 46: Loam to very stony loam and well-drained soil. Surface layers are commonly coarse upland to shallow loam from 4-10 inches thick. Rock fragments in surface soils comprise 5-60 percent cobble and boulders. This map unit covers land east of the Rafferty lift and north of the USFS boundary.

Erosion Hazard:	Revegetation Limitation:	Stability Rating:	Slope (%)
High	Moderate	Marginally Stable	30-70

Map Unit 59: Loamy and well-drained soil. Surface layers are commonly loam to gravelly loam from 6-26 inches thick. Rock fragments in surface soils include up to 10 percent cobble. This map unit covers land between the Summit lift and the Rafferty lift and north of the USFS boundary to the base of the mountain.

Erosion Hazard:	Revegetation Limitation:	Stability Rating:	Slope (%)
High	Slight	Stable	30-60

3.4.2.3 Water Quality

The Wyoming Department of Environmental Quality has classified Flat Creek as impaired since 2002 due to poor physical substrate and habitat alteration (WDEQ 2019a). Existing water quality concerns include urban stormwater, encroachment by development on riparian habitat, and alterations to the stream channel (TCD 2019). A collaborative watershed committee including the Bridger-Teton is working to implement a watershed management plan to address these concerns (TCD 2019).

Cache Creek is a tributary stream to Flat Creek that receives municipal stormwater as it passes through the Town of Jackson. Additional stormwater is contributed directly to Flat Creek by stormwater outfalls along the northwest side of the town (Remlinger 2006). Substantial reductions in stormwater pollutant loads including sediment and nutrients have been achieved in the past 10 years due to treatment wetlands, wetland enhancements, and stormwater retention structures (TOJ 2013).

As described in section 3.4.2.1.2, field surveys and other existing data show there are no receiving water bodies or wetlands located in or adjacent to the permit area. Before entering the Town of Jackson, Cache Creek passes by the northeast corner of the existing permit boundary, approximately 1,900 feet away. Based on distance to the stream channel and local infiltration rates, no surface runoff from the permit area reaches Cache Creek. As mentioned in section 3.4.2.1.2, little snowmelt runoff from the permit area reaches East Snow King Avenue and the Town stormwater collection system. No stream channels or wetlands were identified in the south permit area or immediately downslope of this area. Although Leeks Canyon is included in the Flat Creek watershed, the stream channel in the lower canyon area does not reach Flat Creek.

3.4.3 DIRECT AND INDIRECT EFFECTS

3.4.3.1 Hydrology

3.4.3.1.1 Alternative 1

No additional snowmaking or clearing for ski runs would occur under the no-action alternative. The existing distribution of natural snow accumulation would continue on the front and back sides of Snow King Mountain. Snowmaking would continue to be used to develop early season coverage then on an as-needed basis to supplement natural snow cover and provide a desirable and safe skiing surface. Under the no-action alternative, the total volume of water used for snowmaking would continue to be approximately 25 million gallons per year. Conditions that influence surface runoff and groundwater recharge would remain the same as described under section 3.4.2.1. Snowmelt runoff generated in the permit area would continue to infiltrate and provide groundwater recharge to local aquifers.

3.4.2.1.2 Alternative 2

Under this alternative, snowmaking coverage would be expanded on both existing and proposed runs (Figure 3-2). Snowmaking 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. This would result in approximately 147.7 acres of additional snowmaking coverage for a total of 237.2 acres (Figure 3-2).

As discussed below, snowmaking water use is projected to increase. However, the increase in snowmaking system coverage would not necessarily correspond to a proportional increase in water use and production of artificial snow. The purpose of the expansion would be to provide flexibility and increased efficiency regarding where snowmaking could be applied.

New snowmaking would focus on priority areas where skier demand is likely to be highest. North side priority areas would include the full length of the summit access road/novice skiway, beginner terrain on the summit, and the ridge area between the Summit gondola top terminal and Lift A. South side priority areas would include the south facing slope between Lift D and Lift A, including corridors from the ridge

down to the bottom of Lift A. Snowmaking would be employed on remaining, lower priority areas as needed according to skier demand, existing snow cover, and weather conditions conducive to making snow.

Based on existing application rates that account for variation in snowfall between wet and dry years, elevation of proposed coverage, and best professional judgement, this alternative would require an additional 20–35 million gallons of water per year for snowmaking. Given the annual volume of 25 million gallons currently used for snowmaking, a total of 45-60 million gallons per year would be used annually for snowmaking under this alternative. The 60 million gallons per year total would be the maximum water volume if snowmaking occurred on all proposed areas of system coverage during a dry year. During most years, annual total water use would be less than this due to the focus on priority snowmaking areas.

Under this alternative, the permit area would expand to 525 acres including east and west boundary adjustment areas. This would add 133 acres of tree islands to the permit area and increase percent tree cover from 39 percent to 54 percent. Project elements under the Alternative 2 would reduce this tree cover through glading (32.7 acres) and clearing (47.7 acres). In many cases, glading would not require much tree removal. Clearing activities would primarily create new ski runs on the north side and east boundary adjustment area. Clearing for new ski runs on the south side would remove few trees due to the low density of tree cover.

These actions would modify the existing pattern of tree islands and tree density on the north and south sides of the permit area, including the east and west boundary adjustment areas. These modifications would alter existing low-level wind patterns that influence snow accumulation. Minor increases in snow accumulation could occur in response to these changes, particularly at the edge of new clearings. Gladed areas located adjacent to new ski runs in the east boundary adjustment area and on the south side would decrease this edge effect by deflecting less wind compared to complete tree cover. Snow that accumulated in cleared and gladed areas would also receive more sunlight compared to areas with tree cover.

Modifications of tree cover under this alternative would result in slight, localized changes in snow accumulation and snowmelt in areas where clearing occurred. These the changes would not result in measurable impacts on runoff volumes or timing compared to existing conditions.

Despite the fact that snowmaking water use at Snow King could more than double, the snowmelt runoff scenario in the permit area would remain similar to existing conditions (section 3.4.2.1.3). This is because snowmaking is expensive and therefore used as little as possible. When natural snow is sufficient to meet a ski area’s needs, snowmaking does not occur. On the other hand, during dry years, or years when natural snow comes late, snowmaking offsets shortages of natural snow. As a result, similar amounts of snow accumulate naturally or as a result of snowmaking over the course of a season, and the amount of runoff remains comparable. During high snowfall years, when runoff increases notably, snowmaking is generally minimal and a minor contributing factor.

Depending on how much snow is made in any given year, the snowmelt period could be extended at some locations due to the higher density of machine-made snow. Extending the snowmelt period would benefit groundwater recharge by providing additional time for infiltration to occur.

Overall, any change in snowmelt runoff, infiltration, and groundwater recharge associated with this alternative would remain within the range of variability in volumes and rates experienced at Snow King in the past.

3.4.2.1.3 Alternative 3

Changes in snowmaking coverage and tree cover under Alternative 3 would be the same as under Alternative 2. Impacts on snowmelt runoff, infiltration, and groundwater recharge would also be the same.

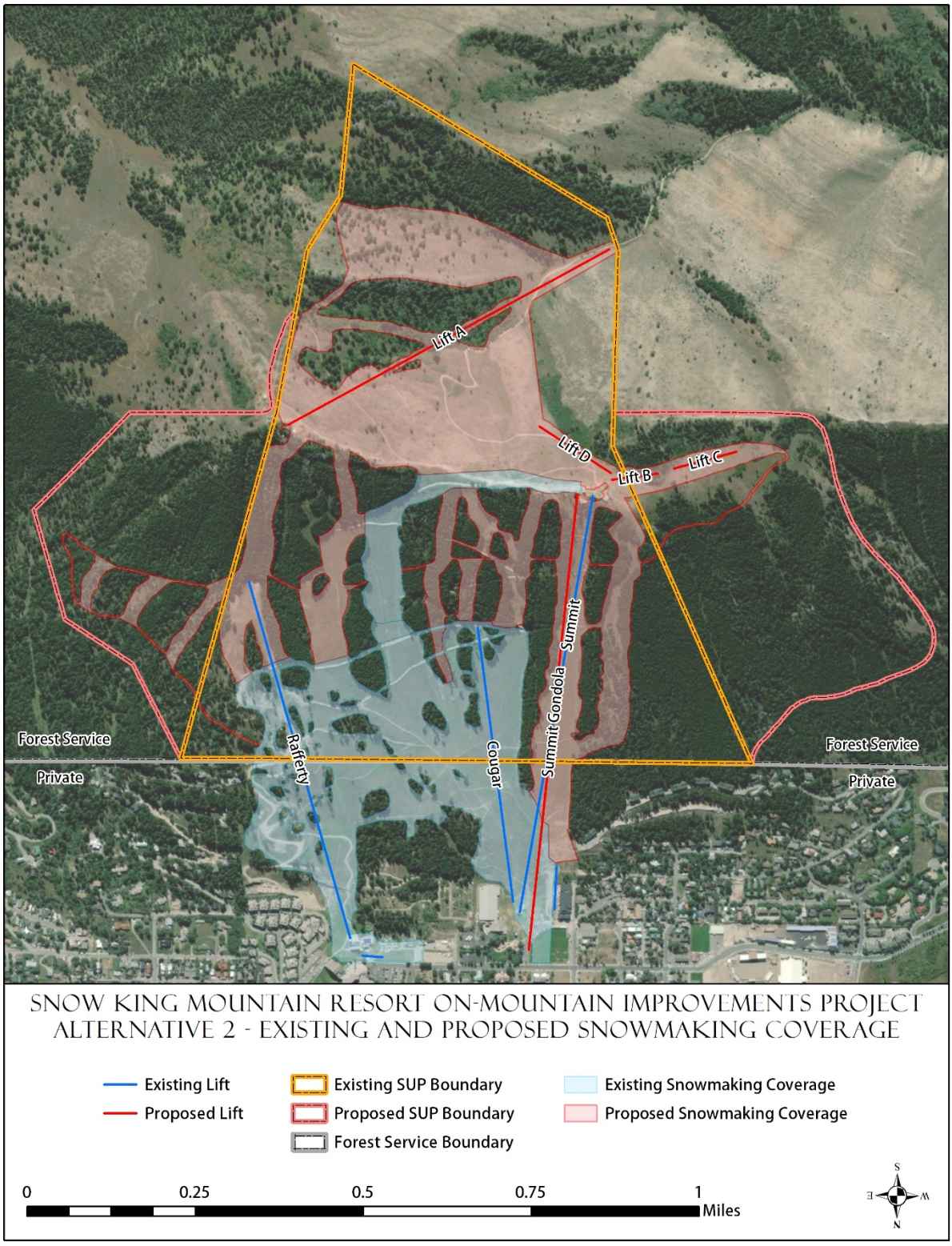

Figure 3-2. Existing and proposed snowmaking under Alternative 2.

3.4.2.1.4 Alternative 4

New snowmaking coverage under Alternative 4 would be 147.2 acres, or 0.5 acres less than Alternative 3. These changes would occur primarily in the central portion of the front side. Changes in glading and thinning activities under Alternative 4 would also be minor, including 0.3 fewer acres of glading and 11.3 fewer acres of thinning compared to Alternative 3. Clearing activities under Alternative 4 would include 15 more acres compared to Alternative 3. Similar to Alternative 3, this alternative would not result in measurable impacts on runoff volumes or timing or on groundwater recharge compared to existing conditions.

3.4.3.2 Erosion and Slope Stability

3.4.3.2.1 Alternative 1

No development would occur under this alternative, and Snow King would continue to operate under its current design and capacity. Conditions that influence soil erosion and slope stability would generally remain as described in section 3.4.2.2. Erosion would continue to occur at existing rates, particularly in areas where soil surfaces were exposed to raindrop impact or concentrated flow. Potential sources of soil erosion would continue to be existing roads, trails, and areas where vegetation is sparse or absent. At present, the existing summit access road experiences ongoing erosion issues. Erosion management would include standard practices currently used to manage soil erosion and slope stability including water bars, silt fences, erosion control blankets and mats, and wattles (Stanley 2019c, Teton Conservation District 2014).

3.4.3.2.2 Alternative 2

Connected Disturbed Area Approach

Natural erosion and sediment transport processes are part of soil development. However, prior to site rehabilitation, erosion from areas disturbed by construction can occur at an accelerated rate. The method used here to assess erosion and sedimentation hazard resulting from proposed development is based on the connected disturbed area (CDA) approach described by Furness et al. (2000) and the Forest Service (2006). We have adapted that methodology to provide a risk assessment rating for this project. Our methodology involves the following steps, applied to each proposed project element:

1. Determining the erosion potential prior to BMP implementation based on the erosion hazard of the affected soil types, the size of disturbance, the intensity of disturbance (i.e., clearing, grading, or excavation), the slope of the disturbed area, and the distance to the closest drainage channel or other runoff pathway (e.g., road or trail).
2. Identifying appropriate BMPs to reduce erosion and sedimentation hazard.
3. Assessing the erosion/sedimentation risk after BMP implementation based on the efficacy of the identified BMPs.

Based on the factors listed in point 1, project elements are assigned a pre-BMP risk rating of high, medium, or low for erosion and sedimentation. Generally, elements are assigned a high risk rating if they have two or more of the following attributes: large disturbance area (greater than 1 acre), steep slopes (greater than 50 percent), and proximity to a runoff pathway. Elements are assigned a moderate risk rating if they have one of these attributes and a low risk rating if they have none. Other factors including soil erosion hazard, intensity of disturbance, revegetation limitation, mass stability, and disturbance in historic landslides are considered to resolve border-line risk ratings.

This rating system is designed to be conservative – i.e., to indicate the maximum possible risk. For example, some elements with high risk ratings such as hiking/biking trails and utility trenches have a relatively large disturbance area but confined width throughout their length, which reduces actual risk. Similarly, while disturbance from a structure may exceed the 1-acre threshold, much of the projected disturbance is due to

vehicle traffic and material storage, which are less intense and can be shifted to avoid runoff pathways during the construction period, alleviating the risk. Actual excavation would generally be limited to structure footings. Glading is assigned a high risk rating due to size and pathway intersections but poses less real risk because of the low intensity of disturbance.

The CDA approach prescribes "disconnecting" disturbed areas. If sediment sources are disconnected from the "easy pathways" down the mountain, the total sediment yield to runoff pathways can be greatly reduced (Furniss et al. 2000).

Specific BMPs to reduce erosion, disconnect disturbed areas from runoff and erosion pathways, and minimize the watershed and water quality impacts of each element are identified in the CDA analysis for this alternative. These measures are described in more detail in section 3.4.5, following the discussion of direct and indirect effects. Most of these BMPs are core measures recommended by state and federal agencies.

CDA Results

Table 3-7 summarizes results of the CDA analysis. Impacts of each project element are shown separately in the table. The total disturbed area for this alternative is included at the bottom of the table.

This alternative would affect four of the seven soil units in the permit area. With the exception of those located on soil unit 14, all project elements occur on soil units that have a high erosion hazard. The bottom terminals for the zip line and gondola would be located on soil unit 14 (low erosion hazard) at the Snow King base area.

Disturbance area for individual projects ranges from 38.2 acres for new and modified ski run clearing to <0.1 acre for trails or electrical utility lines. As shown in Table 3-7, Alternative 2 would affect a total of 144.5 acres. Many project elements would include excavation: the summit access road/novice skiway; utility trenches for water and power; and footings for buildings, towers, and terminals. A total of 35 acres would be disturbed through excavation, including 29.8 acres for the summit access road/novice skiway and trenches associated with snowmaking and lighting for night skiing.

Grading would affect 29.1 acres, of which 20.2 acres would occur as part of construction of the new and modified ski runs and the bike trails. The remaining grading would occur as part of construction for new hiking trails and to contour areas around buildings and other structures.

Clearing (approximately 47.7 acres) and glading (32.7 acres) would result in only minor erosion potential as surface disturbance would be limited to stump removal and skidding trees.

Elements of this alternative would occur on slopes ranging from 11 to 67 percent. Most project elements (115.5 acres of the 144.5 acres of total disturbance) occur on moderately steep slopes (i.e., maximum slopes within disturbance area greater than 50 percent). These steep slopes influence other ratings used to characterize soil properties and suitability for specific purposes.

Elements of this alternative would occur on soils with a slight, severe, or very severe revegetation limitation, as defined by the Soil Conservation Service (SCS 1985):

- Slight: An acceptable response to revegetation efforts can be expected during the first year following revegetation.
- Severe: A slow response to revegetation can be expected. Special erosion control practices may be needed for soils with severe ratings and several years will be required to establish acceptable cover.
- Very Severe: A slow response can be expected, erosion control practices will be needed, and the site may not return to the pre-disturbance vegetative cover.

Table 3-7. Connected Disturbed Area (CDA) analysis results for the Alternative 2.

Project	Soil Unit/Erosion Hazard	Project Disturbance Area (ac)	Intensity of Disturbance	Max Slope	Revegetation Limitation	Mass Stability	Landslide Disturbance (acres)/type	Proximity to Runoff Pathway	Pre-BMP Erosion/ Sedimentation Risk	BMPs
Terrain Development										
Teaching Center Terrain	391/High	6.1	Grading	43	Very Severe	Marginally Stable	–	Crosses trails and roads numerous times	Low	9, 10
New and Modified Ski Runs (clearing)	391/High	38.2	Clearing	67	Very Severe	Marginally Stable	>0.1/ms-mf	Crosses trails and roads numerous times	High	3, 10, 11, 12
Modified Ski Run (grading)	391/High	6.3	Grading	44	Very Severe	Marginally Stable	>0.1/ms-mf	Crosses road 1x and trail 4x	High	3, 8, 9, 12, 13, 16, 19, 21, 23, 25
Glading	391/High	32.7	Glading	58	Severe	Marginally Stable	4.4/ms-mf	Crosses road 1x and trails 1x	High	7, 10, 12
Summit Access Road/Novice Skiway	391/High	15.6	Excavation	63	Very Severe	Marginally Stable	1.5/ms-mf	Crosses trail 3x, crosses road 1x	High	3, 10, 11, 12, 14
Lifts										
Summit Gondola (corridor)	391/High	4.4	Clearing	54	Severe	Marginally Stable	0.8/mrs-mf	Crosses trail 12x, crosses road 1x	High	3, 10, 11, 12
Gondola (towers)	391/High	0.3	Excavation	46	Severe	Marginally Stable	>0.1/mrs-mf	Adjacent to trails, adjacent to road	Moderate	7, 10, 11
Gondola (bottom terminal)	14/Low	0.2	Excavation	11	Slight	Stable	–	Crosses road 1x	Moderate	3, 4, 8, 9, 11, 15, 27

Table 3-7 (cont'd). Connected Disturbed Area (CDA) analysis results for the Alternative 2.

Project	Soil Unit/Erosion Hazard	Project Disturbance Area (ac)	Intensity of Disturbance	Max Slope	Revegetation Limitation	Mass Stability	Landslide Disturbance (acres)/type	Proximity to Runoff Pathway	Pre-BMP Erosion/ Sedimentation Risk	BMPs
Lift A (corridor)	484/High	2.5	Clearing	45	Severe	Marginally Stable	–	Crosses road 2x, >600 ft. from trail	Moderate	3, 10, 11, 12
Lift A (power)	391/High	<0.1	Excavation	20	Very Severe	Marginally Stable	–	Crosses road 1x, >800 ft. from trail	Moderate	17
Lift A (terminals)	484/High	0.9	Excavation	53	Severe	Marginally Stable	–	Crosses road 2x, >700 ft. from trail	High	8, 9, 11, 15
Lift A (towers)	484/High	0.3	Excavation	47	Severe	Marginally Stable	–	Adjacent to trails, adjacent to road	Moderate	7, 10, 11
Conveyor Lifts (B and C)	484/High	0.3	Excavation	19	Severe	Marginally Stable		Crosses trail 4x, and road 1x	Moderate	9, 10
Back-side Surface Tow - Lift D (corridor)	484/High	0.3	Clearing	34	Severe	Marginally Stable	–	Crosses trail 1x and road 2x	Moderate	3, 10, 11, 12
Back-side Surface Tow - Lift D (power)	484/High	<0.1	Excavation	11	Severe	Marginally Stable	–	Crosses trail 1x, >100 ft. from road	Moderate	17
Back-side Surface Tow - Lift D (terminals)	484/High	0.1	Excavation	26	Severe	Marginally Stable	–	Adjacent to trail, >50 ft. from road	Moderate	8, 9, 11, 15
Facilities										
Summit Building (facility)	391/High	1.8	Excavation	56	Very Severe	Marginally Stable	–	Crosses trail 1x, crosses road 2x	High	3, 8, 10, 11, 15, 25

Table 3-7 (cont'd). Connected Disturbed Area (CDA) analysis results for the Alternative 2.

Project	Soil Unit/Erosion Hazard	Project Disturbance Area (ac)	Intensity of Disturbance	Max Slope	Revegetation Limitation	Mass Stability	Landslide Disturbance (acres)/type	Proximity to Runoff Pathway	Pre-BMP Erosion/ Sedimentation Risk	BMPs
Observatory (facility)	391/High	0.3	Excavation	17	Very Severe	Marginally Stable	–	Crosses trail 1x, <300 ft. from road	Moderate	3, 8, 11, 25
Observatory (power)	391/High	0.1	Excavation	20	Very Severe	Marginally Stable	–	Crosses trail 1x, >100 ft. from road	Moderate	17
Temporary Ski Patrol (facility)	391/High	0.2	Grading	51	Very Severe	Marginally Stable	–	>200 ft. from trail, crosses road 2x	High	3, 8
Temporary Ski Patrol (power)	391/High	<0.1	Excavation	49	Very Severe	Marginally Stable	–	>300 ft. from trail, crosses road 1x	Moderate	19
Yurt Trail	484/High	0.7	Grading	40	Severe	Marginally Stable	–	<100 ft. from trail, crosses road 1x	Low	12, 14
Yurt Camp	372/High	0.3	Grading	38	Severe	Marginally Stable	–	>1000 ft. from trails and road	Moderate	3, 8, 25
Wedding Venue (facility)	391/High	0.4	Excavation	33	Very Severe	Marginally Stable	–	>100 ft. from trail	Low	3, 8, 11, 25
Wedding Venue (access)	391/High	<0.1	Grading	24	Very Severe	Marginally Stable	–	>100 ft. from trail	Low	14
Night Skiing (power)	391/High	6.4	Excavation	54	Very Severe	Marginally Stable	0.4/ms-mf	Crosses trails and roads numerous times	High	9, 17

Table 3-7 (cont'd). Connected Disturbed Area (CDA) analysis results for the Alternative 2.

Project	Soil Unit/Erosion Hazard	Project Disturbance Area (ac)	Intensity of Disturbance	Max Slope	Revegetation Limitation	Mass Stability	Landslide Disturbance (acres)/type	Proximity to Runoff Pathway	Pre-BMP Erosion/ Sedimentation Risk	BMPs
Snowmaking	391/High	7.8	Excavation	65	Very Severe	Marginally Stable	0.1/mrs-mf/ms-mf	Crosses trails and roads numerous times	High	9, 17
Summer Activities										
Zip Line (corridor)	391/High	2.3	Clearing	53	Severe	Marginally Stable	0.4/mrs-mf	Crosses trail 16x, crosses road 2x	High	3, 10, 11, 12
Zip Line (bottom terminal)	14/Low	0.5	Excavation	11	Slight	Stable	–	<50 ft. from road	Low	8, 11, 15
Mountain Bike Trails	484/High	13.9	Grading	56	Very Severe	Marginally Unstable	1.4/mrs-mf/ms-mf	Crosses trails and roads numerous times	High	12, 14, 24
Hiking Trails	391/High	1.6	Grading	67	Very Severe	Marginally Stable	>0.1/mrs-mf	Crosses trail 9x, adjacent to road	High	12, 14
Total disturbance Alternative 2 (ac)		144.5								

The bottom terminals for the gondola and the zip line would be located on soil with a slight limitation to revegetation. All other elements included under this alternative would disturb soils with severe and very severe revegetation limits. To return vegetation to pre-disturbance conditions, these projects will need erosion control measures and the benefit of mulch or other amendments and practices that enhance soil stability, seed germination, and vegetative growth. These practices are included for the applicable project elements in Table 3-7. Based on past success of revegetation efforts at Snow King (Stanley 2019c), these BMPs would restore disturbed areas to pre-disturbance conditions.

Mass stability is based on historical landslide activity and probability of mass movement (SCS 1985). Mass movement, whether accelerated by anthropogenic activities or not, can result in increased soil erosion and sedimentation resulting in lowered soil productivity. Mass stability ratings associated with elements of this alternative include (SCS 1985):

- Stable: Evidence of past mass movement is not discernable and land characteristics are not conducive to future mass movement.
- Marginally stable: Evidence of past mass movement has not been discerned but there are land characteristics which are conducive to mass movement. On-site evaluation and stabilization measures may make activity on these sites feasible without initiating mass movement.

Two elements located in areas with little to no slope have a stable rating. All other elements are found on soil units with a marginally stable rating due primarily to slope. These elements would require BMPs designed to minimize or eliminate the risk of instability during construction and rehabilitation. These practices are included for applicable project elements in Table 3-7.

This alternative includes 11 elements located on mapped landslide areas that total approximately 9.1 acres of disturbance. Most elements are located on slump/debris-flow or rockslide/debris-flow landslide types. The proposed bike trails cross both landslide types. Project elements disturbing more than 1 acre of mapped landslide areas under this alternative include: glading (4.4 acres), bike trails (1.4 acres), and the summit access road/novice skiway (1.5 acres). Surface disturbance would be minimal for glading activities. The bike trails have a narrow disturbance width that would include shallow disturbance (grading) in some areas. The summit access road/novice skiway would excavate a wider corridor and include cut and fill to create the road surface in areas with steep slopes.

Proximity to runoff pathways is noted for each project element in Table 3-7 including distance and number of crossings. Runoff pathways include existing or proposed roads and trails that could potentially transport surface runoff and suspended sediment to downslope areas, so surface disturbance on and near runoff pathways is a concern during runoff events. Disturbance from glading and clearing activities for ski runs, lifts, and zip lines would span runoff pathways but create minimal disturbance. Grading activities for larger projects such as modified ski runs, summit teaching center, and mountain bike trails would either create disturbance near runoff pathways or cross runoff pathways at trail intersections. Excavation would directly disturb runoff pathways at intersections with utility trenches for power and water. Excavation for structures would not occur in pathways, but heavy equipment may cross pathways during construction of footings or foundations.

Conclusions

The CDA approach was used to incorporate the variables of soil type, area and intensity of disturbance, surface slope, revegetation limits and mass stability, disturbance in historic landslide areas, and proximity to runoff channels. As discussed above under Connected Disturbed Area Approach and indicated in Table 3-7, each element of Alternative 2 is assigned a high, medium, or low risk rating for erosion, sedimentation, and instability prior to BMP implementation. This rating indicates the potential for individual elements to cause erosion, deliver sediment to downslope locations, or create instability during or following construction. Runoff pathways and steep slopes are a primary concern and, as noted in Table 3-7, virtually

all elements are on marginally stable sites. Most elements of Alternative 2 have a moderate or high risk ratings prior to BMP implementation.

Elements with a high risk rating account for 13 of the 31 individual elements addressed in Table 3-7. Most of them involve large contiguous areas (greater than 10 acres), on steep slopes, with multiple crossings of runoff pathways. These include the steeper ski runs and the summit access road/novice skiway.

Elements with a moderate risk rating account for 13 of the 31 elements and include towers and terminals for the proposed gondola and ski lifts, corridor clearing, utility (electrical) trenches, observatory, and trail segments. Excavation for towers and terminals would be confined to the structure footprint, reducing the extent of intense disturbance. Corridor clearing would remove trees by felling and skidding, creating relatively minor disturbance. Holes created during stump removal would be filled to prepare the area for installing lift towers and winter grooming. Based on these considerations, elements with moderate risk ratings are not a serious concern.

The five project elements with low risk ratings do not cross runoff pathways created by roads and trails. They would generally include small disturbances located on low-moderate slopes. They are also not a serious concern.

Table 3-7 identifies BMPs that would minimize or reduce the potential for erosion, sedimentation, and slope instability. These BMPs are described in section 3.4.5. During construction Snow King would be required to comply with pollution control measures in a Storm Water Pollution Prevention Plans, enforced by Wyoming Department of Environmental Quality. This would provide additional assurance that potential sedimentation impacts were effectively minimized.

Impacts would be minimized prior to construction by following recommendations in Table 3-7 in regard to project design, location, and timing. Other BMPs in Table 3-7 are designed to manage runoff and promote infiltration during construction and through the project lifetime. Surface contouring, surface roughness, and water bars will disperse and infiltrate runoff before it can accumulate and create rill or gully erosion.

Long-term impacts from soil disturbance would be minimized by BMPs that promote successful rehabilitation such as preserving topsoil and using native plant species and soil amendments (e.g., fertilizer and mulch). Based on existing surface conditions, additional structures are not recommended in Table 3-7 to maintain slope stability, beyond what would be used to prevent erosion and restore disturbed areas. Protecting the soil surface from erosion will also maintain existing levels of stability and prevent conditions that contribute to rockfall or slope failure by landslides or soil creep.

With these BMPs in place, the erosion, sedimentation, and instability risk ratings for all project elements under this alternative would fall to low. While temporary impacts would occur during and immediately following construction on some projects, no measurable long-term impacts on erosion, sediment transport, or slope stability would result from implementation of this alternative. This conclusion is supported by previous experience with rehabilitation efforts in the permit area (Stanley 2019c) and existing levels of stability in the project area.

3.4.3.2.3 Alternative 3

Discussion of projected impacts under Alternative 3 focuses on differences from those described for Alternative 2, above. Alternative 3 includes different locations for some of the same projects under Alternative 2 including the gondola bottom terminal, zip line bottom terminal, and the new hiking trail. New project elements under Alternative 3 include intermediate towers for the zip line Option 2 and forest thinning.

Project elements under Alternative 3 (Table 3-8) are located on soils with a high erosion hazard with the exception of the new location for the gondola bottom terminal. The new location would be on soil unit 14 with a low erosion hazard, which is the same as for the gondola bottom terminal under Alternative 2.

Disturbance intensity for project elements under Alternative 3 includes thinning/glading, clearing, grading, and excavation. Forest thinning would involve 154.2 acres of forest cover where trees would be selectively removed, primarily to reduce fuel loads. Clearing activities could increase by up to 0.4 acre under Alternative 3. The minor differences between Alternative 2 and Alternative 3 in grading and excavation acreage are due to overlapping disturbance from nearby projects and are negligible. Total disturbance for all project elements under Alternative 3 would be 297 acres for Option 1 and 298.5 acres for Option 2. These totals are 152.5 and 154 acres more, respectively, than the 144.5 acres total disturbance under Alternative 2.

Maximum slope of disturbed areas would increase under Alternative 3 compared to Alternative 2 for several project elements including the gondola bottom terminal, (from 11 percent to 40 percent), zip line terminals (from 11 percent to 56 percent), and zip line corridor (from 53 percent to 66 percent). These changes are due to moving the gondola bottom terminal upslope and adding new zip line terminals. Maximum slope in areas of forest thinning would be 81 percent. Note that these slope measurements reflect the steepest portion of the disturbance footprint, which can exaggerate steepness.

Revegetation limits under Alternative 3 increase to very severe for Options 1 and 2 of the zip line corridor and bottom terminal. Forest stand thinning would also occur in areas with very severe revegetation limits. All other project elements under Alternative 3 would have the same revegetation limitation as under Alternative 2.

Mass stability under Alternative 3 would increase to marginally unstable for Options 1 and 2 of the zip line corridor and bottom terminal. Forest stand thinning would occur in areas that are marginally stable. All other project elements under Alternative 3 would have the same mass stability rating as under Alternative 2.

Landslide disturbance would decrease from 0.4 acres to 0.1 acres under Alternative 3 for both Option 1 and 2 zip line corridors. The Option 1 and 2 zip line terminals would also result in 0.1 ac of landslide disturbance each under Alternative 3. Forest stand thinning would create 14.4 acres of landslide disturbance.

Runoff pathways would be crossed by forest thinning as well as clearing for the gondola and zip line corridors. Disturbance from these activities would be minimal. Grading for hiking trails would connect with existing trails and roads at some locations. Excavation for terminals and lift tower footing would not occur in existing runoff pathways. Any disturbance from heavy equipment involved with these activities would be limited.

The same BMPs applied under Alternative 2 would minimize or eliminate the potential for erosion, sedimentation, and slope instability under Alternative 3. Similar to Alternative 2, BMPs under Alternative 3 would manage runoff, promote infiltration, and stabilize soil surfaces following construction. Some of the more important BMPs used would include surface contouring, surface roughness, water bars, staggering timing of construction projects, preserving topsoil, and using native plant species and soil amendments. All construction activities must comply with federal, state, and local codes related to construction disturbance and runoff from construction sites. Section 3.4.5 includes a full list of BMPs.

Table 3-8. Connected Disturbed Area (CDA) analysis results for Alternative 3.

Project	Soil Unit/Erosion Hazard	Project Disturbance Area (ac)	Intensity of Disturbance	Max Slope	Revegetation Limitation	Mass Stability	Landslide Disturbance (acres)/type	Proximity to Runoff Pathway	Pre-BMP Erosion/ Sedimentation Risk	BMPs
Lifts										
Summit Gondola (corridor)	391/High	4.2	Clearing	54	Severe	Marginally Stable	0.9/mrs-mf	Crosses trail 9x, >300 ft. from road	High	3, 10, 11, 12
Gondola (towers)	391/High	0.3	Excavation	47	Severe	Marginally Stable	.0.1/mrs-mf	Adjacent to trail, >50 ft from road	High	7, 10, 11
Gondola (bottom terminal)	14/Low	0.4	Excavation	40	Slight	Stable	-	Crosses trail 1x and road 1x	Moderate	8, 9, 11, 15
Summer Activities										
Zip Line Option 1 (corridor)	391/High	1.7	Clearing	52	Very Severe	Marginally Stable	0.1/ms-mf	Crosses trail 2x, crosses road 5x	High	3, 10, 11, 12
Zip Line Option 1 (terminal)	391/High	0.1	Excavation	25	Very Severe	Marginally Stable	0.1/ms-mf	Crosses trail 2x, crosses road 5x	Moderate	8, 11, 15
Zip Line Option 2 (corridor)	391/High	2.9	Clearing	66	Very Severe	Marginally Unstable	0.1/ms-mf	Crosses trail 2x, crosses road 5x	High	3, 10, 11, 12
Zip Line Option 2 (terminal)	391/High	0.4	Excavation	56	Very Severe	Marginally Unstable	0.1/ms-mf	Crosses trail 2x, crosses road 5x	High	8, 11, 15
Hiking Trail	391/High	0.6	Grading	47	Very Severe	Marginally Stable	-	Cross trail 1 x, >1,000 ft from road	Moderate	12, 14

Table 3-8 (cont'd). Connected Disturbed Area (CDA) analysis results for Alternative 3.

Project	Soil Unit/Erosion Hazard	Project Disturbance Area (ac)	Intensity of Disturbance	Max Slope	Revegetation Limitation	Mass Stability	Landslide Disturbance (acres)/type	Proximity to Runoff Pathway	Pre-BMP Erosion/ Sedimentation Risk	BMPs
Forest Stand Thinning	391/High	154.2	Glading	81	Very Severe	Marginally Stable	14.4/mrs-mf/ms-mf	Crosses trails and roads numerous times	High	7, 10, 12
Total Disturbance Alternative 3 - Option 1 (ac)		297.0								
Total Disturbance Alternative 3 - Option 2 (ac)		298.5								

With these BMPs in place, the erosion and sedimentation risk ratings for all project elements under Alternative 3 would fall to low. While temporary impacts would occur during and immediately following construction on some projects, no measurable long-term impacts on erosion or stability would result from implementation of this alternative. This conclusion is supported by previous experience with rehabilitation efforts in the permit area (Stanley 2019c) and existing levels of stability in the project area.

3.4.3.2.4 Alternative 4

Discussion of projected impacts under Alternative 4 focuses on differences from those described for Alternative 3, above. Alternative 4 project elements that have different CDA results from Alternative 3 include clearing and glading new ski runs, snowmaking, mountain bike trails, and forest stand thinning (Table 3-9). Although Table 2-1 shows no change in forest stand thinning between Alternative 3 and 4, Table 3-9 does show a decrease in acreage. This is due to overlap from clearing activities used to construct new ski runs under Alternative 4.

Other than the gondola bottom terminal that is the same as under Alternative 3, most project elements under Alternative 4 are located on soil unit 391 with a high erosion hazard. Proposed Mountain bike trails located on the back of Snow King Mountain are primarily in soil unit 484, which also has a high erosion hazard.

Overall disturbance would increase under Alternative 4 relative to Alternative 3 (Tables 3-8 and 3-9) including 15 acres more clearing and 0.9 more acres for excavation. Other differences under Alternative 4 include 11.6 acres less glading, and 0.7 fewer acres of grading compared to Alternative 3.

Changes in maximum slope of disturbed areas under Alternative 4 would include bike trails (decrease from 56 to 51 percent). Maximum slope for other project elements would remain the same as under Alternative 3.

Relative to Alternative 3, revegetation limits for glading new ski run areas under Alternative 4 would increase from severe to very severe and decrease for snowmaking from very severe to severe.

No changes would occur in mass stability between Alternatives 3 and 4.

Relative to Alternative 3, landslide disturbance under Alternative 4 would increase for mountain bike trails (1.5 acres). Landslide disturbance for forest thinning would be the same as under Alternative 3.

Glading and clearing activities under Alternative 4 would cross runoff pathways as part of developing new ski trails and developing other skiable terrain. Grading activities associated with developing mountain bike trails on the front and back sides of the permit area would merge with existing trails and roads. Excavation for snowmaking lines would temporarily disturb runoff pathways at intersections with existing trails and roads.

The same BMPs applied under Alternative 3 would minimize or eliminate the potential for erosion, sedimentation, and slope instability under Alternative 4. The recommended BMPs would reduce potential for these impacts to occur by enhancing infiltration and stabilizing soil surfaces once construction and associated disturbance was finished. BMPs critical to mitigating these impacts under Alternative 4 are the same as under the other alternatives.

All construction activities must comply with federal, state, and local codes related to construction disturbance and runoff from construction sites. Section 3.4.5 includes a full list of BMPs.

The erosion, sedimentation, and instability risk ratings for all project elements under Alternative 4 would fall to low with these BMPs in place. No measurable long-term impacts on erosion or stability would result from implementation of Alternative 4. Similar to other alternatives, this conclusion is supported by previous experience with rehabilitation efforts in the permit area (Stanley 2019c) and existing levels of stability.

Table 3-9. Connected Disturbed Area (CDA) analysis results for Alternative 4.

Project	Soil Unit/Erosion Hazard	Project Disturbance Area (ac)	Intensity of Disturbance	Max Slope	Revegetation Limitation	Mass Stability	Landslide Disturbance (acres)/type	Proximity to Runoff Pathway	Pre-BMP Erosion/ Sedimentation Risk	BMPs
Terrain Development										
New Ski Runs (clearing)	391/High	53.2	Clearing	67	Very Severe	Marginally Stable	<0.1/ms-mf	Crosses trail 2x, crosses road 2x	High	3, 10, 11, 12
Glading	391/High	32.4	Glading	58	Very Severe	Marginally Stable	4.4/ms-mf	Crosses trails 1x and road 1x	High	7, 10, 12
Snowmaking	391/High	8.7	Excavation	65	Severe	Marginally Stable	-	Crosses trails and roads numerous times	High	9, 17
Summer Activities										
Mountain Bike Trails	484/High	13.0	Grading	51	Very Severe	Marginally Unstable	1.5/ms-mf	Crosses trails and roads numerous times	High	12, 14, 24
Forest Stand Thinning	391/High	142.9	Glading	81	Very Severe	Marginally Stable	14.4/mrs-mf/ms-mf	Crosses trails and roads numerous times	High	7, 10, 12
Total Disturbance Alternative 4 - Option 1 (ac)		300.6								
Total Disturbance Alternative 4 - Option 2 (ac)		302.1								

3.4.3.3 Water Quality

3.4.3.3.1 Alternative 1

Under the no-action alternative, water quality in Flat Creek would be expected to continue to improve in response to water quality improvement projects and other efforts from the Flat Creek Watershed Committee. As described in section 3.4.2.1, no stream channels or other water features are located in the existing permit area. Current operations at Snow King Mountain Resort do not influence water quality in Cache Creek, Flat Creek, or the seasonal stream channel in lower Leeks Canyon.

3.4.3.3.2 Alternative 2

This alternative would involve construction activities that result in disturbance and short-term opportunities for erosion and surface runoff to occur. The two avenues for potential short-term impacts on water quality in Flat Creek are through Cache Creek and through stormwater collected on East Snow King Avenue and adjacent roads. Long-term potential impacts on water quality would not occur on Cache Creek, Flat Creek, or the seasonal stream channel in lower Leeks Canyon in response to project developments.

Under this alternative, the east and west boundary adjustment areas would extend the permit boundary outward. The east boundary adjustment area would include glading and clearing activities for new ski runs, and excavation for snowmaking lines and segments of the summit access road/novice skiway. All activities would occur more than 2,000 feet away from the main channel of Cache Creek. Opportunities for surface erosion and sedimentation following disturbance would be removed in the east boundary adjustment area by design criteria (section 3.4.5), naturally high infiltration rates (section 3.4.2.1.3), and distance between proposed disturbance and the creek channel.

Under this alternative, projects within 100 feet of East Snow King Avenue and adjacent roads are the gondola and zip line bottom terminals, the stairway trail improvement, and snowmaking lines. Design criteria would be used to minimize or eliminate erosion and prevent runoff from entering the municipal stormwater system during construction of these projects (section 3.4.5).

No long-term or short-term impacts on water quality in Cache Creek or Flat Creek would occur as a result of this alternative.

3.4.3.3.3 Alternative 3

Construction activities under Alternative 3 in the east boundary adjustment area would be the same as for Alternative 2 with the exception of forest stand thinning. All disturbance would be more than 2,000 feet away from Cache Creek. Opportunities for surface erosion and sedimentation following disturbance would be removed by design criteria, naturally high infiltration rates, and distance between proposed disturbance and Cache Creek, as discussed above for Alternative 3).

Projects near East Snow King Avenue and adjacent roads under Alternative 3 would include the same projects as Alternative 2, with the exception of the bottom gondola terminal. Under Alternative 3, the bottom terminal would be moved to the existing Cougar bottom terminal site. Design criteria would be used to minimize or eliminate erosion and prevent runoff from entering the municipal stormwater system during construction of these projects, as discussed above for Alternative 2.

No long-term or short-term impacts on water quality in Cache Creek or Flat Creek would occur as a result of Alternative 2.

3.4.3.3.4 Alternative 4

Construction activities under Alternative 4 in the east boundary adjustment area would include additional clearing activities beyond what would occur under Alternative 3. Other minor differences would include snowmaking pipelines for the new ski runs and limited changes due to new alignment of mountain bike trails. These differences would not result in potential water quality impacts on Cache Creek, located more than 2,000 feet away from all project elements under Alternative 4.

Projects near East Snow King Avenue and adjacent roads and their effects under Alternative 4 would be the same as those discussed above under Alternative 3.

No long-term or short-term impacts on water quality in Cache Creek or Flat Creek would occur as a result of Alternative 4.

3.4.4 CUMULATIVE EFFECTS

Several of the projects described in section 3.1.2 have temporally and spatially overlapping impacts on the same resources affected directly or indirectly by the proposed action and alternatives. In regard to hydrology, the 2015 Rafferty lift replacement and run development project and the 2014 snowmaking infrastructure project affected both surface runoff and groundwater recharge to some degree. By reducing tree cover and increasing snowmaking, they altered snow accumulation amounts and patterns. By increasing the net amount of man-made snow, they increased runoff. These impacts are evident in current conditions described in section 3.4.2.1. That description establishes baseline condition and ensures that the cumulative effects of these projects are considered.

As to erosion and slope stability, the same two projects as well as the communication services project and the Lower Elk lighting project involved, or will involve in the case of the ongoing lighting project, soil surface disturbance through grading and/or excavation. These activities create the risk of erosion and instability. These risks are greatest when surfaces are recently disturbed and unprotected from raindrop impact and other erosive forces that can transport fine soil particles. This risk is short-term, assuming that effective disturbed site rehabilitation practices are implemented.

Except for the Lower Elk lighting project, these actions are included as appropriate in the description of current conditions in section 3.4.2.2.1, so their cumulative effects are reflected in baseline conditions in this analysis. The impacts of the lighting project would be limited to excavating the hole for the light pole footing. Excavation would be completed with hand tools or light mechanical equipment. Excavated soil would be used as backfill around the footing and any excess would be scattered or smoothed to match surrounding surface elevations. Design criteria outlined in section 3.4.5 would be in force to avoid any long-term erosion increase lasting cumulative effect.

All of the cumulative actions involving clearing, surface disturbance, or increased snowmaking within the project area have the potential for cumulative water quality impacts. However, for reasons discussed in section 3.4.3.3, the proposed action and action alternatives are not projected to adversely affect water quality directly or indirectly, so there is not potential for cumulative impacts.

3.4.5 DESIGN CRITERIA

Prepare a Storm Water Pollution Prevention Plan (SWPPP) that will apply to all authorized elements. The SWPPP is a condition of Wyoming's Pollutant Discharge Elimination System Permit and will include BMPs for erosion control, sediment control, site stabilization, operational controls, and provisions for maintenance and inspection.

Include in the SWPPP pertinent BMPs from *National Best Management Practices for Water-Quality Management on National Forest System Lands. Volume 1: National Core BMP Technical Guide* (Forest Service 2012a) and *Ski Area BMPs (Best Management Practices) Guidelines for Planning, Erosion Control, and Reclamation* (Forest Service 2001a, Wasatch-Cache National Forest). These may include the following:

Pre-Construction

1. Conduct appropriate soil and water assessments to support design of runoff and erosion control structures.

2. Develop engineering drawings for projects requiring a construction plan. Include plan and profile views of structures as appropriate.
3. Comply with all applicable federal, state and local codes related to construction disturbance and runoff from construction sites. As required, develop and implement an erosion control and sediment plan that covers all disturbed areas, including borrow, stockpile, skid trails, roads, or any areas disturbed by development activities.
4. Design and locate parking, staging, and stockpiling areas of appropriate size and configuration to accommodate expected vehicles and avoid or minimize adverse effects to adjacent soil, water quality, and riparian resources.
5. Coordinate all phases of sanitation system management (planning, design, field surveys and testing, installation, inspection, operation, and maintenance) with appropriate agencies to ensure compliance with applicable regulations.
6. In summer operating plans, include an erosion structure maintenance schedule identifying structures needing maintenance.
7. Plan projects to minimize re-entry after the site is stabilized.

Construction

8. Limit the amount of exposed or disturbed soil at any one time to the minimum necessary. Define outer boundaries of disturbance with markers. Install sediment and stormwater controls prior to disturbance where practicable.
9. When topsoil is present or can be salvaged, remove and stockpile with appropriate cover and erosion control methods. Revegetation specifications and seed mixes must be approved by the Forest Service.
10. Limit operation of equipment when ground conditions could result in excessive rutting, soil puddling, or runoff of sediments.
11. Confine all light vehicle traffic, parking, staging, and stockpiling materials to designated areas to minimize ground disturbance. Heavy equipment (e.g. feller buncher, dozer, etc.) will be used but also consider aviation assets to deliver lift towers and place equipment.
12. If tree removal is necessary, work with the Forest Service to identify appropriate timing. Small trees, branches and other small residue created during clearing or glading activity will be chipped, mulched, burned, or moved off site. Avoid damage to remaining trees and root systems adjacent to cut slopes, construction areas, and cleared areas.
13. Prevent water from running down ski run prism particularly on steep grades (20 to 40 percent) and from accumulating on gentle slopes (0 to 30 percent). Water bar spacing will account for slope as follows:

Slope (%)	Spacing (feet)
2%	250
5%	150
10–30%	100
>30%	75

14. Prevent water from running down roads and trails using water bars and rolling dips with a cross-slope of 2 to 5 percent. Minimize cross slopes in areas where infiltration is a possible method to

reduce runoff. Water bars, rolling dips and culverts will be inspected and repaired on a weekly basis during construction. Ruts will be repaired immediately.

15. Infiltration trenches or like features shall be installed to intercept runoff from loading and unloading areas for ski lifts, zip lines, mountain coasters and any outdoor locations where people will gather. Use erosion control mat or similar materials to protect any cut and fill areas associated with rocky or cobbly locations.
16. Construct modified water bars across newly graded ski slopes to prevent the concentration of water flow, act as micro-infiltration ditches and divert runoff to undisturbed terrain. Where feasible, use a horseshoe design concept for waterbars and ditches with the tailing off ends of the structures at a 5 to 7 percent slope into the naturally vegetated areas.
17. Whenever possible, place excavated material on the uphill side of trenches and water bars. Manage material placement to avoid trapping or concentrating water flow during construction. Fill trenches with a 2-inch surcharge / berm to allow for settlement. Construct water bars over newly trenched areas for snowmaking lines, buried utilities, etc. when the slope requires it.
18. Use correctly installed silt fence, preapproved wattle, or similar erosion control features to prevent sediment from entering existing drainage channels, for projects within 50 feet of existing channels.
19. Use diversions ditches as needed to divert water away from newly graded ski run segments where both sides of the run slope inward and prevent discharge from modified water bars. A mid-slope diversion ditch may also be necessary to move runoff away from the ski run.
20. Protect any point of water discharge (e.g. trenches, ditches, water bars) with riprap or other methods to slow water velocity and disperse runoff.

Post Construction Restoration/Maintenance

21. Routinely monitor new and modified ski run surfaces for a minimum of 2 years following construction. If coarse grooming is needed to fill eroded areas, use subsoil from nearby excavations (e.g. stockpiled from past construction) and cover with salvaged topsoil for a finished slope grade.
22. Ensure that permit holder-owned and other authorized drinking water systems on National Forest System lands are operated and maintained according to direction in FSM 7423.
23. Consider amending soil with mulch (e.g. wood chips), compost, mycorrhizal fungi inoculants and other products to provide added nutrients, promote revegetation success, and increase infiltration. Utilize irrigation where appropriate.
24. Use and maintain surfacing materials suitable to the trail site and use to withstand traffic and minimize runoff and erosion. For biking trails, pay attention to areas where high wheel slip (curves, acceleration, and braking) during motorized use generates loose soil material.
25. Install suitable stormwater and erosion control measures to stabilize disturbed areas and waterways before seasonal shutdown of project operations or when severe or successive storms are expected.
26. Maintain the natural drainage pattern of the area wherever practicable.
27. Use and maintain suitable measures to collect and contain oil and grease in parking areas with high use and where drainage discharges directly to channels or stormwater collection systems.

3.5 VEGETATION

3.5.1 SCOPE OF ANALYSIS

3.5.1.1 Noxious Weeds

- *How would construction and use of the proposed infrastructure affect the introduction and spread of noxious weeds?*

The project area supports plant species that are included on the list of noxious weeds maintained by the Wyoming Department of Agriculture, and construction, maintenance, and use of proposed infrastructure could introduce new weed species or spread existing infestations.

Indicator: Identification of weed species that may occur at Snow King based on past observations and reconnaissance completed for this analysis, then assessment of the risk of spreading those species and introducing new ones based on characteristics of each disturbance type.

3.5.2 AFFECTED ENVIRONMENT

Noxious weeds are harmful to agriculture, the general public, and the environment because they tend to displace native plants, degrade wildlife habitat, alter nutrient cycling and fire behavior, contribute to soil erosion, and potentially reduce recreational values. They have developed many characteristics, such as rapid growth rates, high seed production, and extended growing periods that give them competitive advantages over native plants (Sheley et al. 1996).

The Forest Service must consider the risk of introducing or spreading noxious weeds at Snow King through ground-disturbance associated with construction and maintenance and through subsequent recreational use. Weeds may be introduced if construction or recreation equipment has operated previously in an area with infestations. Disturbing soil creates conditions for establishment of weeds, and disturbance adjacent to existing infestations may facilitate the spread of the infestation. Foot and bicycle traffic may also bring in seed from outside sources or spread existing infestations.

3.5.2.1 Management Direction

Management direction regarding noxious weeds includes Executive Order 13112, issued in February 1999, which directs federal agencies to "…prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause…" The Forest Service Manual sets objectives, policies, and responsibilities for weed management on National Forest System lands and specifies the use of an integrated approach including prevention, control, cooperation, and education. Specific guidance is provided in the *Guide to Noxious Weed Prevention Practices* (Forest Service 2001b) that establishes Forest policy for noxious weed procedures (i.e., best management practices or BMPs). The Bridger-Teton Forest Plan specifies following the guidelines set forth in the *Intermountain Region Noxious Weed and Poisonous Plant Control Program* (Forest Service 1986a), which also suggests the use of integrated pest management to control noxious weeds.

In accordance with the National Forest Ski Area Special Use Permit Act of 1986, permitted ski areas must maintain a vegetation management plan providing effective procedures for maintaining healthy forest vegetation within their permit boundaries. Snow King's vegetation management plan (Western Bionomics 2016) reflects Forest Plan direction, and one of its objectives is to "Reduce or eliminate populations of invasive weeds" (p. 1). It goes on to identify weed species encountered during plan preparation (p. 2) and to identify measures to control weeds (pp. 26 and 30). These measures are addressed in the effects analysis below (section 3.5.3). In addition to the vegetation management plan, Snow King also worked with the Teton County Weed and Pest District to develop a weed management plan. The identifies noxious weeds

located within the ski area boundary and provides management suggestions for each species (Cauffman 2008).

3.5.2.2 Local Conditions

Wyoming state law mandates the control of noxious weeds on public and private property throughout the state. The Teton County Weed and Pest District was established by Wyoming State Statutes (W.S. 11-5-101 through 119) to implement an effective program for the control of noxious weeds in Teton County. Teton County considers noxious weed management to be a high priority, and the Teton County Weed and Pest District works with both public and private landowners to eradicate or prevent the spread of noxious weeds.

To facilitate state-wide and local management, the Wyoming Department of Agriculture maintains two lists: one which identifies weeds that are common throughout the state, and a second that identifies weeds specific to each county (Table 3-10). However, the dynamic nature of noxious weeds and continued management of known infestations requires a constant re-assessment and prioritization of noxious weeds and continued effort to manage infestations by the Teton County Weed and Pest District.

For the past 5 years, weed management efforts at Snow King have followed the direction outlined in their vegetation and weed management plans. In early and mid-summer, a crew of three employees travels through the permit area treating noxious weeds identified by the Teton County Weed and Pest District. However, at present, Snow King has numerous user-created hiking and biking trails that are not maintained. This increases the total area of disturbance at the ski area and also creates additional dispersal pathways which facilitate the spread of noxious weed seeds and limit the effectiveness of weed management efforts.

The dynamic nature of noxious weeds requires the continued monitoring and control of new and existing infestations. Snow King remains actively engaged in the ongoing effort.

As to specific noxious weed species of concern in this analysis, the first thing to note is that many of the species identified in Table 3-10 could become a concern at Snow King. Weeds are known as invasive species because of their high seed production, effective seed transport mechanisms, and rapid establishment and spread. That is why weed management efforts must be collaborative, flexible, and sustained. While the risk assessment reported here addresses species that have been identified on the basis of previous observations and more recent reconnaissance, the design criteria and BMPs discussed below (section 3.5.5) are appropriate to any weed species potentially occurring in the project area.

No comprehensive weed inventory has been completed at Snow King, but noxious weeds were identified in the course of developing the ski area's vegetation management and weed management plans as well as during routine Bridger-Teton fieldwork. In addition, as part of preparing this EIS, botanists noted any noxious weeds observed during field reconnaissance (Cirrus 2019). All species of noxious weeds identified to date at Snow King are included in the target species' summaries below (section 3.5.2.3) but, as noted above, the weed situation is inherently dynamic.

3.5.2.3 Target Species

Eighteen noxious weeds have been reported over time as occurring at Snow King and are discussed below. Where available, the location of each infestation is provided.

3.5.2.3.1 Black Henbane

Black henbane is native to Europe but is now common across much of the northern US. This plant is an annual or biennial that can grow up to 6 feet tall. It can grow in a wide variety of habitats but prefers moist soils that have been disturbed. It reproduces only by seed, and a single plant can produce up to 500,000 seeds. Management efforts typically focus on early detection and prevention of seed production and spread (Cauffman 2008, Pokorny et al. 2017).

Table 3-10. Noxious weeds for Wyoming and Teton County as reported by the Wyoming Department of Agriculture.

Species	Comments[1,2]
Absinth wormwood (*Artemisia absinthium*)	Can tolerate both wet and dry soils, but generally found in well-drained soils. Establishes quickly in disturbed or overgrazed areas.
Austrian fieldcress (*Rorippa austriaca*)	Found in disturbed soils along roadsides, fields, and mud flats. Usually associated with moist soil.
Baby's breath (*Gypsophila paniculate*)	Found in dry, sandy soil along roadsides, fencerows, and disturbed areas.
Black henbane (*Hyoscyamus niger*)	Prefers disturbed soils such as pastures, roadsides, and fence rows.
Bohemian knotweed (*Fallopia bohemica)*	A large plant that can grow 6-12 feet tall, common along rivers and riparian areas.
Bull thistle (*Cirsium vulgare*)	Prefers open, sunny areas. Can tolerate wet or dry soils and is typically found in disturbed areas.
Canada thistle (*Cirsium arvense*)	Found in disturbed soils including pastures, crops, roadsides and other open areas.
Cheatgreass/downy brome (*Bromus tectorum*)	One of the most widespread annual grasses in North America, it can tolerate a range of soil conditions and elevations.
Chicory (*Cichorium intybus*)	Found along roadsides and disturbed sites with well-drained soils.
Common burdock (*Arctium minus*)	Prefers open, disturbed soils in pastures, hay fields, and grasslands.
Common mullein (*Verbascum thapsus*)	Forms a dense ground cover that displaces native species. Prefers dry, sandy soils in open areas.
Common St. Johnswort (*Hypericum perforatum*)	Found in disturbed soils in open areas, including forest clearings.
Common tansy (*Tanacetum vulgare*)	Typically found in disturbed areas, especially in the wet soil conditions of riparian areas.
Cypress spurge (*Euphorbia cyparissias*)	Prefers open habitats that have been disturbed, typically in dry soil.
Dalmation toadflax (*Linaria dalmatica*)	Typically found in well-drained soils but tolerates a wide range of soil conditions. Generally found in open areas such as pastures and roadsides.
Dames rocket (*Hesperis matronalis*)	Typically found in moist soil along forest edges, roadsides, and open areas.
Diffuse knapweed (*Centaurea diffusa*)	Prefers well-drained soils in pastures, roadsides, trails, and gravel pits.
Dyers woad (*Isatis tinctorial*)	Does well in poor soil conditions along roadsides and rangelands. Can also be found in forest openings.
Field bindweed (*Convolvulus arvensis*)	Can be found along roadsides, in grasslands, and near streams.
Field scabious (*Knautia arvensis*)	Tends to invade pastures and disturbed areas in a variety of soil types.
Giant knotweed (*Fallopia sachalinensis*)	Prefers moist soil along rivers, streams, and ditches. Can grow to 12 feet in height.

Table 3-10 (cont'd). Noxious weeds for Wyoming and Teton County as reported by the Wyoming Department of Agriculture.

Species	Comments[1,2]
Himalayan knotweed (*Polygonum polystachyum*)	Similar to giant knotweed.
Hoary alyssum (*Berteroa incana*)	Common in fields and disturbed areas and tolerates a range of soil conditions.
Hoary cress (whitetop) (*Cardaria draba* and *Cardaria pubsecens*)	Often found in open areas in pastures, rangelands, and forest openings. Can also be found along streambanks.
Houndstongue (*Cynoglossum officinale*)	Found in disturbed areas, forest edges, and riparian areas.
Japanese knotweed (*Fallopia japonica*)	Occurs in many habitats and a variety of soil conditions, often in disturbed areas.
Leafy spurge (*Euphorbia esula*)	Prefers open areas with disturbed soils including pastures and prairies.
Meadow knapweed (*Centaurea pratensis)*	Typically found in moist soils within forest openings and along rivers and streams.
Medusahead rye (*Taeniatherum caput-medusae*)	Typically found in dry, open areas with disturbed soils.
Moth mullein (*Verbascum blattaria*)	Tends to invade pastures and meadows, can be found in open woodlands.
Musk thistle (*Carduus nutans*)	Spreads rapidly in disturbed soils. Prefers open meadows and pastures, but can colonize dense forests.
Orange hawkweed (*Hieracium aurantiacum*)	Commonly found on disturbed sites in pastures, meadows, and roadsides.
Ox-eye daisy (*Chrysanthemum leucanthemum*)	Tolerates a wide variety of light conditions, growing in open and partially shaded areas.
Perennial pepperweed (*Lepidium latifolium*)	Common in disturbed areas in a wide variety of soil conditions, from rangelands to coastal wetlands, riverbanks, and marshes.
Perennial sowthistle (*Sonchus arvensis*)	Often found in disturbed soils along roadsides and railroads.
Plumeless thistle (*Carduus acanthoides*)	Tends to invade disturbed soils in open habitat, typically along roadsides and railroads.
Poison hemlock (*Conium maculatum*)	Prefers moist soil near riparian habitat.
Puncturevine (T*ribulus terrestris*)	Often found in disturbed areas with sandy or gravelly soils.
Purple loosestrife (*Lythrum salicaria*)	An aggressive invader of wet soils, often found in wetlands, wet meadows, riverbanks and streambanks.
Quackgrass (*Agrioyron repens*)	Prefers disturbed soils in open areas.
Rush skeltonweed (*Chondrilla juncea*)	Can grow in both wet and dry habitats, often in disturbed areas.
Russian knapweed (*Centaurea repens*)	Prefers moist soil in disturbed areas.

Table 3-10 (cont'd). Noxious weeds for Wyoming and Teton County as reported by the Wyoming Department of Agriculture.

Species	Comments[1,2]
Russian olive (*Elaeagnus angustifolia*)	Tolerates a wide range of soils in open areas, typically found in pastures and roadsides.
Saltcedar (*Tamarix spp*)	Invades wet soils along streambanks, wetlands, and moist rangelands.
Scentless chamomile (*Matricaria perforata*)	Common in disturbed areas such as roadsides, fields, and meadows.
Scotch thistle (*Onopordum acanthium*)	Often found in disturbed soils in pastures.
Skeletonleaf bursage (*Franseria discolor*)	Prefers dry soils in disturbed areas such as pastures, prairies, and roadsides.
Spotted knapweed (*Centaurea maculosa*)	Invades disturbed areas such as pastures and meadows as well as forest openings.
Squarrose knapweed (*Centaurea virgata*)	Found in disturbed fields and pasturelands with degraded soils.
Sulfur cinquefoil (*Potentilla recta*)	Can occur in open habitat or forest and tolerates a wide range of soil conditions.
Tall buttercup (*Ranunculus acris*)	Common in forests, meadows, and disturbed sites. Tolerates a wide range of soil conditions.
Ventenata (*Venenata dubia*)	Prefers disturbed soils in open areas.
Yellow starthistle (*Centaurea solstitalis*)	Found in disturbed areas such as pastures, forest openings, and roadsides.
Yellow toadflax (*Linaria vulgaris*)	Can invade a wide range of habitat conditions, including pastures and roadsides as well as undisturbed prairies.

[1]Whitson 2006

[2] Invasive Plant Atlas 2019

3.5.2.3.2 Bull Thistle

Bull thistle is native to Europe, western Asia, and northern Africa, but is now common across the northern and southwestern US. This plant is an annual or biennial that can grow up to 7 feet tall in ideal conditions. It can thrive in a wide variety of soil conditions and typically occurs in disturbed areas such as roadsides, pastures, and forest clearcuts. Once established, it often grows in dense thickets that displace native vegetation (Invasive Plant Atlas 2018). Bull thistle can only reproduce by seed and thus can be managed over time by reducing seed production and spread (Cauffman 2008, King County 2014).

Bull thistle was noted in the northwest portion of the existing permit boundary area along the Sink or Swim hiking trail (Western Bionomics 2016).

3.5.2.3.3 Canada Thistle

Canada thistle is native to southeastern Eurasia but is now common throughout much of the US. This plant is a perennial that can grow up to 4 feet tall in ideal conditions. It often forms dense patches once it becomes established in an area. It is highly competitive with native plants but can be vulnerable to competition during the seedling stage. Compared to other noxious weeds, Canada thistle tolerates a more limited range of soil

conditions. This species reproduces by seeds as well as root buds. Management efforts typically target early detection, removal of live plants, and disruption of seed production (Cauffman 2008, Forest Service 2014a).

Canada thistle was noted along the Summit trail (Teton County Weed and Pest District 2018).

3.5.2.3.4 Cheatgrass

Cheatgrass is native to Eurasia but is now common across much of the US. This plant is an annual grass that can grow up to 2 feet tall. It often displaces native plants by emerging earlier in the spring and outcompeting other plants for water in the soil. One of the impacts of cheatgrass is the influence it has on local fire regimes; the structure and life cycle of the plant promotes larger and more frequent fires. This plant reproduces entirely by seed, but the seeds do not remain viable in the soil for more than 2 to 3 years. Therefore, management of this plant often focuses on preventing seed production and establishment, as well as persistent treatments of existing infestations.

Cheatgrass was noted along the Summit trail (Teton County Weed and Pest District 2018).

3.5.2.3.5 Common Mullein

Common mullein is native to Europe, Africa, and Asia but is now common across much of the US. This plant is a biennial that can reach up to 7 feet tall in idea conditions. It is highly adaptable and can invade a wide variety of habitat types. It reproduces by seeds, and its seeds can remain viable in the soil for up to 100 years. However, the seeds require sunlight for germination, which restricts germination to bare, often disturbed soil. Management typically targets minimizing disturbance, early detection, and persistent removal of plants before seeding (Cauffman 2008, Gucker 2008).

3.5.2.3.6 Common Tansy

Common tansy is native to Eurasia but is now common across much of the US. This plant is a perennial that can reach up to 7 feet tall in idea conditions. It is often found on disturbed sites and can tolerate a wide range of soil conditions. This species reproduces mainly by seed but can form dense stands through rhizomatous reproduction. Management typically targets early detection and control of established colonies with herbicides (Cauffman 2008, LeCain and Sheley 2014).

Common tansy was noted along the Summit trail (Forest Service 2019a, Teton County Weed and Pest District 2018).

3.5.2.3.7 Dalmatian Toadflax

Dalmatian toadflax is native to the Mediterranean region but is now common in the western US. This plant is a short-lived perennial that averages 3 feet in height with long, yellow, two-lipped flowers with an orange bearded throat. It is highly adaptable and typically invades disturbed soils. This species reproduces mainly by seed but can also spread through root buds. A single plant can produce up to 500,000 seeds in a year. While smaller infestations can be managed through early detection and reducing seeding and the spread of seeds, larger infestations are difficult to manage and can take 10–15 years of repeated treatments and follow up management to control (Cauffman 2008, Forest Service 2014b).

Dalmatian toadflax was noted near the top of the Summit lift (Cirrus 2019) and along the Summit trail (Forest Service 2019a, Teton County Weed and Pest District 2018).

3.5.2.3.8 Diffuse Knapweed

Diffuse knapweed is native to the eastern Mediterranean region and western Asia but is now common across the western and central US. This plant can be an annual, biennial, or short-lived perennial that can grow up to 2 feet tall. The flowers are usually white but occasionally light purple. Diffuse knapweed can tolerate a wide range of soil conditions, including forest openings. It reproduces by seed, and a single plant can produce up to 1,200 seeds. Human activities are one of the main sources of seed distribution for this species. Management of this species typically includes early detection and removal of plants, particularly before seeding (Parkinson and Mangold 2017).

3.5.2.3.9 Field Scabious

Field scabious is native to Europe but is now common across the northern US. This plant is a perennial with a deep taproot. Each plant has multiple long, slender flower stems that can reach up to 5 feet tall, with a single light purple flower at the end. Field scabious is considered a relatively new invader to Teton County (Teton County Weed and Pest District 2019). It can only reproduce by seeds, and thus can be managed over time by reducing seed production and spread (Montana State University Extension 2014).

3.5.2.3.10 Houndstongue

Houndstongue is native to western Asia and eastern Europe but is now common across the northern US. This plant is biennial, remaining in a vegetative state for the first year of growth and flowering in its second year. It is capable of delaying flowering until conditions are ideal. Houndstongue typically invades disturbed sites, including woodlands and forest clearings. Once established, it typically grows in dense thickets, especially in disturbed forest areas (Zouhar 2002a). It can only reproduce by seed, and thus can be managed over time by reducing seed production and spread. Houndstongue seeds do not remain viable in the seedbank for more than a few years, so persistent management can yield positive results (Cauffman 2008, Kedzie-Webb and Sheley 2017).

Houndstongue was noted in the eastern boundary adjustment area along the Hagen trail (Western Bionomics 2016).

3.5.2.3.11 Leafy Spurge

Leafy spurge is native to Eurasia but is now common across much of the US. This plant is a long-lived perennial that can grow up to 3 feet tall. This plant can grow in a variety of habitats, from riverbanks and flood plains to grasslands and mountain slopes. It can often grow quite aggressively in disturbed soils. While this plant can and does reproduce by seed, it can also reproduce through rhizomes below ground, making management difficult (Goodwin et al. 2003).

3.5.2.3.12 Musk Thistle

Musk thistle is native to western and central Europe but is now common throughout the US. This plant is biennial, remaining in a vegetative state for the first year of growth and flowering in its second year. It tolerates a wide variety of soil conditions and is typically found in disturbed sites in pastures and forested areas, occurring in dense stands in highly disturbed sites (Zouhar 2002b). Musk thistle can only reproduce by seed, and thus can be managed over time by reducing seed production and spread (Cauffman 2008, Beck 2013).

Musk thistle was noted along the western border of the western boundary adjustment area (Western Bionomics 2016) and along the Summit trail (Forest Service 2019a, Teton County Weed and Pest District 2018).

3.5.2.3.13 Oxeye Daisy

Oxeye daisy is native to Europe but is now common throughout the US. This plant is a perennial that has multiple long slender stems with a single white flower on top. It can grow in a variety of soil conditions and is commonly found in disturbed soils. Oxeye daisy reproduces by seed but can also spread using underground rhizomes. A single plant can produce up to 26,000 seeds. Management of this species typically includes reducing seed production and spread (Cauffman 2008, Mangold et al 2017).

3.5.2.3.14 Rush Skeletonweed

Rush skeletonweed is native to Eurasia but is now common in the western and central US. This plant is a biennial, remaining in a vegetative state in its first year of growth and flowering in its second year. It can grow up to 4 feet tall, with a slim flowering stem with many branches. It reproduces by seed but can regenerate from roots deep in the soil if the aboveground portion is removed (Jacobs et al. 2009). Once

established, this plant can be difficult to manage. Management typically includes early detection and follow-up treatments of infested areas.

3.5.2.3.15 Russian Knapweed

Russian knapweed is native to Eurasia but is now common across the western and central US. It is a long-lived creeping perennial that can reach up to 3 feet tall. Its flowers range from pink to lavender and resemble thistles. While this plant can reproduce through seeds, most often it produces dense stands through rhizomatous reproduction. Once established, Russian knapweed can be difficult to control. Management of this species typically includes early detection and eradication through repeated treatments (Cauffman 2008, Forest Service 2015a).

3.5.2.3.16 Scentless Chamomile

Scentless chamomile is native to Europe but is now common throughout much of the US. This plant can be an annual, perennial, or biennial. It typically grows 6–24 inches tall, with many daisy-like flowers on a single plant. It is found in a variety of habitats but often occurs in disturbed soils (Colorado Department of Agriculture 2019). It reproduces by seeds and thus can be managed over time by reducing seed production and spread.

Scentless chamomile was noted near the top of the Summit lift (Cirrus 2019).

3.5.2.3.17 Spotted Knapweed

Spotted knapweed is native to Europe but is now common throughout much of the US. This plant is a perennial or biennial that typically grows 2–4 feet tall. It has purple to pink flowers, with many small flowers per head. It can be found in a variety of habitats but often occurs on disturbed soils (Colorado Department of Agriculture 2015). It reproduces by seeds and thus can be managed over time by reducing seed production and spread (Cauffman 2008).

Spotted knapweed was noted along the Summit trail (Teton County Weed and Pest District 2018).

3.5.2.3.18 Yellow Toadflax

Yellow toadflax is native to the Mediterranean region but is now common across the US. This plant is a perennial that average 1 to 3 feet in height. It is highly adaptable to a wide range of soil conditions and is often found in disturbed areas. In contrast to Dalmatian toadflax, yellow toadflax reproduces mainly through root buds, which can produce a plant up to 10 feet away from the parent plant. Established yellow toadflax infestations are difficult to control and can take 10–15 years of repeated treatments and follow up management to eradicate (Cauffman 2008, Forest Service 2014b).

Yellow toadflax was noted along the Summit trail (Teton County Weed and Pest District 2018).

3.5.2.4 Spread Vectors

Noxious weed seeds can be dispersed in a variety of ways depending on each species' seed dispersal mechanisms. Some plants utilize gravity and wind to disperse their seeds, often having specialized seeds made to catch a gust of wind. Other seeds attach to a passing animal, human, or vehicle to disperse from the parent plant. These seeds typically have barbs or hooks. Some species require the ingestion of seeds by wildlife and are fruity or otherwise palatable to encourage consumption. The operation of construction equipment, transfer of soils, use of straw for site rehabilitation, and increased recreational use can increase noxious weed seed dispersal.

Construction equipment can lead to seed dispersal through the disturbance of plants with wind-dispersed seeds, which can release the seeds into the air, or through the attachment of seeds to the wheels and underside of the vehicles, which can result in seeds being directly moved to new areas by the equipment. Soil transfer can lead to seed dispersal through the movement of seeds already in the soil. This can result from the use of excess soil in one area as fill in another, from importation of fill material from off site, or

from the movement of soil on construction equipment. Weed seeds can also be present in rehabilitation materials, such as straw or seed mixes from off-site locations. If straw mulch or seed mixes are contaminated with noxious weeds, they can be a vector for seed dispersal.

Increased recreational use can lead to an increase in weed seed dispersal through the disturbance of plants with wind-dispersed seeds or through the attachment of seeds to shoes, clothing, and equipment, including bicycles. Recreationists can also introduce seeds from off-site locations.

3.5.2.5 Risk Assessment

This assessment of the risk of introducing or spreading weeds assumes that the target species discussed above could occur anywhere in or adjacent to the permit area over the term of the project (estimated 5 years, section 1.1). Accordingly, the risk of weed introduction to new locations or spread of infestations depends on certain characteristics of each proposed element, and those element-specific effects combine to indicate the relative effect of each alternative. The characteristics assessed for each element are as follows:

1. Disturbance type: Section 3.1.1 describes the disturbance type associated with each of the proposed elements, either glading, clearing, grading, or excavation. Clearing and glading entail little or no soil disturbance, while grading and excavation create more favorable conditions for weed establishment.
2. Disturbance size: Section 3.1.1 also provides the acreage of disturbance for each proposed element. In general, the greater the area, the greater the potential for weed establishment and spread.
3. Disturbance shape: Linear elements, particularly trails, have more potential to serve as vectors for weed introduction and spread as they generally intersect more diverse areas than do elements with consolidated disturbance footprints.
4. Disturbance duration: The disturbed areas associated with most proposed elements would be rehabilitated and revegetated after construction, limiting the time they were susceptible to weed infestation. Other elements, particularly trails, would remain disturbed, and thus potential infestation sites and vectors, as long as they were in use.

If other weed species were found to occur in the permit area over the term of the project, the risk of spread would generally be similar as for these target species, as would the responsive actions discussed below (section 3.5.5).

3.5.3 Direct and Indirect Effects

The analysis below considers the current level of weed management (section 3.5.2.2), the known species present (section 3.5.2.3), spread vectors for those species (section 3.5.2.4), and the risk assessment (section 3.5.2.5) in determining what impacts the alternatives may have regarding weeds. All of these factors are also used to inform an integrated weed-management strategy presented in section 3.5.5. To focus the analysis, elements generating a similar type of disturbance are combined into either clearing, glading, grading, or excavation.

3.5.3.1 Alternative 1

There would be no new disturbance of the existing habitat since elements proposed under other alternatives would not be developed. There would be no notable change in recreational use, and noxious weed conditions would remain as described above in the affected environment section. Given the nature of the noxious weeds present in the area, there is a moderate risk that the species currently present in the area may continue to expand. Off-trail hiking and user-created hiking and biking trails would continue to serve as vectors for weed introduction and spread. The ski area would continue to treat existing and new weed infestations, consistent with the terms of their vegetation management and weed management plans.

3.5.3.2 Alternative 2

This alternative would result in 80.4 acres of glading and clearing, with limited potential to increase weed introduction or spread. It would also entail 64.1 acres of grading and excavation, with higher potential to create conditions favorable to weeds due to high levels of soil disturbance and equipment operation. Of 144.5 acres of total disturbance, 83.3 acres would be associated with development of new ski terrain, creating large expanses susceptible to weed establishment.

The increase in recreational infrastructure would likely increase recreational use of Snow King during the spring, summer, and fall months. This could increase the spread of noxious weeds compared to current conditions.

In terms of disturbance shape, 15.5 miles of hiking and front-side mountain biking trails would be constructed, and development of the mountain bike zone on the back side would increase trail mileage. These trails would create extensive disturbed corridors passing through virtually all vegetation communities in the ski area and providing potential vectors for weed introduction and spread.

Under this alternative, mountain bike use could occur on both the new downhill trail system as well as on the existing Cache Creek/Game Creek cross-country trail system. Intermingling use on the two trail systems would increase the potential for weed introduction and spread via mountain bikes and riders.

On the other hand, one of the reasons for creating new and improved hiking and biking trails is to concentrate use and avoid the many problems associated with off-trail use and user-created trails, including the introduction and spread of weeds. Toward that end, this alternative would also obliterate 1.1 miles of existing service roads and user-created trails.

In addition to the mountain bike zone, Alternative 2 would establish the yurt camp and associated recreational use on the back-side of the mountain. This activity could introduce noxious weeds or spread existing infestations of noxious weeds.

Overall, this alternative would have the most grading and excavation, the most miles of trail, intermingling of use with the Cache Creek/Game Creek trail system, and the fewest miles of road and trail obliteration. Accordingly, it would pose the greatest risk of weed introduction and spread.

This risk would be reduced by Snow King's ongoing weed management efforts, described above (section 3.5.2.2). However, development at this scale warrants more comprehensive and systematic efforts to avoid weed introduction, identify and treat new and existing weed infestations, monitor success, and re-treat as necessary. Accordingly, the design criteria section (3.5.5) requires implementation of an integrated weed-management strategy. The weed management BMPs that comprise that strategy are drawn primarily from the *Guide to Noxious Weed Prevention Practices* (Forest Service 2001b) and should be implemented to augment ongoing efforts at Snow King. These measures should preclude any substantial increase in weed introduction and spread from occurring as a result of this alternative.

3.5.3.3 Alternative 3

To provide a clear contrast, this discussion addresses only differences in effects between Alternative 3 and Alternative 2, described above.

Alternative 3 increases the total area of disturbance compared to Alternative 2 by 154 acres. A majority of this increase in disturbance is attributed to proposed thinning of 154.2 acres in an effort to reduce fuels in the wildland urban interface. This would have minimal impact on noxious weeds. Alternative 3 would have 1 less mile of hiking trail and would obliterate 0.9 more miles of roads and user-created trails compared to Alternative 2. This would focus recreation on established roads and trails, allowing for better noxious weed management and limiting the spread and establishment of noxious weeds. Any differences in the construction footprint would be negligible in terms of the risk of noxious weed spread and establishment.

As with Alternative 2, the integrated weed-management strategy should preclude any substantial increase in weed introduction and spread from occurring as a result of this alternative.

3.5.3.4 Alternative 4

To provide a clear contrast, this discussion addresses only differences in effects between Alternative 4 and Alternatives 3, described above.

Compared to Alternative 3, Alternative 4 would increase the total acres gladed and cleared by 3.4 acres, which could increase weed introduction or spread; however, glading and clearing activities do not pose as great a risk of weed spread as grading and excavation. Alternative 4 would increase the total acres graded and excavated by 0.2 acres, relative to Alternative 3. This would not appreciably affect the risk of spreading noxious weeds.

Compared to Alternative 3, Alternative 4 would decrease the total miles of mountain bike trails by 0.9 miles relative to Alternative 3, resulting in a minor reduction in the risk of spreading noxious weeds by reducing spread vectors. The length of service roads obliterated would be 0.5 miles less due to retaining Slow Trail, offsetting this reduction to some degree.

Overall, Alternative 4 would have similar potential for the introduction and spread of noxious weeds. As with Alternatives 3, implementation of an integrated weed-management strategy should preclude any substantial increase in weed introduction and spread from occurring as a result of this alternative.

3.5.4 Cumulative Effects

Of the cumulative actions listed in section 3.1.2, the five past projects and the one current project all have impacts that overlap the direct and indirect effects of the proposed action and action alternatives discussed above. The soil disturbance associated with each creates new sites susceptible to weed encroachment. In particular, linear disturbances resulting from the 2015 Rafferty lift replacement, 2013 communications services installation, and 2014 snowmaking system infrastructural improvements can set the stage for introduction and wide expansion of infestations.

The cumulative effects of the five past projects are reflected in the preceding description of the affected environment (section 3.5.2.2). The ongoing Snow King Lower Elk Lighting project is located in the existing permit boundary area, and the disturbance associated with installing 15 new light structures could create new sites susceptible to encroachment. However, this potential is very low due to the small, discrete areas of disturbance and the ongoing weed management effort at Snow King.

Overall, these disturbances have cumulatively increased the variety and extent of weeds at the ski area. Consistent, ongoing efforts to avoid, detect and manage infestations are critical. The design criteria outlined below will help support a systematic effort.

3.5.5 Design Criteria

Prior to construction, implement an integrated weed-management strategy that incorporates the following BMPs (Forest Service 2001b):

Construction Planning

1. Minimize soil disturbance associated with authorized project elements.

Pre-construction Surveys

2. Before ground-disturbing activities begin, inventory and prioritize weed infestations for treatment in project operating areas and along access routes. Record all survey data.

Minimizing the Introduction of Noxious Weeds

3. Locate and use weed-free project staging areas. Avoid or minimize all types of travel through weed-infested areas or restrict to those periods when spread of seed or propagules are least likely.
4. Determine the need for, and when appropriate, identify sites where equipment can be cleaned. Clean equipment before entering permit area; a Forest Officer, in coordination with the Unit Invasive Species Coordinator, needs to approve use of on-Forest cleaning sites in advance. This practice does not apply to service vehicles traveling frequently in and out of the project area that will remain on the roadway. Seeds and plant parts need to be collected when practical and incinerated. Remove mud, dirt, and plant parts from project equipment before moving it into a project area.

Minimizing the Spread of Noxious Weeds.

5. Clean all equipment, before leaving the project site, if operating in areas infested with weeds. Determine the need for, and when appropriate, identify sites where equipment can be cleaned. Seeds and plant parts need to be collected when practical and incinerated.
6. Inspect, remove, and properly dispose of weed seed and plant parts found on workers' clothing and equipment. Proper disposal means bagging the seeds and plant parts and incinerating them.
7. Maintain stockpiled, uninfested material in a weed-free condition.
8. Retain native vegetation in and around project activity to the maximum extent possible consistent with project objectives.
9. Minimize soil disturbance to the extent practical, consistent with project objectives.
10. Maintain trailhead and other areas of concentrated public use in a weed-free condition. High use recreation areas are a high priority for weed eradication.
11. Post weed awareness messages and prevention practices at strategic locations such as trailheads, roads, boat launches, and forest portals.

Restoration

12. Follow Forest Service policy (FSM 2070) and use genetically appropriate native materials for any rehabilitation and restoration. Involve a qualified Forest Service representative in development, review, and/or approval of plant materials selected for use in site rehabilitation and restoration.
13. Revegetate disturbed soil (except travelways on surfaced projects) in a manner that optimizes plant establishment for that specific site. Define for each project what constitutes disturbed soil and objectives for plant cover revegetation.
14. Revegetation may include topsoil replacement, planting, seeding, fertilization, liming, and weed-free mulching as necessary. Use native material where appropriate and feasible. Use certified weed-free or weed-seed-free hay or straw where certified materials are required and/or are reasonably available. Always use certified materials in areas closed by administrative order. Where practical, stockpile weed-seed-free topsoil and replace it on disturbed areas (e.g. road embankments or landings).
15. Use Forest Service seeding guidelines to determine detailed procedures and appropriate mixes.

Effectiveness Monitoring

16. Inspect and document all limited-term ground-disturbing operations in noxious weed infested areas for at least three growing seasons following completion of the project. For on-going

projects, continue to monitor until reasonable certainty is obtained that no weeds have occurred. Provide for follow-up treatments based on inspection results.

Reporting

17. Record all pre-construction and post-construction surveys and data using approved agency protocols, as instructed by the Forest Service.

3.6 WILDLIFE

3.6.1 SCOPE OF ANALYSIS

3.6.1.1 Special-status Species

- *How would construction and use of the proposed infrastructure affect special-status wildlife species?*

The US Fish and Wildlife Service Information for Planning and Consultation database indicates that several wildlife species listed under the Endangered Species Act of 1973 may occur in the project area, and the Forest Service's list of sensitive species in the Intermountain Region also includes several species potentially found in the area. The Migratory Bird Species Act of 1918 provides protections to some bird species that may frequent the project area. Construction and use of the proposed infrastructure could affect these special-status species through disturbance, displacement, or habitat impacts.

Indicators: Survey of areas that would be disturbed by construction and subsequent use for appropriate species and habitat-based assessments for more reclusive species, then assessment of impacts on special-status species based on occurrence and type, extent, and timing of disturbance of individuals or habitat. Conclusions determined and expressed as called for in the protocols for federally listed, Forest Service sensitive, migratory bird species.

3.6.1.2 Specialized Habitats

- *How would construction and use of the proposed infrastructure affect elk or mule deer winter use?*

Parts of Leeks Canyon and adjacent areas include winter range for elk and mule deer, and there are wildlife migration corridors in the area. To protect these specialized habitats, winter wildlife closure areas have been established around Snow King. Construction and use of the proposed infrastructure could affect these habitats through disturbance, displacement, or fragmentation.

Indicators: Review of existing data on these specialized habitats, then assessment of potential effects based on the type, extent, and timing of disturbance of individual animals or habitat.

3.6.2 AFFECTED ENVIRONMENT

Table 3-11 identifies all special-status species known, or suspected, to occur on the Jackson Ranger District of the Bridger-Teton (Forest Service 2019a). Fourteen of these species are either known to occur or have habitat in the project area and are discussed in detail below. The remaining species have no habitat in the project area and are not addressed further.

Table 3-11. Special-status species (threatened, endangered, and sensitive) on the Bridger-Teton and their status in the project area.

Species Name	Habitat Description	Status	Known Occurrences in the Project Area	Habitat Present in Project Area
Mammals				
Bighorn sheep (*Ovis Canadensis*)	Rugged terrain and areas near rugged terrain with grasses and forbs.[1]	Region 4 Sensitive	No	Yes
Canada lynx (*Lynx canadensis*)	Coniferous or mixed forests, thick undergrowth for hunting, old growth with deadfall for denning and resting. [1]	Threatened	No	Yes
Fisher (*Pekania pennanti*)	Mid-to-low elevation coniferous or mixed forests with dense canopies, large trees, abundant snags, and downed logs. Avoids areas of high human activity.[1]	Region 4 Sensitive	No	Yes
Grizzly bear (*Ursus arctos horribillis*)	Diverse habitats that provide relative solitude, ungulate prey and carrion, herbaceous vegetation and mast cops such as whitebark pine. [1]	Threatened	No	Yes
Spotted bat (*Euderma maculatum*)	Associated with cliffs and a variety of habitats, including openings in high-elevation conifer and aspen communities.[1]	Region 4 Sensitive	No	Yes
Townsend's western big-eared bat (*Corynorhinus townsendii townsendii*)	Uses a wide variety of roosting and foraging habitats, including caves and mines for roosting and open areas for foraging.[1]	Region 4 Sensitive	No	Yes
Wolverine (*Gulo gulo*)	Wide ranging species that uses a variety of montane habitats.[1]	Region 4 Sensitive	No	Yes
Birds				
Bald eagle (*Haliaeetus leucocephalus*)	Roosts in large trees. Generally nests in mature, old-growth trees within 2 kilometers of water.[2]	Region 4 Sensitive	Yes	Yes
Boreal owl (*Aegolius funereus*)	High-elevation spruce/fir or mixed forests. Requires cavities for nesting. Cavities generally found in older trees and snags.[2]	Region 4 Sensitive	No	Yes
Common loon (*Gavia immer*)	Large water bodies with islands and fish.[2]	Region 4 Sensitive	No	No

Table 3-11 (cont'd). Special-status species (threatened, endangered, and sensitive) on the Bridger-Teton and their status in the project area.

Species Name	Habitat Description	Status	Known Occurrences in the Project Area	Habitat Present in Project Area
Flammulated owl (*Psiloscops flammeolus*)	Dry upland ponderosa pine; sometimes Douglas fir or aspen forests with brushy understory.[2]	Region 4 Sensitive	Yes	Yes
Great gray owl (*Strix nebulosi*)	Mixed lodgepole pine, Douglas fir, or aspen forests. Commonly nests in large broken-toped snags.[2]	Region 4 Sensitive	Yes	Yes
Greater sage-grouse (C*entrocercus urophasianus*)	Sagebrush obligate. Requires expansive areas dominated by sagebrush of varying densities and age classes.[2]	Region 4 Sensitive	No	No
Harlequin duck (*Histrionicus histrionicus*)	Large, fast-flowing rivers with forested banks for nesting.[2]	Region 4 Sensitive	No	No
Northern goshawk (*Accipiter gentilis*)	Coniferous or mixed, old-growth forests. Often nests in small (~10-acre) patches of trees, such as those present in the project area.[2]	Region 4 Sensitive	Yes	Yes
Peregrine falcon (*Falco peregrinus anatum*)	Habitat varies widely. Nesting habitat most commonly associated with cliffs.[2]	Region 4 Sensitive	No	Yes
Three-toed woodpecker (*Picoides dorsalis*)	Coniferous or mixed forests, generally with abundant beetle-killed snags.[2]	Region 4 Sensitive	Yes	Yes
Trumpeter swan (*Cygnus buccinators*)	Freshwater ponds, lakes, or marshes with abundant aquatic vegetation.[2]	Region 4 Sensitive	No	No
Yellow-billed cuckoo (*Coccyzus americanus*)	Large stands of riparian woodlands greater than 25 contiguous acres at least 330 feet wide below 7,000 feet.[2]	Threatened	No	No
Amphibians				
Boreal toad (*Bufo boreas*)	Requires perennial, slow-moving, or standing water, generally with emergent vegetation.[1]	Region 4 Sensitive	No	No
Columbia spotted frog (*Rana luteiventris*)	Requires perennial, slow-moving, or standing water, generally with emergent vegetation.[1]	Region 4 Sensitive	No	No

Table 3-11 (cont'd). Special-status species (threatened, endangered, and sensitive) on the Bridger-Teton and their status in the project area.

Species Name	Habitat Description	Status	Known Occurrences in the Project Area	Habitat Present in Project Area
Fish				
Yellowstone cutthroat trout (*Oncorhynchus clarki bouvieri*)	Cold-water perennial streams or lakes and ponds with suitable substrate for spawning and sufficient food source.[1]	Region 4 Sensitive	No	No

[1] Natureserve 2019. http://explorer.natureserve.org/index.htm

[2] Birds of North America. http://bna.birds.cornell.edu/bna

3.6.2.1 Threatened and Endangered Species

The Endangered Species Act of 1973, as amended (FWS 1973), is administrated by the Fish and Wildlife Service and the National Marine Fisheries Service. The act requires federal agencies to ensure that any activities they authorize, fund, or carry out do not jeopardize the continued existence of any federally listed threatened, endangered, or proposed species. Compliance with this direction will be documented in a biological assessment. The analysis for these species is presented below.

3.6.2.1.1 Canada Lynx

The Canada lynx (lynx) was listed as threatened in the contiguous US in March 2000 (FWS 2000). Critical habitat for lynx was designated in September 2014 (FWS 2014). Threats to lynx include habitat loss, alteration, and fragmentation; competition from other predators such as coyotes, mountain lions, or bobcats; and trapping.

Lynx distribution includes Alaska and Canada, down into the Rocky Mountains, the northern Great Lakes region, and northern New England. In the Rocky Mountains, they typically occur in subalpine (boreal) conifer forests with cold snowy winters (Ruediger et al. 2013). Lynx denning habitat is characterized by the presence of large woody debris and usually consists of older successional or mature stands (Ruediger et al. 2013).

Snowshoe hares (*Lepus americanus*) are the primary prey of lynx, while red squirrels (*Tamiasciurus hudsonicus*) are an important alternate prey species in more southern latitudes where snowshoe hare densities are lower. Early to advanced successional stands with a dense, multi-layered understory are optimal for snowshoe hares, and thus important as lynx foraging habitat (Ruediger et al. 2013). Snowshoe hares are found throughout the Bridger-Teton in suitable habitat.

Based on Bridger-Teton habitat modeling, the Flat Creek Lynx Analysis Unit (LAU), which includes Snow King, covers 72,949 acres and contains 45,296 acres of suitable lynx habitat. While lynx habitat overlaps the project area, there are no records of lynx occurrences at or near Snow King (Figure 3-3; WNHD 2018). Surveys for lynx have been completed on other areas of the Bridger-Teton with positive results (Holden 2004). According to the *Canada Lynx Conservation Agreement* (FWS 2006) between the Forest Service and the Fish and Wildlife Service, all mapped lynx habitat on the Bridger-Teton must be considered "occupied" because lynx have been found on the Forest.

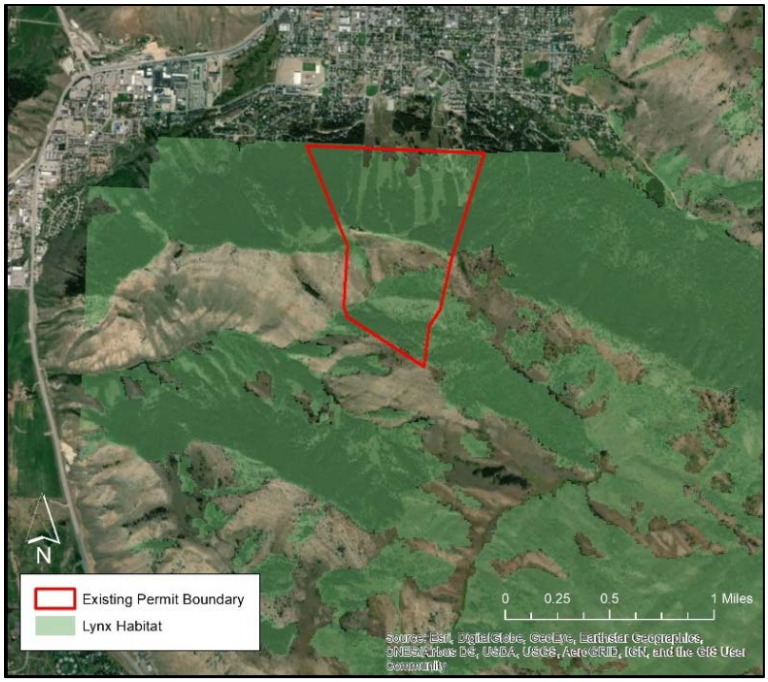

Figure 3-3. Suitable lynx habitat in relation to the existing permit boundary area.

The Endangered Species Act defines critical habitat for threatened and endangered species. Critical habitat is an area that provides features that are important for the conservation of a species that may require special management practices or protection (FWS 1973). There are five main geographical areas of designated lynx critical habitat: 1) New England; 2) the Great Lakes region; 3) northern Idaho and western Montana; 4) Washington; and 5) southwestern Montana and western Wyoming. The Wyoming/Montana critical habitat designation extends from southwestern Montana to Cokeville, Wyoming. The existing permit boundary area overlaps with this designated critical habitat (Figure 3-4). The project does not fall within a designated linkage area.

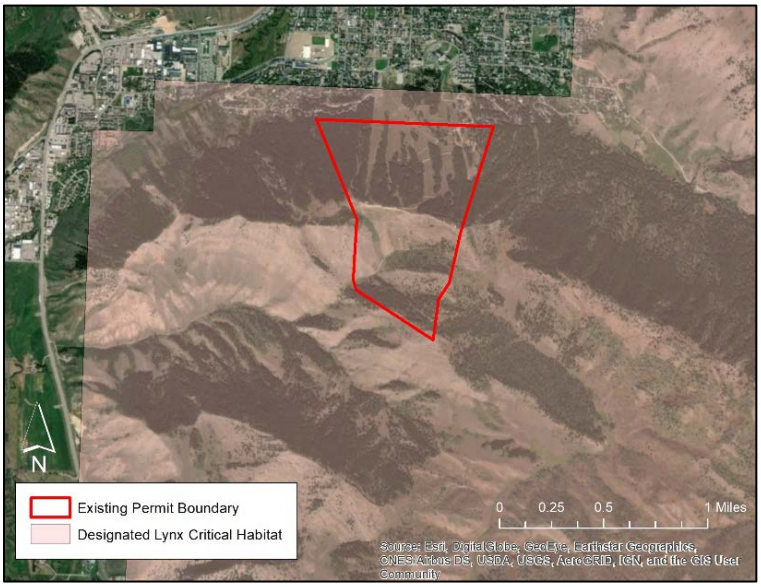

Figure 3-4. Designated lynx critical habitat in relation to the existing permit boundary area.

Northern Rockies Lynx Management Direction

Applicable objectives, standards, and guidelines for lynx management from the *Northern Rockies Lynx Management Direction Record of Decision* (Northern Rockies Lynx Management Direction; Forest Service 2007) guided this analysis of potential effects on lynx and lynx habitat, as discussed below.

Habitat Linkage and Movement

- Objective ALL O1: Maintain or restore lynx habitat connectivity in and between LAUs and/or linkage areas.
- Standard ALL S1: New or expanded permanent development and vegetation management projects must maintain habitat connectivity in LAU and/or linkage area.
- Objective HU O2: Manage recreational activities to maintain lynx habitat and connectivity.
- Objective HU O4: Provide for lynx habitat needs and connectivity when developing new or expanding existing developed recreation sites or ski areas.
- Guideline HU G3: Recreation development and operations should be planned in ways that both provide for lynx movement and maintain the effectiveness of lynx habitat.

Habitat Quality and Effectiveness

- Objective HU O1: Maintain the lynx's natural competitive advantage over other predators in deep snow, by discouraging the expansion of snow-compacting activities in lynx habitat.
- Objective HU O3: Concentrate activities in existing developed areas, rather than developing new areas in lynx habitat.
- Guideline HU G1: When developing or expanding ski areas, provisions should be made for adequately sized inter-trail islands that include coarse woody debris, so winter snowshoe hare habitat is maintained.
- Guideline HU G2: When developing or expanding ski areas, lynx foraging habitat should be provided consistent with the ski area's operational needs, especially where lynx habitat occurs as narrow bands of coniferous forest across mountain slopes.
- Guideline HU G10: When developing or expanding ski areas and trails, consider locating access roads and lift termini to maintain and provide lynx security habitat, if it has been identified as a need.

3.6.2.1.2 Grizzly Bear

The grizzly bear was listed as threatened in the lower 48 states in July of 1975 (FWS 1975). Since that time, it has been delisted and relisted several times. As of July 31, 2019, the species is again listed as threatened (FWS 2019). Critical habitat for grizzly bears has not been designated. Grizzly bears occur in forest environments, grasslands, and shrublands, particularly riparian zones. They prefer habitats that provide relative solitude, support animal prey, and provide herbaceous vegetation or mast crops such as berries or nuts.

The project area is within the Demographic Monitoring Area for the Greater Yellowstone Ecosystem bear population. Recent research by the Interagency Grizzly Bear Study Team indicates that the trend of female grizzly bears with cubs of the year was up for the period between 1983 and 2018 (IGBST 2018). This does not necessarily indicate that the population has increased over the same period, but it is suggestive of an upward population trend for grizzly bears in the monitoring area. Since no Bridger-Teton-specific information for this species is available, for the purposes of this analysis we will treat the upward trend on the monitoring area as indicative of the trend on the Bridger-Teton.

There are three Wyoming Natural Heritage database records for grizzly bears within 5 miles of the project area but no records within 2 miles of the project area (WNHD 2018). Given the historic sightings, it is possible that a grizzly bear could be in the area during project implementation, attracted to mast crops (e.g., huckleberries) and occasional ungulate carcasses in the area.

3.6.2.1.3 Wolverine

Wolverines are currently proposed for listing as threatened under the ESA (FWS 2016). Although proposed species do not receive protections under the ESA until their listing is finalized, the wolverine is discussed in this section since their status is in flux. In North America, wolverines occur in a wide variety of alpine, boreal, and arctic habitats, including boreal forest, tundra, and montane forests throughout much of Alaska and Canada. The southern portion of the species' range extends into the contiguous US, including high-elevation alpine portions of Washington, Idaho, Montana, Wyoming, California, and Colorado (Copeland et al. 2010). This species' requirement for cold, snowy conditions means that in the southern portion of its range where ambient temperatures are warmest (like Wyoming) wolverines occur principally at high (greater than 8,000 feet) elevations (Murphy et al. 2011, Inman et al. 2012). Deep snow is required for successful wolverine reproduction because female wolverines dig elaborate natal dens in the snow.

Wolverines are opportunistic feeders and consume a variety of foods depending on availability. Home ranges of wolverines are large and vary greatly in size depending on availability of food, gender, age, and differences in habitat quality. Adult male wolverines in the Greater Yellowstone Area had average home ranges of 311 square miles, while females averaged 128 square miles (Inman et al. 2012).

No records of wolverines exist in the Wyoming Natural Heritage Database within 2 miles of the project area (WNHD 2018). They generally avoid high levels of human disturbance; however, they appear to tolerate low to moderate levels of human recreational activity (Heinemeyer and Squires 2014). No surveys for this species were conducted in the project area.

3.6.2.2 Forest Service Sensitive Species

The population trend and viability of sensitive species is a concern. They are managed under the authority of the National Forest Management Act (PL 94-588) and are administratively designated by the Regional Forester (FSM 2670). Table 3-11 shows which sensitive wildlife species and associated habitats occur in the project area.

3.6.2.2.1 Bighorn Sheep

Bighorn sheep are a widely distributed species, ranging from the northern Rockies south to the Baja peninsula. The subspecies present in the project area is the Rocky Mountain bighorn. Rocky Mountain bighorn are found in and around rugged areas they use as escape terrain where their adaptations allow them to outrun and outmaneuver potential predators. This dependence on escape terrain limits potential habitat. Human activity is known to impact this species by causing avoidance of otherwise suitable habitat (Longshore and Thompson 2013, Courtemanch 2014). Nearby populations of Rocky Mountain bighorn have been shown to avoid habitat used by winter recreationists (Courtemanch 2014).

Hiking trails have been shown to be avoided by desert bighorn sheep but to have no effect on Sierra Nevada bighorn sheep, both closely related to Rocky Mountain bighorn sheep (Hicks and Elder 1979, Longshore and Thompson 2013). Trail avoidance by desert bighorn sheep was very short lived. Sheep avoided trails during high-use weekends and returned during weekdays (Longshore and Thompson 2013).

The bighorn sheep population around Snow King is a part of the Jackson herd unit (WGFD 2018a). The population is currently estimated to be 363, which is within 20 percent of the population objective of 400. The 3-year mid-winter trend average (2016–2018) is 378 (WGFD 2018a). There are records of bighorn sheep using the existing permit boundary area (WNHD 2018).

3.6.2.2.2 Fisher

In June 2011, it was determined that listing the fisher as threatened or endangered was not warranted (FWS 2011). The northern Rockies fisher distinct population segment was again petitioned for listing in 2013 (Curry 2013) and found not warranted in 2017 (FWS 2017). As of now, fishers remain a Region 4 sensitive species.

Fishers evolved in forest types with common windthrow events and mixed fire frequency and intensity (Jones 1991). These disturbances resulted in complex and intricate landscape mosaics of young, mixed-age, and late-seral components that fishers require for breeding and foraging (Jones 1991). Fishers select landscapes where there are highly connected patches of mature forest (≥ 50 percent) with small (≤ 5 percent) open areas (Sauder 2014). However, fisher prey on species associated with non-forest types (Jones and Garton 1994). Fishers avoid open areas (Buskirk and Powell 1994, Powell and Zielinski 1994), and increasing the amount of open areas can have large effects on the probability of fisher occupying an area (Sauder 2014, Buskirk and Powell 1994, Powel and Zielinski 1994). Fishers have avoided open areas 25 meters across and less in the Midwest (Powell 1979). Reduction of understory vegetation may decrease fisher prey availability, disrupt daily movements, and increase predation vulnerability (Naney et al. 2012).

The forested habitat within the current permit boundary area is highly fragmented due to past ski area development. The lack of continuous canopy cover and extensive openings likely prohibits use by fishers. However, the small islands of forested habitat may allow fishers to move through the project area. No records exist in the Wyoming Natural Heritage Database within 2 miles of the project area (WNHD 2018).

3.6.2.2.3 Spotted Bat

Spotted bats are found throughout the west in a wide variety of habitats. In Wyoming they are found in the western third of the state and have been recorded at elevations up to 9,000 feet in caves and rock crevices (Watkins 1977, Priday and Luce 1999, Luce et al. 2004). In general, spotted bats are found within 6 miles of cliffs with nearby permanent water (Priday and Luce 1999).

Little is known about spotted bat populations in western Wyoming (Priday and Luce 1999, Luce et al. 2004). No records exist in the Wyoming Natural Heritage Database within 2 miles of the project area (WNHD 2018). No bat surveys were completed in the project area. However, given the habitat and terrain within and surrounding the project area, it is assumed spotted bats could be present.

3.6.2.2.4 Townsend's Western Big-eared Bat

There is some disagreement and ambiguity as to whether the western subspecies of Townsend's big-eared bat, the subspecies listed as sensitive in Region 4, are found in Wyoming. However, Townsend's big-eared bats do occur in Wyoming, and for purposes of this analysis it is assumed they are of the western subspecies (Handley 1959, Piaggio and Perkins 2005). During spring, summer, and fall, Townsend's big-eared bats roost in buildings, mines, and caves at elevations up to 11,000 feet. Hibernacula used in winter are almost exclusively mines or caves and can be up to 20 miles away from summer-use sites. Townsend's big-eared bats eat moths and other flying insects that they take on the wing, generally at the margins of forest patches (Kunz and Martin 1982).

No records for this species exist in the Wyoming Natural Heritage Database within 2 miles of the project area (WNHD 2018). No bat surveys were completed in the project area. However, given the habitat and terrain surrounding and within the project area, it is assumed this species could be present.

3.6.2.2.5 Bald Eagle

Bald eagles are closely associated with water, and their nest sites are commonly found less than 1 mile from a lakeshore or riverbank. Large trees are necessary to support eagle nests. Old-growth stands, with their structural diversity and open canopies, provide important habitat for eagles because snags and open-canopied trees located near the nest site and foraging areas offer favorable perches. Bald eagles with access

to open water or alternate food sources near their nesting territories may not migrate in winter; however, many eagles migrate southward to areas with available prey (Buehler 2000).

Bald eagles are common in and around the project area. Several records for this species exist in the Wyoming Natural Heritage Database, and additional records exist on eBird (eBird 2015, WNHD 2018). No surveys for this species were conducted in the project area.

3.6.2.2.6 Boreal Owl

Boreal owls are generally associated with dense, mature, and old growth subalpine forests dominated by subalpine fir (*Abies lasiocarpa*) and Engelmann spruce (*Picea engelmanni*; Hayward and Hayward 2020). They also often occur in other conifer and mixed-conifer aspen stands that support inclusions of mature subalpine forests and may forage in forest openings (Hayward and Hayward 2020). In western Wyoming, subalpine forests typically occur above 8,000 feet in elevation, with stringers extending to low elevations along stream courses. They are often bordered by Douglas fir and/or lodgepole pine forests, sagebrush steppe, or grassland steppe at low elevations, and by alpine habitats and white-bark pine (*Pinus albicaulis*) at high (9,500 feet) elevations. Prey species include voles, mice, shrews, pocket gophers, squirrels, chipmunks and, less frequently, small birds and insects (Hayward and Hayward 2020).

No records exist for boreal owls within 2 miles of the project area (WNHD 2018). Two rounds of surveys were conducted in the project area in March and April 2018. No boreal owls were detected during these surveys. However, boreal owls could potentially utilize the project area as some marginal quality habitat is present. Boreal owls are common in other areas of the Bridger-Teton.

3.6.2.2.7 Flammulated Owl

Flammulated owls typically occur in mixed coniferous forests of pine, spruce, and fir at higher elevations, as well as oak and pinyon pine at lower elevations. They are secondary cavity nesters, nesting in relatively open stands of large-diameter (greater than 21-inch) ponderosa pine, Jeffrey pine (*Pinus jeffreyi*), Douglas-fir (*Pseudotsuga menziesii*), and aspen (*Populus tremuloides;* Linkhart and McCallum 2013).

This species is an insectivorous, cavity nesting, neotropical migrant. Territories are established in early May and eggs are typically laid in early June. The young fledge in late July and disperse by September. Threats include loss of habitat, habitat fragmentation, and nest disturbance (Linkhart and McCallum 2013).

There is one record of flammulated owl within 2 miles of the project area, but no records within the project area (WNHD 2018). Two rounds of surveys were conducted in the project area in early June and late June 2018. No flammulated owls were detected during these surveys. However, flammulated owls could potentially utilize the project area as some marginal quality habitat is present.

3.6.2.2.8 Great Gray Owl

This species inhabits mixed coniferous forests usually bordering small openings or meadows. It is generally associated with lodgepole pine, Douglas fir, spruce fir, and aspen forests. Semi-open areas where small rodents are abundant, and that occur near dense coniferous forests for roosting and nesting, are optimum habitat for great gray owls. These owls prefer mature or old growth forests on flat or moderate slopes for nesting and high crown cover for security, using broken top snags, stumps, dwarf-mistletoe platforms, or old hawk and raven nests as nesting structures. Dense stands of smaller diameter trees are also used for roosting by adults and their young. They forage primarily in wet montane meadows and older open forest stands with a high density of pocket gophers and voles (Duncan 1997).

The Teton Raptor Center has records of call responses in Wilson Canyon to the southeast from 2014 and records of two GPS tagged individuals from the winter of 2018 to 2019. (Teton Raptor Center 2015; Teton Raptor Center 2018; Figure 3-5). These individuals were documented using the existing permit boundary area, particularly the forested habitat at the southern end of the existing boundary area. The call responses detected during surveys conducted by the Teton Raptor Center in 2014 indicate breeding activity and nesting in the general area of the detections (Figure 3-5). Two rounds of breeding owl surveys were

conducted in the project area in March and April 2018. No great gray owls were detected during these surveys. However, as documented by the Teton Raptor Center, they do utilize the project area in the winter and breed nearby.

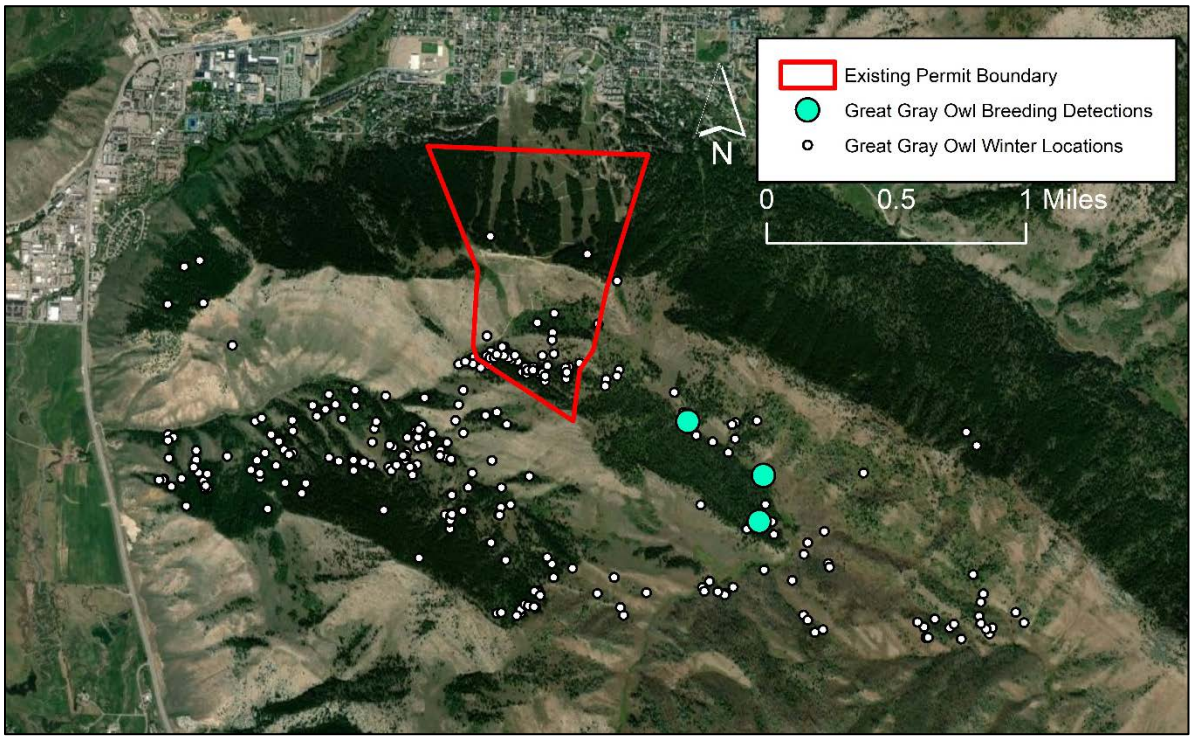

Figure 3-5. GPS location data for two great grey owls in the winter of 2018 and 2019 and breeding detections from 2014 in relation to the existing permit boundary area.

3.6.2.2.9 Northern Goshawk

Average goshawk home range sizes during nesting are 1,400–8,600 acres in North America, depending on sex and habitat characteristics (Squires and Reynolds 1997). Within a home range, northern goshawks typically have three levels of habitat: foraging habitat, a post-fledgling area (PFA), and the core nesting area (Northern Goshawk Working Group 2009).

Foraging Habitat

Foraging habitat for goshawks is poorly understood for North American populations, though they generally forage in diverse habitats ranging from open-sage steppes to dense forests and riparian areas (Squires and Reynolds 1997).

Post-Fledging Area (PFA)

The PFA typically surrounds the nesting stand and serves as the area where fledgling goshawks develop their flying and hunting skills (Squires and Kennedy 2006). The PFA includes forested habitat, small openings, large trees, downed logs, and woody debris (Forest Service 2019c, Reynolds et al. 1992). This area is used by the entire family group and can represent the portion of the territory that is defended from other goshawks within the home range (Forest Service 2019c). Fledgling goshawks generally utilize an area within 200 to 800 meters of a nest for the first 3 weeks after leaving the nest.

After their adult feathers have fully grown in, they utilize a much larger area around the nest, which is considered the PFA (Kennedy et al. 1994). The size of the PFA can vary widely based on local habitat conditions and data collection and analysis methods. In management guidelines, the PFA is often cited as between 300 and 600 acres, with a mean of 420 acres when local movement data is unavailable (Forest

Service 2019c). More accurate PFA sizes can be obtained using location data from fledgling goshawks as they move around the nest area during the post-fledging period (mid-July through August; Northern Goshawk Working Group, McClaren et al. 2005). When fledgling data is unavailable, adult goshawk movement data can be used to estimate the post-fledging area. Generally, female movement data corresponds more closely to fledgling habitat use, as male goshawks utilize larger areas than females and fledgling goshawks (Kennedy et al. 1994).

Core Nesting Area

Goshawks typically nest in mature to old-growth forests composed primarily of large trees with high (60–90 percent) canopy closure (Squires and Reynolds 1997). High canopy closure is one of the most uniform habitat characteristics of goshawk nest stands (Hayward and Escano 1989). The core nesting area of northern goshawks has been reported up to 250 acres in size (Forest Service 2019c), with core nesting areas reported in Wyoming up to 200 acres (Patla 1997, Squires and Ruggiero 1996). The size of the core nesting area varies widely based on local habitat conditions but can generally be defined as an area of high use by the adult goshawks surrounding the nest during the nesting period (March through June, Northern Goshawk Working Group 2009, Forest Service 2019c).

Species Occurrence in the Project Area

Northern goshawks have been documented within and around the project area (Teton Raptor Center 2019a; WNHD 2018). Four rounds of surveys were conducted in the project area in March, April, early June, and late June 2018. Wildlife recording devices were deployed to detect any northern goshawk calls. Once a call was identified, personnel were deployed to try to locate the nest. This survey protocol is considered to be extremely effective in detecting nesting goshawks if they are present (Woodbridge and Hargis 2006). One goshawk call was recorded, but no nest location was found. Using GPS collar data, the Teton Raptor Center located an active nest in 2019 outside of the existing permit boundary (Figure 3-6). This nest was active with three young at the time of the survey. The nest to the east of the 2019 active nest was also active within the last 7 years. Together, these two nests have successfully produced young in 2013, 2015, 2016, 2017, and 2019 (no monitoring was completed in 2018; Teton Raptor Center 2020). Additional alternative nests have also been located in the vicinity (Teton Raptor Center 2019b).

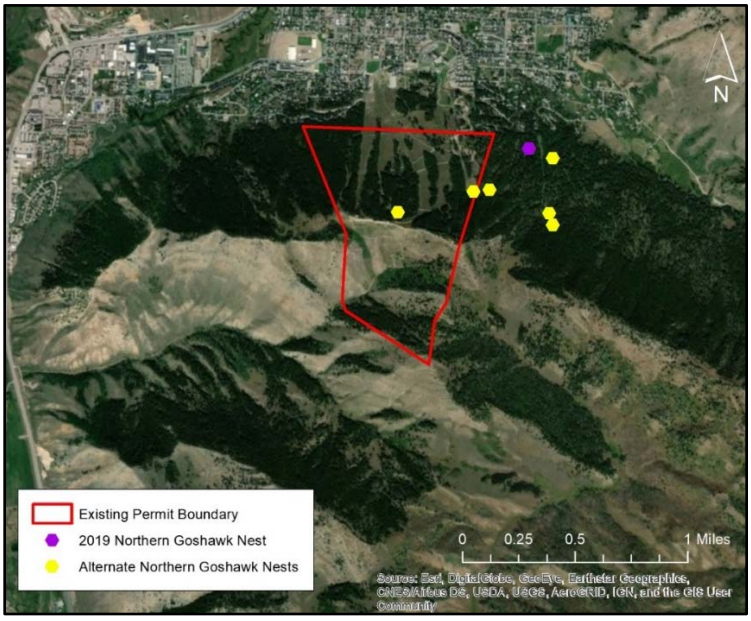

Figure 3-6. Active and alternate northern goshawk nests in relation to the existing permit boundary area.

The Teton Raptor Center captured, and radio-tagged the male goshawk from the 2019 active nest to collect location data. Location data was collected from July 2019 through July 2020 (Figure 3-7). The location data from this time period suggests that the male goshawk frequently uses an area approximately 10 miles by 10 miles, including parts of the Town of Jackson and the existing ski area boundary (Figure 3-7). This entire area would be considered foraging habitat for this goshawk.

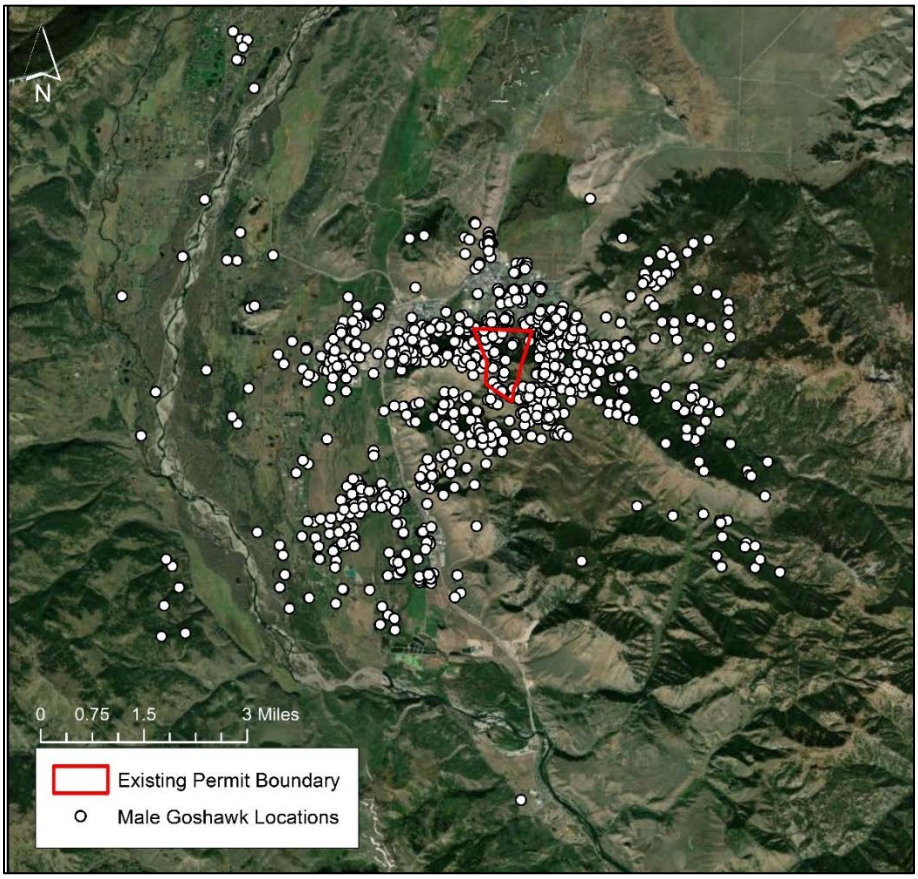

Figure 3-7. Male goshawk foraging habitat use (July 2019 to July 2020) in relation to the existing permit boundary area.

While the PFA is typically defined as 420 acres, it varies greatly by nesting pair depending on local habitat conditions (Forest Service 2019c, Reynolds et al. 1992). Therefore, instead of creating a perfect 420-acre circle around the known active nests, we utilized kernel density maps to determine the area of highest use by the GPS collared male goshawk during the post-fledging period (June 15 through August 31; Northern Goshawk Working Group 2009). While fledgling or female collar data would have provided a more accurate estimate of fledgling habitat use during the post-fledging period, the only data available was from the male goshawk of the nesting pair. Therefore, the male's location data was used. Since male goshawks utilize a larger area during the post-fledging period than the female or fledglings, the estimated PFA from the male goshawk's location data likely overestimates the true fledgling habitat use (Kennedy et al. 2004, McClaren et al. 2005).

A kernel density estimate was completed using the Kernel Density tool in ArcGIS, which creates a utilization distribution raster. This raster was displayed using 5th, 25th, and 95th percentiles to demonstrate northern goshawk use (Figure 3-8). As shown in Figure 3-8, the red area received the highest amount of use. The red area represents the 5 percent of raster cells that contained the most use based on the GPS locations and the kernel density estimator. Accordingly, the orange area represents the 25 percent of raster cells that contained the most use based on the GPS locations and the kernel density estimator, and so forth.

Thus, from these maps, we can determine the areas of highest use that are likely the most important to this pair of nesting goshawks.

The location data shows the male goshawk using a total area of over 12,000 acres, with concentrated use to the east of the existing permit area (Figure 3-8) during the post-fledging period (July 15 through August 31; Northern Goshawk Working Group 2009). While the male goshawk did spend most of its time outside of the existing permit area, it did utilize areas within the permit boundary as well. While there are several disjointed areas that received high use during the post-fledging period, we considered only the orange area that is contiguous around the known active nests as the core PFA (Figure 3-8).

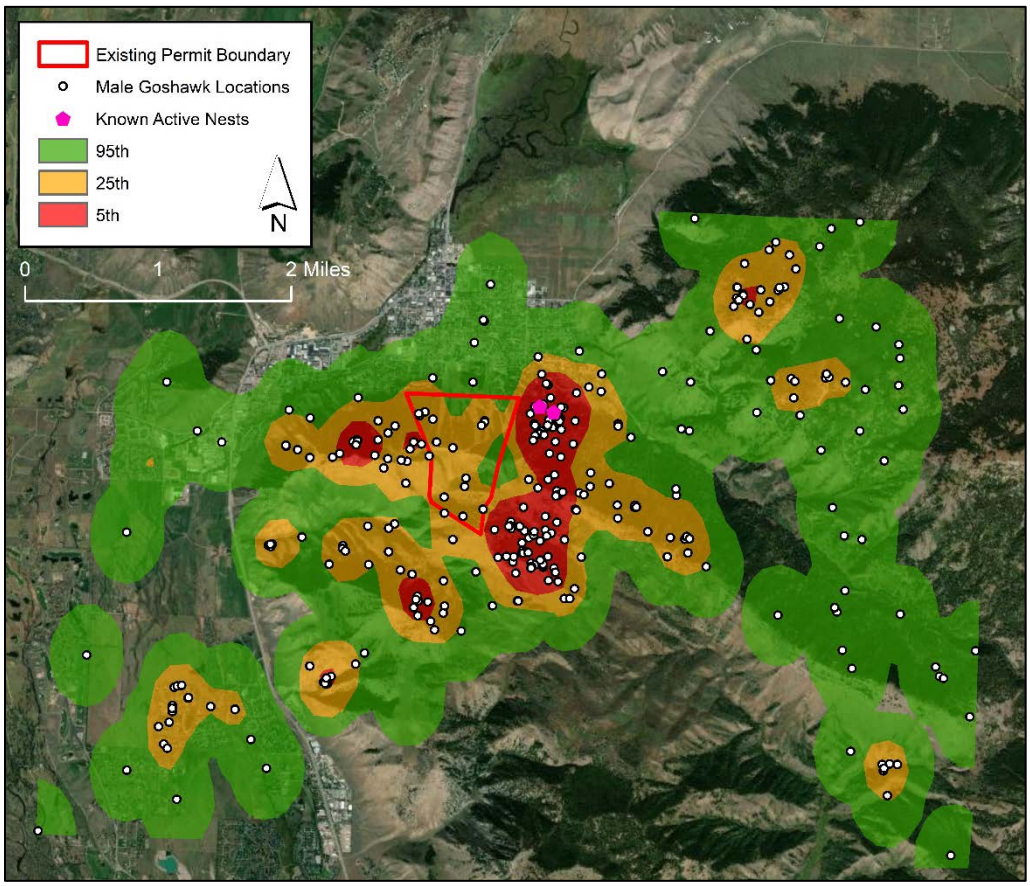

Figure 3-8. Male goshawk post-fledging period (July 15 through August 31, 2019; Northern Goshawk Working Group 2009) habitat use in relation to the existing permit boundary area.

The location data shows the male goshawk using a total area of over 13,000 acres, with concentrated use to the north of the existing permit area during the nesting period (March 1 through June 30; Northern Goshawk Working Group 2009; Figure 3-9). While there are several disjointed areas that received high use during the nesting period, we considered only the orange area that is contiguous around the known active nests as the core nesting area (Figure 3-9). From this data, it appears that the core nesting area is located mostly outside of the existing permit boundary area.

As shown in figures 3-7 through 3-9, the male goshawk appears to be utilizing the existing permit boundary area, despite high levels of recreational activity and disturbance. The Hagen Highway trail crosses within 300 feet of the two active nests and receives an average of 296 users per day (Friends of Pathways 2019b). Despite this high level of disturbance, the breeding pair is averaging 2.3 young per year from 2013 to 2019 (Teton Raptor Center 2020). This suggests that this goshawk pair is much more habituated to disturbance than other goshawks that typically inhabit more remote areas.

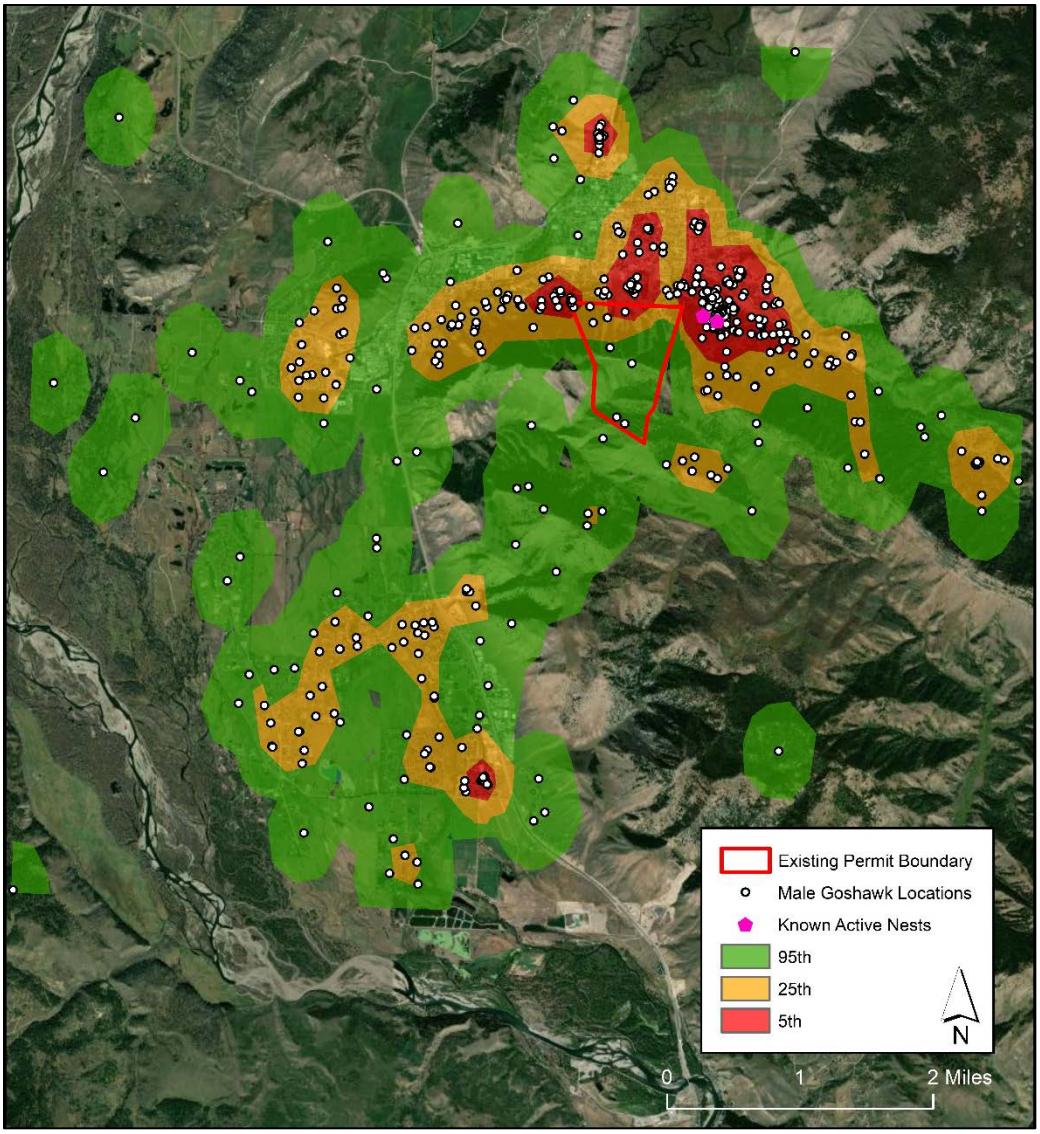

Figure 3-9. Male goshawk nesting period (March 1 through June 30, 2019; Northern Goshawk Working Group 2009) habitat use in relation to the existing permit boundary area.

Conservation Goals

The *Bridger-Teton National Forest Sensitive Species Conservation Assessment for Northern Goshawks* (Goshawk SCA; Forest Service 2019c) provides a list of conservation goals for the northern goshawk. According to the Goshawk SCA, "Potential conservation actions identified in these documents are not intended to be mandatory but may be recommended as design features of alternatives or mitigation measures during project analysis." The goals listed in the Goshawk SCA are as follows:

- Goal 1: Provide suitable nesting, post-fledgling, and foraging habitat within active and inactive (occupied within past 10 years) goshawk home ranges.
- Goal 2: Conserve existing conditions in the core nest areas because desired conditions are assumed present around recently occupied nest areas in each foraging area.
- Goal 3: Provide habitat for hiding/escape cover for goshawk fledglings and goshawk prey, and foraging opportunities for adults and fledglings during the fledgling-dependency period. Maintain

an interspersed mosaic of structural stages, young to old forest, to increase the diversity of habitat for goshawks and their many prey species.

- Goal 4: Where roads and trails pass through active or inactive goshawk nesting areas, maintain security for breeding pairs, nesting, and nestling/fledgling goshawks.

In addition to these goals, regional precedent protects active northern goshawk nests by establishing a 30-acre buffer around any active nests, within which no adverse management activities should occur (Reynolds et al. 1992). However, this goshawk pair nests and forages in an area subject to high levels of disturbance in an area that has been permitted for recreational use. Therefore, this nest is not considered a high priority for protection, as it is not located in an area with large patches of contiguous habitat with little to no existing disturbance.

3.6.2.2.10 Peregrine Falcon

Peregrine falcons occupy a wide range of habitats. They are typically found in open country near rivers, marshes, and coasts. Cliffs are preferred nesting sites, although reintroduced birds now regularly nest on man-made structures such as towers and high-rise buildings. Peregrines may travel more than 15 miles from the nest site to hunt for ducks, shorebirds, or songbirds. However a 5-mile radius around the nest is an average hunting area, with 60 percent of foraging occurring within this distance (White et al. 2002).

Two records for peregrine falcons exists within 2 miles of the study area (WNHD 2018). No surveys for this species were conducted in the project area.

3.6.2.2.11 Three-toed Woodpecker

Three-toed woodpeckers require coniferous forest with snags that are used for nesting and feeding. They are primarily associated with recent coniferous forest burns and bark beetle infestations, foraging on insects in recently dead and dying trees. They excavate a new cavity annually for nesting (Leonard 2001).

No records for three-toed woodpeckers exist within 2 miles of the project area (WNHD 2018). While there has been some beetle kill at Snow King, some of the snags are cut down for skier safety. When compared with the surrounding forest, the snag density at Snow King is very low. No surveys have been conducted for this species in the project area.

3.6.2.3 Migratory Birds

Migratory birds are protected under the Migratory Bird Treaty Act of 1918. Executive Order 13186 details the responsibilities of federal agencies to protect bald and golden eagles and other migratory birds. In December 2008, the Forest Service and the Fish and Wildlife Service signed an MOU to promote the conservation of migratory birds (Forest Service 2008). Pursuant to the Executive Order and the MOU, the Forest Service ensures that environmental analyses of federal actions required by NEPA evaluate the effects of actions and agency plans on migratory birds, with emphasis on: 1) species of management concern along with their priority habitats; and 2) species of conservation concern.

A list of birds of conservation concern is published and maintained by the Fish and Wildlife Service, Division of Migratory Bird Management (FWS 2008). The current list is available at http://www.fws.gov/migratorybirds. The project area is located within the Northern Rockies Bird Conservation Region (BCR 10).

There are a total of 22 Fish and Wildlife Service birds of conservation concern for BCR 10. Three of these species are also Forest Service sensitive species, one is a threatened species under the Endangered Species Act, and one is a Bridger-Teton management indicator species. The Endangered Species Act-listed and Forest Service sensitive species are discussed above. These species are described in Table 3-12.

Table 3-12. Northern Rockies Bird Conservation Region (BCR 10) Birds of Conservation Concern, their habitat, and their presence in the project area.

Species Name	Habitat Description	Known Occurrences in the Project Area	Habitat Present in Project Area
Bald eagle	See sensitive species section.	Yes	Yes
Swainson's hawk (*Buteo swainsoni*)	Most habitats below 9,000 feet with open areas for foraging. Nests in trees, occasionally on cliffs. Feeds mostly on small mammals.	Yes	Yes
Ferruginous hawk (*Buteo regalis*)	Basin prairie shrublands, mountain foothills grasslands, cottonwood-riparian. Nests on rock outcrops, the ground, banks, or in trees. Feeds mostly on small mammals.	No	No
Peregrine falcon	See sensitive species section.	No	Yes
Upland sandpiper (*Bartramia longicauda*)	Eastern great plains grasslands, dry-land grass pastures. Nests in depressions on open ground, usually concealed by grass. Feeds on insects, terrestrial invertebrates, seeds.	No	No
Long-billed curlew (*Numenius americanus*)	Sagebrush-grasslands, meadow grasslands, irrigated meadows. Nests on the ground near water. Feeds on insects, aquatic invertebrates.	Yes	Yes
Yellow-billed cuckoo (*Coccyzus americanus*)	See Table 3-11.	No	No
Flammulated owl	See sensitive species section.	Yes	Yes
Black swift (*Cypseloides niger*)	Small islands of breeding populations in Intermountain West. Nests on ledges or shallow caves in steep rock faces and canyons, usually near or behind waterfalls, and in sea caves.	No	No
Calliope hummingbird (*Selasphorus calliope*)	Coniferous forests, woodland chaparral, mountain-foothills, shrublands, riparian shrub, mountain park-meadows, alpine grasslands. Uses many habitats during migration. Nests on limbs or conifer cones. Feeds on nectar, insects.	No	Yes
Lewis's woodpecker (*Melanerpes lewis*)	Ponderosa pine savannah, pine-juniper, other coniferous forests, aspen, cottonwood-riparian, below 8,500 ft. Nests in cavities in dead or live trees or poles. Feeds on insects, nuts, and berries.	No	Yes
Williamson's sapsucker (*Sphyrapicus thyroideus*)	Coniferous forests, especially those that have burned. Also aspen. Nests in cavities in aspen, pine, or fir. Feeds on insects, tree sap.	No	Yes
White-headed woodpecker (*Picoides albolarvatus*)	Coniferous forests from 4,000 to 9,000 feet. Feeds on insects, conifer seeds. Wyoming is considered out of this species geographical range.	No	No

Table 3-12 (cont'd). Northern Rockies Bird Conservation Region (BCR 10) Birds of Conservation Concern, their habitat, and their presence in the project area.

Species Name	Habitat Description	Known Occurrences in the Project Area	Habitat Present in Project Area
Olive-sided flycatcher (*Contopus cooperi*)	Coniferous forests from 8,000 feet to timberline, aspen-riparian. Nests often high in conifer on horizontal branches. Feeds exclusively on insects that can be caught in the air.	No	Yes
Willow flycatcher (*Empidonax traillii*)	Riparian shrub including willow, hawthorn, water birch, and alder below 9,000 feet. Nests in upright or slanting fork in a shrub. Feeds primarily on insects, occasionally berries.	No	Yes
Loggerhead shrike (*Lanius ludovicianus*)	Pine-juniper, woodland-chaparral, basin-prairie and mountain-foothills shrublands. Nest is usually hidden below the crown in the crotch or on a large branch of a deciduous tree or shrub. Feeds on insects, small vertebrates, carrion.	No	No
Sage thrasher (*Oreoscoptes montanus*)	Basin-prairie and mountain-foothills shrublands. Nest is concealed in or beneath a sagebrush shrub. Feeds on insects, some fruit.	No	Yes
Brewer's sparrow	Associated with sagebrush shrublands. Requires areas of tall, dense sagebrush for nesting.	No	Yes
Sagebrush sparrow (formerly sage sparrow) (*Artemisiospiza nevadensis*)	Basin-prairie and mountain-foothills shrublands. Usually nests in or under sagebrush. Feeds on insects, seeds.	No	Yes
McCown's longspur (*Rhynchophanes mccownii*)	Eastern great plains and great basin foothills, grasslands, basin-prairie shrublands, agricultural areas. Nests on the ground in a shallow, natural or scraped depression. Feeds on seeds, insects.	No	No
Black rosy-finch (*Leucosticte atrata*)	Alpine grasslands, alpine moss-lichen-forb, barren ground, fallow agricultural areas. A variety of habitats during the winter. Nests on the ground or on a cliff. Feeds on seeds, insects.	No	Yes
Cassin's finch (*Haemorhous cassinii*)	Coniferous forests up to timberline, including burns. Lower habitats during the winter, especially urban areas. Nests in conifers; nest is usually placed near the end of a large limb. Feeds on buds, berries, and conifer seeds.	No	Yes

3.6.2.4 Specialized Habitat

3.6.2.4.1 Winter Range

There are two species for which winter range is a concern at Snow King: Rocky Mountain elk, and mule deer, hereafter referred to collectively as big game.

Elk are habitat generalists. During the summer, they spend the majority of their time in montane, subalpine, and alpine habitats. During the winter, elk movements are restricted by forage availability and snow conditions. Elk migrate to lower elevations with shallow snow, and typically inhabit coniferous forests interspersed with riparian areas, as well as south-facing slopes with aspen, sagebrush and other shrubs, and grasslands.

The elk population around Snow King is located along the border of the Fall Creek and Jackson herd units (WGFD 2018b). It is estimated that there are 9,627 elk in the Jackson population. The population objective is 11,000 +/- 20 percent. This population is meeting objectives and has remained fairly stable in the last 6 years. It is estimated there are 4,090 elk in the Fall Creek population. The population objective is 4,400 +/- 20 percent. This population is meeting objectives.

Mule deer are also habitat generalists. They are often associated with early-successional vegetation and use sagebrush grasslands, mixed-mountain shrublands, quaking aspen forests, various types of conifer forests, and recent burns. Mule deer in mountainous regions migrate to lower elevations when winter snowpack is deep. Mule deer occur at lower elevations in the project area on a yearlong basis. The mule deer population around Snow King is a part is of the Sublette herd (WGFD 2018c). It is estimated that there are 19,838 mule deer in this population. The population objective is 32,000 +/- 20 percent. This population is below objectives, and no clear trend is apparent as the population has been fluctuating for the last 6 years.

Big game species are forced into lower elevations and smaller ranges during the winter months when forage availability is reduced (Sawyer et al. 2006, Mule Deer Working Group 2018). Mortality associated with severe weather conditions on winter ranges often drives the annual population cycles of big game (WGFD 2011). Displacement from optimal winter range due to disturbance can result in individuals utilizing sub-optimal habitat, which may increase mortality rates (Sawyer et al. 2006). Thus, winter range can act as a limiting resource for big game and as an important driver of local populations.

Certain areas are designated as crucial range by the Wyoming Game and Fish Department for the important role these areas play in providing functioning habitat within a herd unit (WGFD 2019a). Approximately 32 acres of crucial elk winter range overlaps with the existing permit boundary (Figure 3-10). This habitat is in the northeast corner of the existing boundary, which is highly disturbed due to current ski area operations. This area is not often utilized by elk due to the high levels of disturbance. Non-crucial elk winter range has been delineated in close proximity to the back side of the permit area (Figure 3-10).

Mule deer do not have any crucial range within the existing permit boundary. However, crucial winter-yearlong range is located within close proximity to the back side of the permit boundary (Figure 3-11).

Big game species typically retreat from high levels of disturbance, creating a “zone of influence” around the footprint of a given disturbance (Gaines et al. 2003). The distance that big game retreat from a given disturbance varies based on season, sex, and type of disturbance (Montgomery et al. 2013, Lyon 1979). While Morrison et al. (1995) evaluated the impacts of ski resorts on elk, this study focused on summer range and low-impact recreation use. However, Lyon (1985) noted that elk typically retreated the minimum distance required to no longer be in direct line-of-sight of a given disturbance.

To determine the area from which big game would likely be displaced due to disturbance from the proposed activities on the back side of Snow King, we utilized a viewshed analysis to identify the zone of influence. Back-side activities were the focus of this analysis since that is the portion of the existing permit boundary that does not currently have any development, and it is also the area biologists from the Wyoming Game and Fish Department expressed concern over. For this analysis, we assumed mule deer, like elk, would retreat the minimum distance required to no longer be in direct line-of-sight of a given disturbance.

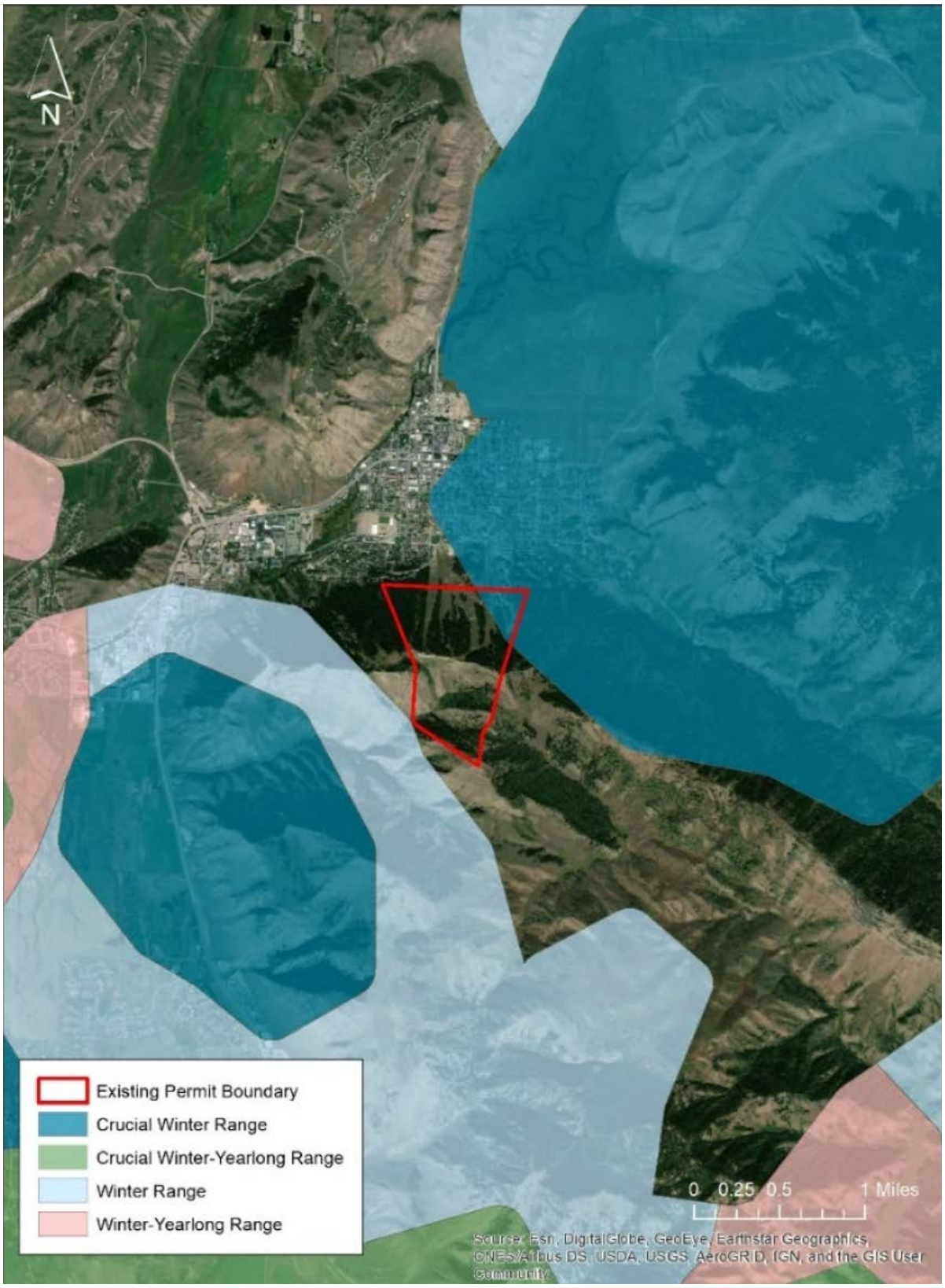

Figure 3-10. Elk winter range in relation to the existing permit boundary (habitat mapping WGFD 2019a).

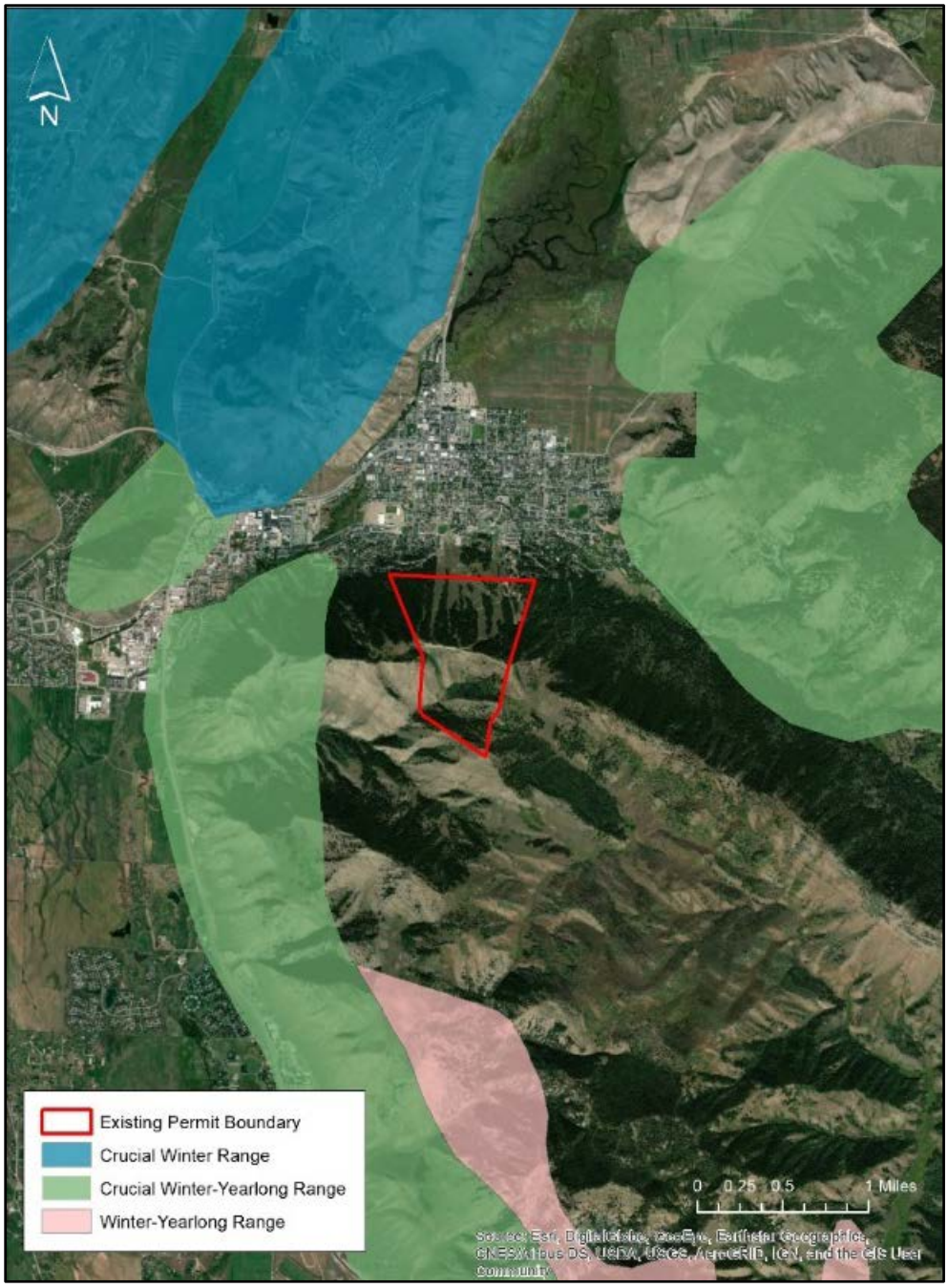

Figure 3-11. Mule deer winter range in relation to the existing permit boundary (habitat mapping WGFD 2019a).

To complete this analysis, we assumed that elk and mule deer would move to avoid a visual disturbance within 2 kilometers (Edge 1982). We then projected a 2-kilometer radius around the proposed Lift A, the central feature of proposed back-side development. We then ran the viewshed model to eliminate areas within the 2-kilometer radius that would be visually blocked from Lift A by intervening terrain. The remaining space within the radius was defined as the area within which elk and mule deer could be displaced by human activity, moving to areas where the activity was no longer visible. The maps generated by this viewshed analysis were then overlaid on winter range maps to determine the amount of winter range that would be affected.

GPS collar data from 11 elk in 2019 (WGFD 2019b) indicates that elk use of the project area is low compared to the surrounding landscape (Figure 3-12).

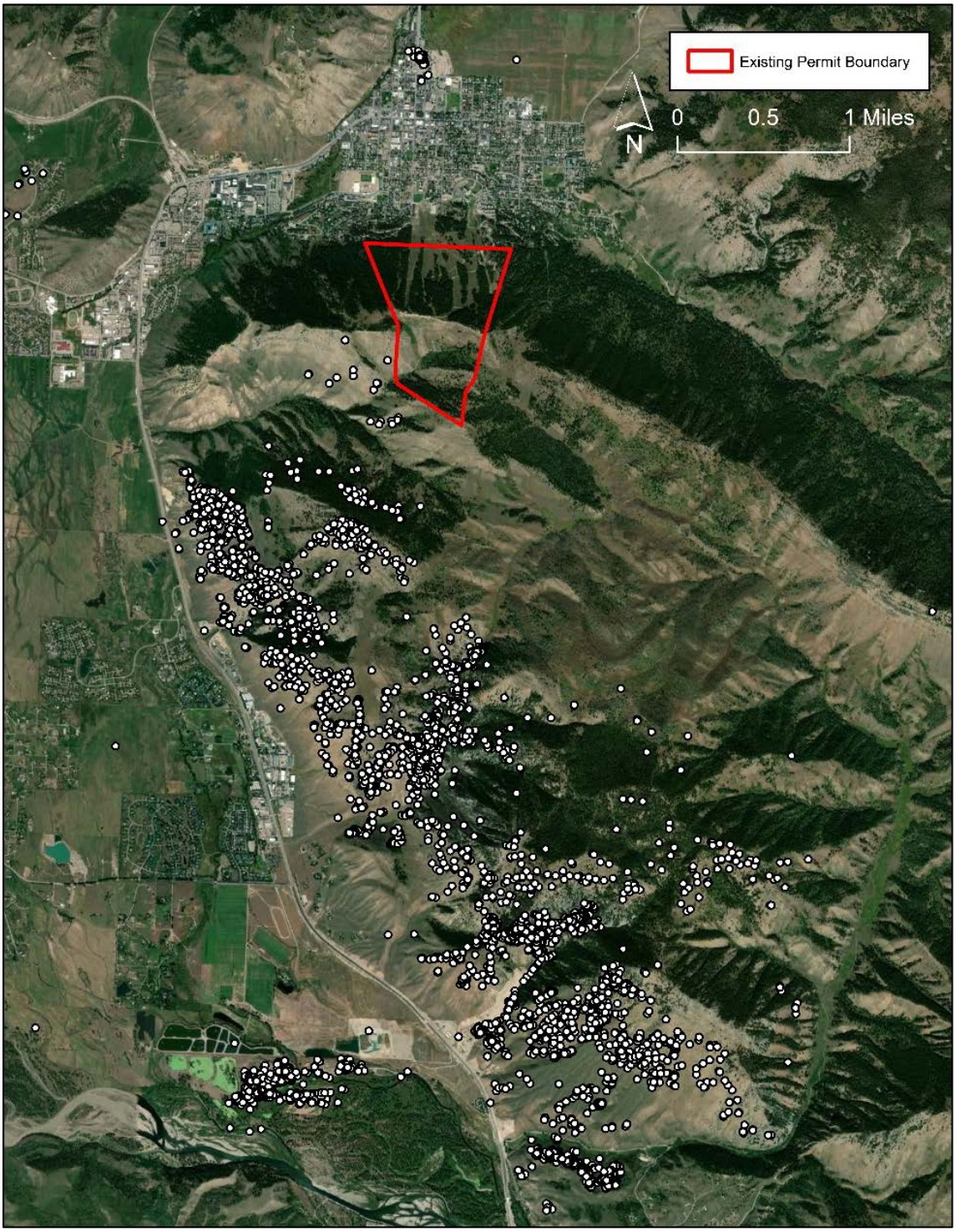

Figure 3-12. Elk use near Snow King, January through June, 2019 (WGFD 2019b), in relation to the existing permit area.

Data from the Teton Science center for mule deer indicates that the existing permit boundary area is not an area of high use during the winter (Figure 3-13).

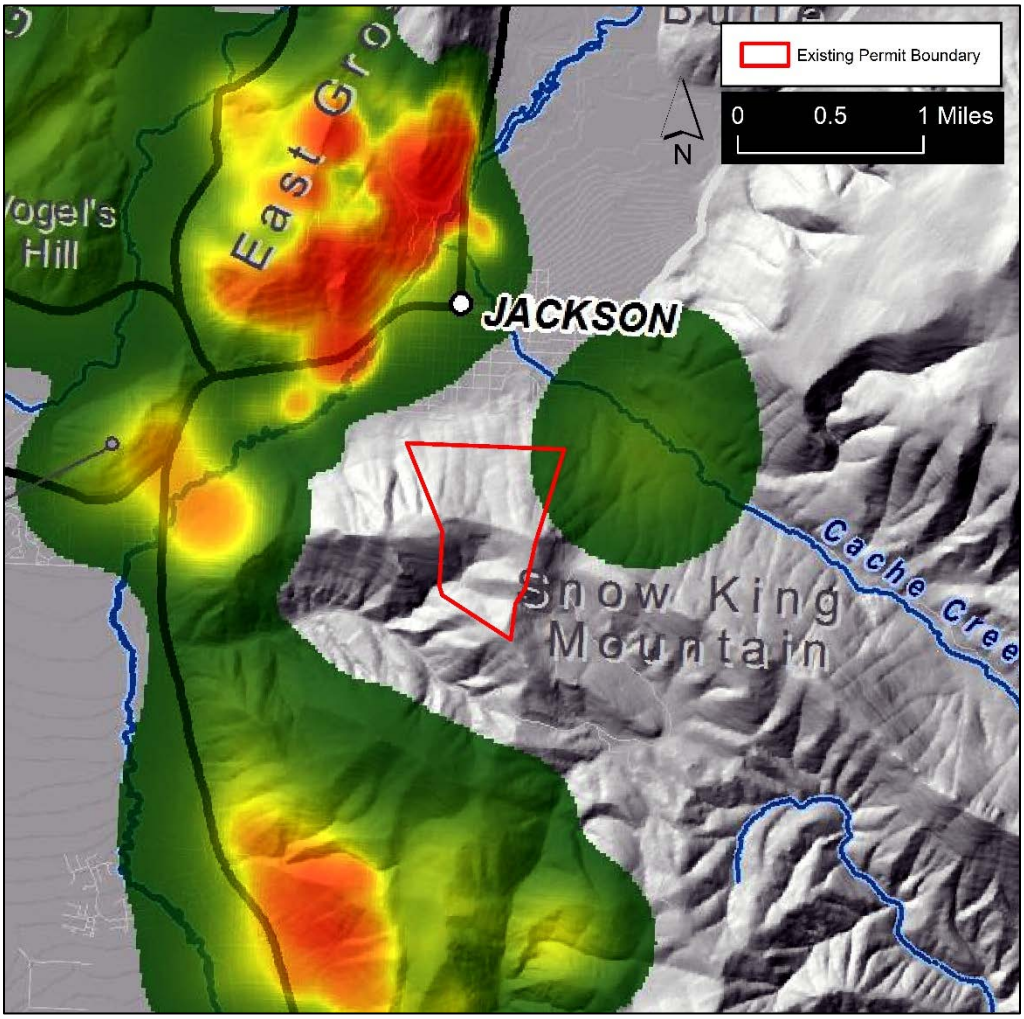

Figure 3-13. Winter use by mule deer indicating high areas of use in red and lower areas of use in green (Teton Science School 2013) in relation to the proposed boundary under Alternative 2.

3.6.2.4.2 Parturition Areas

In early spring, female elk move to parturition areas several days prior to giving birth. They remain in these areas, separated from the main herd, for several days to several weeks. Parturition areas are selected for their nutritional value, often along receding snow lines. Given sufficient nutritional potential, parturition areas can be in open grasslands, shrublands, or forested habitat. Often, females return to the same parturition areas each year (Innes 2011).

Human disturbance in parturition habitat during the calving season can reduce calf survival (Phillips and Alldredge 2000). However, removal of disturbance during calving season within parturition areas can return productivity to pre-disturbance levels (Shively et al. 2005).

There are no habitats designated as elk parturition areas by Wyoming Game and Fish Department within or near the permit boundary (WGFD 2018d; Figure 3-14). However, anecdotal evidence based on personal experience of some Wyoming Game and Fish Department biologists suggests there may be some calving habitat in and near the permit boundary, including around the Game Creek saddle and Leeks Canyon.

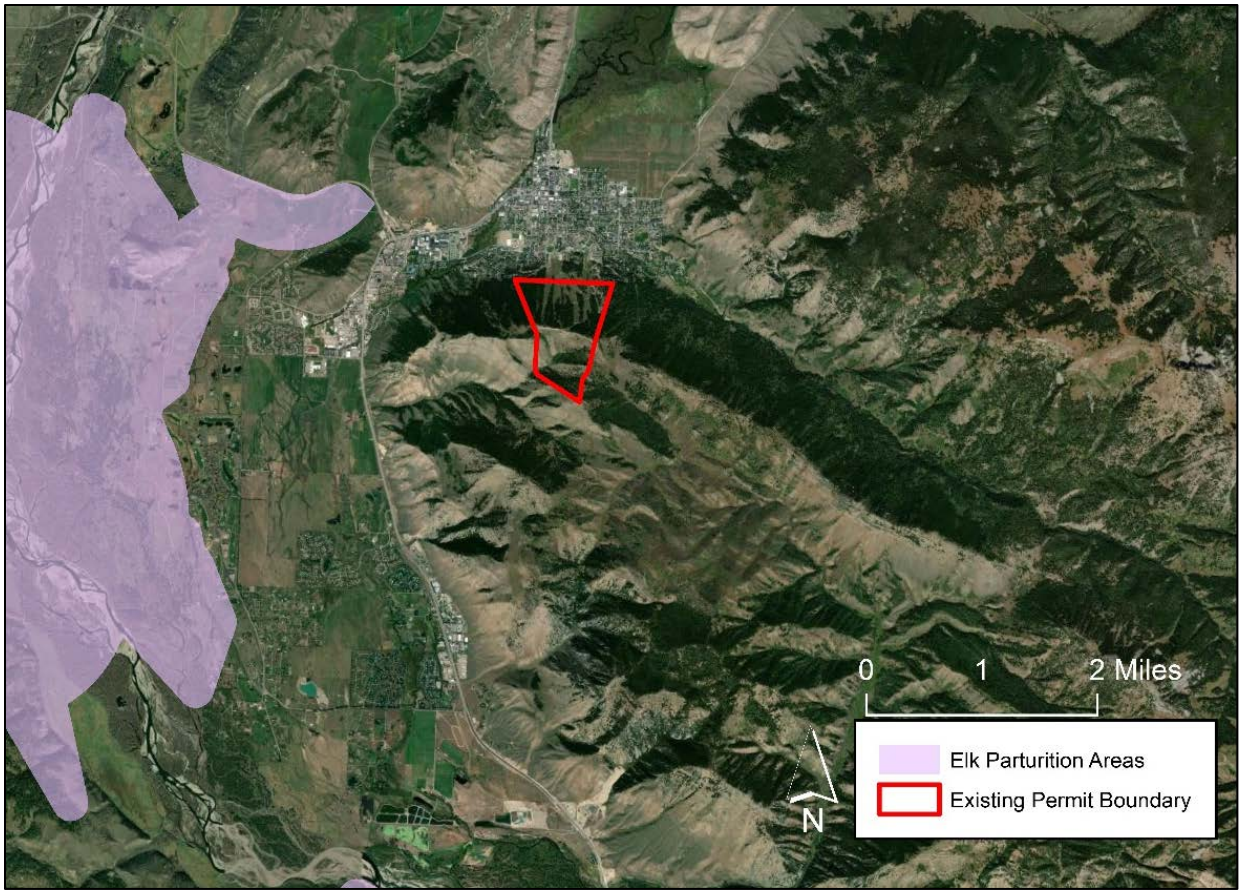

Figure 3-14. Elk parturition areas in relation to the existing permit boundary (habitat mapping WGFD 2018d).

3.6.2.4.3 Migration Routes

Elk, mule deer, bighorn sheep and moose (*Alces alces*) all rely on migration routes to move among their seasonal habitats. Some of these routes have been in use for thousands of years (Miller and Sanders 2000). Maintaining migration routes, and especially bottle necks within these routes (Sawyer et al. 2005), is of great importance to maintaining viable populations of each of the four species. There is no crucial habitat for moose or bighorn sheep near the project area, nor are there any mapped migration routes for moose or bighorn sheep near the existing permit boundary area (WGFD 2018d). The nearest known migration route for bighorn sheep is approximately 12 miles to the northeast, and for moose approximately 4 miles to the west.

Elk have the nearest known migration route, with one route extending north to south approximately 0.6 miles west of the existing permit boundary (WGFD 2018d; Figure 3-15). This route crosses multiple ridges to the south of the project area and continues north through the west end of Jackson.

For mule deer, known migration routes are located to the east of the existing permit boundary area (WGFD 2018d; Figure 3-16). The nearest mule deer migration route is approximately 2 miles to the east of the project area, in the valley along Cache Creek and Cache Creek Drive. A second migration route is approximately 3 miles to the southeast and extends across multiple ridges.

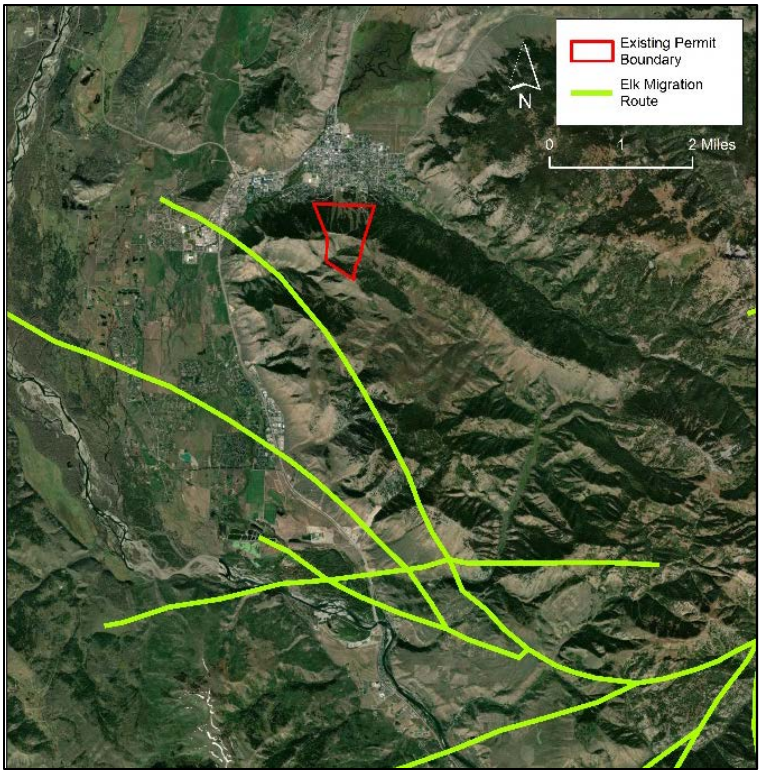

Figure 3-15. Elk migration route in relation to the existing permit boundary.

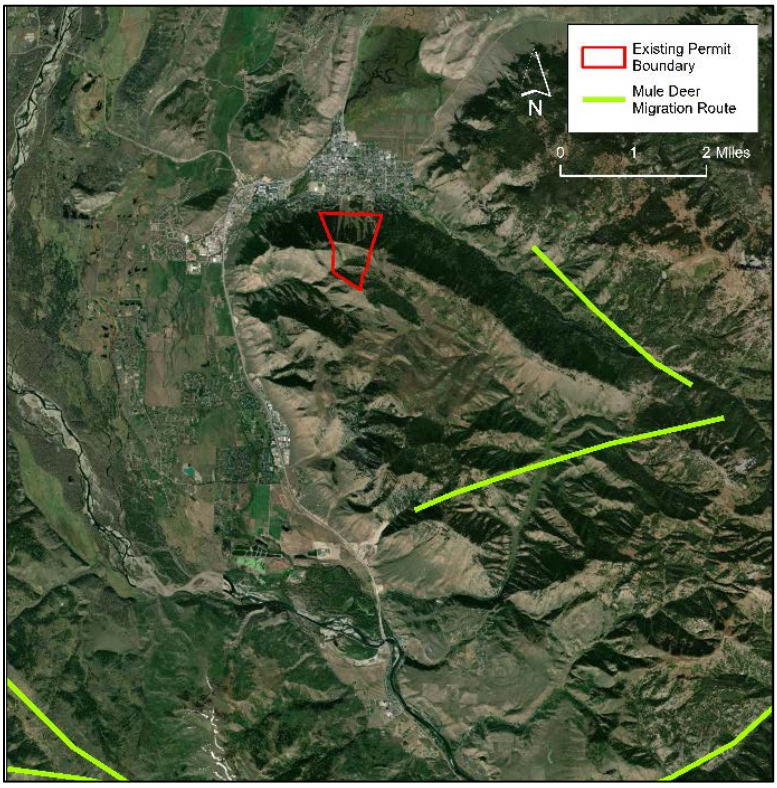

Figure 3-16. Mule deer migration route in relation to the existing permit boundary.

3.6.2.5 Disturbance

During the winter, the existing permit boundary area is used by recreationists for skiing, snowboarding, and snowshoeing. At present, winter recreationists often utilize out-of-bounds areas, particularly to the east and west of the existing permit boundary. Human-use disturbance in the winter is thus concentrated within the existing permit boundary but also extends outside of the boundary into the surrounding area.

During the summer, the existing permit boundary area has resort infrastructure such as the mountain coaster, alpine slide, and a ropes course accessed from the Rafferty lift mid-station, as well as numerous formal and user-created hiking and biking trails (see section 3.10.2.3). While hikers do access the back side of the mountain within the permit boundary area, recreational use of this area is generally low. The surrounding area outside of the permit boundary also has numerous hiking and biking trails, particularly to the east (see section 3.10.2.3). Human-use disturbance in the summer is thus less concentrated within the existing permit boundary and also extends into the surrounding area.

In addition to daytime use of the area by winter and summer recreationists, grooming and snowmaking during the winter season creates disturbance during the night. Grooming is done with large snowcats, and generally takes place from the time the lifts close to approximately midnight. Snowmaking takes place in the late-fall and early-winter whenever temperatures are appropriate for snowmaking activities and natural snowfall is insufficient. Often snowmaking activities take place at night. At present, there is little night-time disturbance during the summer recreational season.

Often, noise from recreational use is considered a disturbance to wildlife. Wildlife can have a range of reactions to noise in the environment. In general, there are three types of response to noise, and each can have negative or positive effects (Knight and Gutzwiller 1995).

The first response is attraction. Attraction can happen when noise leads to a positive reward, such as food. This type of response is often considered the most dangerous, both for wildlife and humans. The second response is tolerance. Tolerance can happen when noise occurs often enough without negative consequences, leading to a gradual habituation of the noise. The third response is avoidance. Avoidance can happen when wildlife cannot tolerate the level of noise and choose to leave the area. This can lead to long-term changes in habitat use and the loss of suitable habitat (Knight and Gutzwiller 1995).

Positive effects on wildlife from noise generally occur when an animal is attracted-to or tolerant of noise. Positive effects include increased food availability and lowered predation risk for individuals willing to utilize habitat closer to noise compared to other less-tolerant competitors or predators.

Negative effects on wildlife from noise are often-times difficult to detect or quantify. Sudden, unexpected noise can lead to wildlife fleeing the area. These panicked flights are often high-energy and short in duration. Noise that becomes constant or predictable is often met with gradual tolerance and habituation as time goes on. However, despite the appearance of noise toleration, the presence of the noise can increase stress, reduce overall fitness, lead to changes in aural communication, and/or change habitat use. Finally, some long-term noise can lead to wildlife being permanently displaced from an area (Knight and Gutzwiller 1995).

Human-generated noise at Snow King includes movement noise such as walking and skiing, vocal noise such as talking and yelling, snowmaking, grooming, explosive avalanche control, and mechanical noises from summer activities. Details regarding the decibel levels for some of these activities are noted in section 3.9, which analyzes impacts of noise on the surrounding landscape. While some of the noise at Snow King is constant and predictable due to consistent operating hours, other noises are less predictable and vary by hour and season.

As discussed in section 3.9, snowmaking generally begins the first week of November at lower elevations and ends in early January. Its duration varies by season, with snowier winters requiring less snowmaking than drier winters. Noise from snowmaking machines operate at a continuous level while in use.

Grooming takes place during the ski season to maintain and improve ski runs. This activity generally takes place from the time the lifts close to approximately midnight. Since the grooming vehicles are moving, the noise they generate is constantly shifting across the landscape.

Explosive avalanche control typically takes place 5 days a year (Stanley 2019a) with approximately 15 5-pound hand charges detonated in the early morning. Due to their infrequent use and sudden, high-level of noise, this likely elicits a flight response from most wildlife in the immediate area.

Recreational noise is present at any time the mountain resort is in use. The sounds made by movement of people or from talking and yelling while recreating vary in level throughout the day and season. The alpine slide, when in use, creates a hissing noise and a clacking sound as the sleds hit the joints in the track. The mountain coaster also produces mechanical noise while operating. This noise is only present during the summer season.

Given how long the ski resort has been in operation, and the general lack of reward for approaching noise sources, wildlife in the area have either habituated to the noise and continue to use the area (tolerance) or changed their patterns of habitat use and no longer use the area (avoidance).

3.6.3 DIRECT AND INDIRECT EFFECTS

3.6.3.1 Alternative 1

3.6.3.1.1 Threatened and Endangered Species

Canada Lynx

Habitat Linkage and Movement

Regional habitat connectivity for lynx would not be impacted by Alternative 1 as no barriers to lynx travel would be created (ALL O1, ALL S1, HU O2, HU O4, HU G3; see section 3.6.2.1.1). Habitat in the project area is currently highly fragmented as a result of past ski area development and operations as well as high levels of development and activity in and around Jackson. Alternative 1 would not create any additional fragmentation or result in barriers to lynx travel.

Habitat Quality and Effectiveness

Alternative 1 would maintain lynx habitat quality and effectiveness at current levels (HU O1, HU O3, HU G1, HU G2, and HU G10; see section 3.6.2.1.1). Ski area activities would remain in the existing developed area. The patches of forest located among the existing ski areas could provide potential hunting opportunities and facilitate movement through Snow King. However, given the high levels of disturbance and recreation in the area and the proximity of Jackson, it is unlikely lynx would choose to occupy the project area.

For the reasons discussed above, Alternative 1 is consistent with the cited objectives, standards, and guidelines. Therefore, Alternative 1 is anticipated to have no impact on the Canada lynx.

Grizzly Bear

Alternative 1 is anticipated to have no impact on grizzly bears since human disturbance in the area would remain at present levels, which likely discourages use of the project area. This alternative is consistent with the standards for managing grizzly bear/human interaction and grizzly bear habitat in the Forest Plan. This includes the use of bear-proof garbage containers and regular collections from these containers.

3.6.3.1.2 Forest Service Sensitive Species

Alternative 1 is anticipated to have no impact on any Forest Service sensitive species, as there would be no change in the existing levels of human disturbance or habitat availability.

3.6.3.1.3 Migratory Birds

Alternative 1 is anticipated to have no impact on migratory birds, as foraging and nesting habitat would remain at its current availability.

3.6.3.1.4 Specialized Habitat

Alternative 1 is anticipated to have no impact on specialized habitat. No additional habitat would be impacted, and there would be no changes in disturbance within and around the permit boundary area. Any avoidance of the ski area by elk or mule deer that currently occurs would continue.

3.6.3.1.5 Disturbance

Alternative 1 is anticipated to have no impact on wildlife disturbance. There would be no changes in resort use within and around the permit boundary area. Any wildlife in the area would continue tolerate or avoid any recreational or noise disturbance in the area.

Alternative 2

In order to provide a clear contrast between Alternative 2 and Alternative 1, the following discussion focuses on how the impacts of Alternative 2 would differ from Alternative 1, described above.

3.6.3.2.1 Threatened and Endangered Species

Canada Lynx

Alternative 2 has the potential to negatively impact Canada lynx through the removal of forested habitat (and thus change prey abundance and distribution), and disturbance from recreational activities. The proposed boundary adjustment overlaps with the Flat Creek LAU, suitable habitat, and designated critical habitat (Figures 3-17 and 3-18). Approximately 133 acres would be disturbed for the construction and maintenance of the elements proposed under this alternative, 122 of which are considered suitable habitat for lynx.

As noted above in section 3.6.2.1, the Northern Rockies Lynx Management Direction provides guidance for management of lynx habitat to address the risks posed by ski areas. Compliance under Alternative 2 is discussed below.

Habitat Linkage and Movement

With the inclusion of design criteria, Alternative 2 would be compliant with all of the objectives, standards, and guidelines found in the Northern Rockies Lynx Management Direction regarding habitat linkage and movement (ALL O1, ALL S1, HU O2, and HU G3, and HU O4). The relevant objectives, standards, and guidelines are listed below with the rationale for project compliance.

- Objective ALL O1: Maintain or restore lynx habitat connectivity in and between LAUs and/or linkage areas.
- Standard ALL S1: New or expanded permanent development and vegetation management projects must maintain habitat connectivity in LAU and/or linkage area.

Regional habitat connectivity and connectivity within the LAU for lynx would not be impacted by Alternative 2 as no barriers to lynx travel would be created, and the project area does not fall within a linkage area.

- Objective HU O4: Provide for lynx habitat needs and connectivity when developing new or expanding existing developed recreation sites or ski areas.

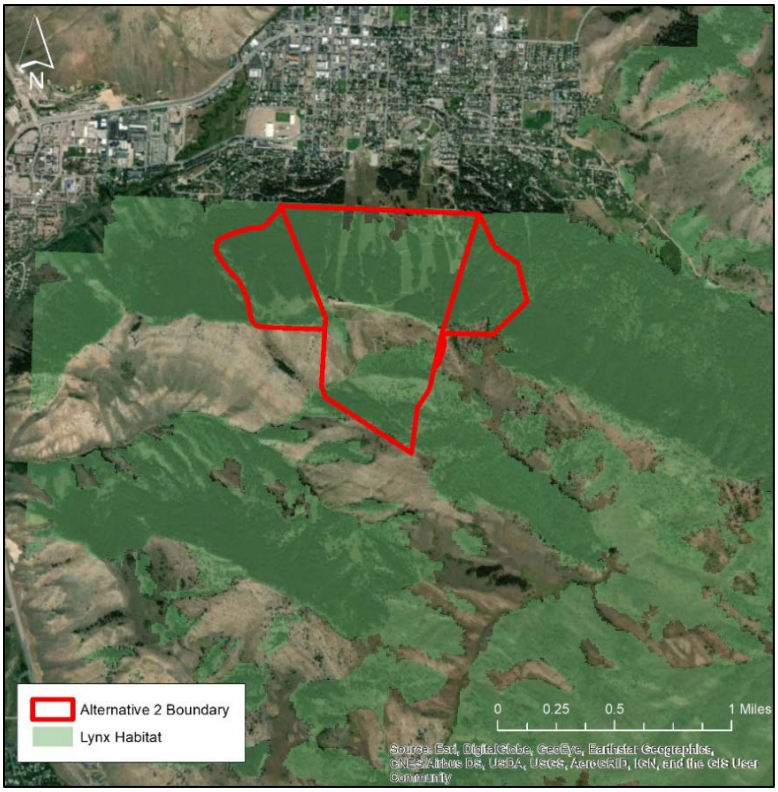

Figure 3-17. Suitable lynx habitat in relation to the Alternative 2 boundary area.

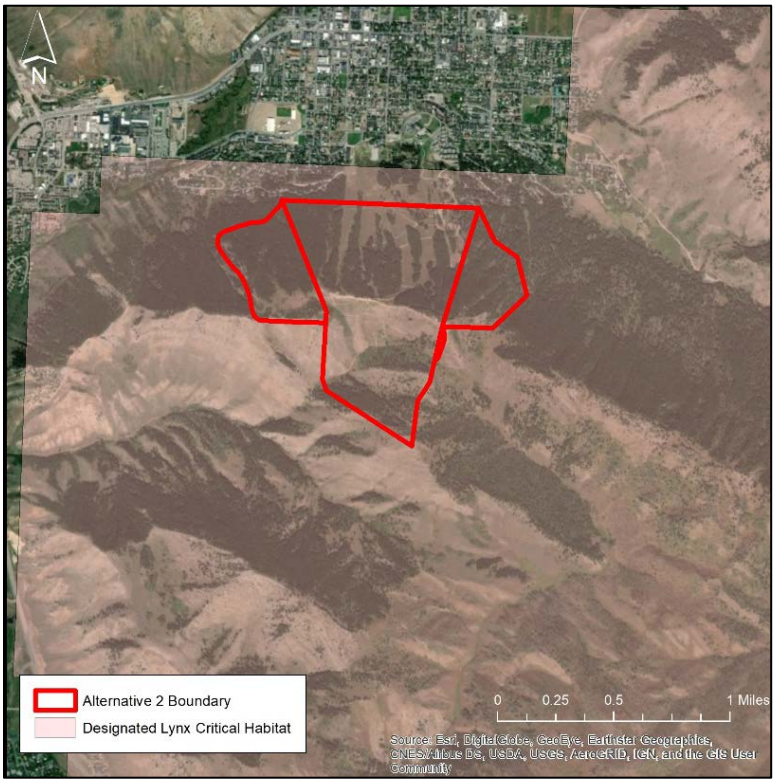

Figure 3-18. Designated lynx critical habitat in relation to the Alternative 2 boundary area.

As described in Chapter 2, Alternative 2 would not comply with HU O4 (see section 3.6.2.1) because glading between ski runs in the eastern boundary adjustment area (runs 4, 5, and 7) would reduce the habitat quality in those forested islands, potentially impacting connectivity in an expansion of an existing ski area. In order to comply with this objective, a design criterion was added that eliminates glading in the forested areas between runs in the eastern expansion area (see section 3.6.5). With this design criterion in place, the existing ski area and proposed boundary adjustments would maintain islands of forested habitat (e.g., between Bearcat and run 15; between runs 1, 2, and 3; and between runs 4, 5, and 7) that may facilitate movement through the project area.

- Objective HU O2: Manage recreational activities to maintain lynx habitat and connectivity.
- Guideline HU G3: Recreation development and operations should be planned in ways that both provide for lynx movement and maintain the effectiveness of lynx habitat.

Habitat in the project area is currently highly fragmented as a result of past ski area development and operations. While most of the proposed disturbance under Alternative 2 would be located within the existing ski area boundary, the proposed boundary adjustments would increase the level of fragmentation adjacent to current ski area operations. As described under HU O4, a design criterion was added that eliminates glading in the forested areas between runs in the eastern expansion area (see section 3.6.5). With this design criterion in place, the existing ski area and proposed boundary adjustments would maintain islands of forested habitat (e.g., between Bearcat and run 15; between runs 1, 2, and 3; and between runs 4, 5, and 7) that may facilitate movement through the project area. Given sufficient hiding cover interspersed with openings, lynx have been documented crossing ski trails and roads in other areas (Ruediger et al. 2013).

Therefore, with the inclusion of design criterion 5, Alternative 2 is compliant with all of the objectives, standards and guidelines regarding habitat linkage and movement.

Habitat Quality and Effectiveness

Alternative 2 would be compliant with all of the objectives, standards, and guidelines found in the Northern Rockies Lynx Management Direction regarding habitat quality and effectiveness (HU O1, HU O3, HU G1, HU G2, and HU G10). Alternative 2 would impact approximately 122 acres of suitable lynx habitat, representing 25 percent of suitable habitat within the adjusted boundary, and less than 0.1 percent of the suitable lynx habitat within the Flat Creek LAU (Table 3-13).

- Objective HU O1: Maintain the lynx's natural competitive advantage over other predators in deep snow, by discouraging the expansion of snow-compacting activities in lynx habitat.

The additional recreational opportunities proposed under Alternative 2 may further expand the range of competitors into suitable Canada lynx habitat. Under current operating conditions, the many skiers that travel out-of-bounds create compacted snow routes that currently allow lynx competitors to access areas within the proposed permit boundary that might not have otherwise been accessible due to deeper snow. This out-of-bounds use may extend further to the east under this alternative, but it cannot extend to the west, due to existing winter recreation closures in this area.

- Objective HU O3: Concentrate activities in existing developed areas, rather than developing new areas in lynx habitat.

While the proposed boundary adjustments would increase the level of fragmentation adjacent to current ski area operations, most of the proposed disturbance under Alternative 2 would be located within the existing ski area boundary.

- Guideline HU G1: When developing or expanding ski areas, provisions should be made for adequately sized inter-trail islands that include coarse woody debris, so winter snowshoe hare habitat is maintained.

- Guideline HU G2: When developing or expanding ski areas, lynx foraging habitat should be provided consistent with the ski area's operational needs, especially where lynx habitat occurs as narrow bands of coniferous forest across mountain slopes.

As described under HU O4, a design criterion was added that eliminates glading in the forested areas between runs in the eastern expansion area (see section 3.6.5). With this design criterion in place, the existing ski area and proposed boundary adjustments would maintain islands of forested habitat (e.g., between Bearcat and run 15; between runs 1, 2, and 3; and between runs 4, 5, and 7) that may provide foraging habitat within the project area.

- Guideline HU G10: When developing or expanding ski areas and trails, consider locating access roads and lift termini to maintain and provide lynx security habitat, if it has been identified as a need.

Ample security habitat is available outside of the adjusted permit area boundary to provide refuge for lynx during the daylight hours when peak recreational activity occurs.

Therefore, with the inclusion of design criterion 5, Alternative 2 would be compliant with the objectives, standards, and guidelines found in the Northern Rockies Lynx Management Direction regarding habitat quality and effectiveness.

Critical Habitat

The adjusted boundary overlaps designated lynx critical habitat (Table 3-13). Approximately 133 acres of critical habitat would be disturbed, representing less than 0.01 percent of the approximately 6 million acres of continuous designated critical habitat in the southwestern Montana and western Wyoming critical habitat area.

Table 3-13. Total acres of lynx habitat disturbance under Alternative 2.

Habitat Type	Acres
Suitable Habitat	122
Critical Habitat	133

Expanded Lighting Area

Snow King currently provides night skiing on the front side of the mountain until 9 PM. Alternative 2 would extend the lighted area on the front side, as well as the ridgetop teaching center on Snow King Mountain and the summit access road/novice skiway. The operating hours would not change, and there would be no night skiing on the back side of the mountain. Therefore, it is unlikely the expanded lighting area would impact Canada lynx, as lynx are generally active at night and have been documented using ski areas when no skiers are present (Ruediger et al. 2000). However, the expanded grooming, snowmaking operations, and yurt camp proposed under Alternative 2 would increase the total area of night-time disturbance compared to existing conditions. Section 3.6.3.2.5 outlines the types of disturbance and noise that would increase under Alternative 2.

On the basis of this analysis, Alternative 2 is consistent with the objectives, standards, and guidelines found in the Northern Rockies Lynx Management Direction. In accordance with the *Canada Lynx Conservation Agreement* between the Forest Service and the Fish and Wildlife Service, suitable lynx habitat on the Bridger-Teton must be considered "occupied." Under this alternative, suitable habitat would be impacted. Therefore, Alternative 2 may impact the Canada lynx but is consistent with the Northern Rockies Lynx Management Direction and its amendment to the Forest Plan.

Grizzly Bear

The project area occurs in occupied grizzly bear range and in biologically suitable habitat identified by the Fish and Wildlife Service. However, the project area is not in the Primary Conservation Area. The potential for conflicts with grizzly bears would be reduced because Bridger-Teton food storage regulations (in effect March 1 to December 1) would be enforced during construction and subsequent recreational use. Human activity generally keeps this species at a safe distance should bears be present during project implementation. Any displacement due to construction would be short-term and would not measurably impact individual fitness. Ungulates that serve as prey and a source of carrion would continue to occur in the project area. Section 3.6.3.2.5 outlines the types of disturbance and noise that would increase under Alternative 2.

For these reasons, Alternative 2 is anticipated to have no impact on the grizzly bear and therefore is consistent with the Forest Plan goal of contributing to the recovery of the species. This alternative is consistent with the standards for grizzly bear/human management and grizzly bear habitat management in the Forest Plan.

Wolverine

Wolverines may be present in the habitat surrounding the project area as part of a larger home range. Areas with high levels of recreational activity are generally avoided by wolverines (Heinemeyer and Squires 2014), so it is unlikely that Snow King is frequently utilized. Section 3.6.3.2.5 outlines the types of disturbance and noise that would increase under Alternative 2. Additionally, the elevation of Snow King (7,808 feet at the highest point) is likely too low for wolverines at this latitude.

Wolverines use a variety of habitats for foraging, including openings where ungulates and carrion may be available. Openings do not limit movement or dispersal of wolverines through a landscape. The reduction in forested habitat and increase in openings would not negatively impact wolverines. Based on this analysis, Alternative 2 is anticipated to have no effect on wolverines.

3.6.3.2.2 Forest Service Sensitive Species

Bighorn Sheep

Rock and cliff habitat are available within the eastern permit boundary adjustment area on the north facing slopes. Data from the Wyoming Game and Fish Department Wildlife Observation System (1996–2018) indicates that the area within the adjusted permit boundary is not an important area of use for bighorn sheep, despite records of occasional use.

While local displacement from the area is possible due to disturbance from expanded recreation, there is an abundance of suitable habitat in the surrounding landscape. Section 3.6.3.2.5 outlines the types of disturbance and noise that would increase under Alternative 2. Given the relatively low level of habitat loss and low levels of bighorn sheep use in the project area, the habitat impacts described may impact individuals but is not likely to result in a measurable impact on bighorn sheep population numbers.

Fisher

Table 3-14 shows the amount of forest disturbance under Alternative 2. This alternative would shift the permit boundary to include forested habitat that may provide foraging, denning, and resting habitat for fishers. Habitat in the permit area is currently highly fragmented as a result of past ski area development and operations. Most of the proposed development is within this highly disturbed area, but the permit boundary adjustments would increase the level of fragmentation adjacent to current ski area operations. Section 3.6.3.2.5 outlines the types of disturbance and noise that would increase under Alternative 2.

The existing permit area and proposed boundary adjustments would maintain small islands of forested habitat that may provide for movement through the project area. However, the reduction in structural

diversity, opening of the canopy, and reduction in forest continuity that would result from the proposed activities would reduce habitat suitability for fisher.

Table 3-14. Total acres of forested habitat disturbed under Alternative 2.

	Alternative 2
Total Acres	93

Given fishers' sensitivity to human disturbance, it is likely any fisher in the area would avoid the town and surrounding high-use area and utilize more distant, undisturbed forested habitat. However, this does not preclude the possibility that fisher use could occur in the forested areas that would be removed by Alternative 2. Therefore, Alternative 2 may impact individuals but is not likely to cause a trend toward federal listing or loss of viability.

Spotted Bat

Alternative 2 would shift the permit boundary to include additional forested habitat that may provide snags for roosting spotted bats, so tree clearing would reduce the amount of habitat that may be used for roosting. While there are snags at Snow King, many are cut down for skier safety. When compared with the surrounding forest, the snag density at Snow King is very low.

On the other hand, the openings created through proposed clearing and glading would likely increase forage availability. Given the large amount of forested habitat that would remain outside of, but adjacent to, the adjusted permit boundary, spotted bats would likely be able to utilize the surrounding habitat for roosting and the habitat within the permit boundary for foraging. Alternative 2 would not impact any roosting caves.

The increase in lighted night skiing would have minimal impact on spotted bat foraging behavior. While it is not clear whether spotted bats migrate locally, hibernate, or migrate long-distances, in Wyoming the winter conditions are too cold to support bat activity during the ski season (Luce and Keinath 2007), but it is possible that night skiing could overlap with the spring emergence of spotted bats (late March). This species generally forages during early dawn and dusk, often emerging from the roost just after sunset (Rabe et al. 1998, Rodhouse et al. 2005), overlapping with lighted night skiing hours. Section 3.6.3.2.5 outlines the types of disturbance and noise that would increase under Alternative 2, including increased night-time activity from snowmaking, grooming and a yurt camp.

It is unclear whether the potential impact on spotted bats would be positive or negative under Alternative 2. Bats may be attracted to the increased prey availability near the lighting or may avoid the area due to increased human activity. If bats were displaced from the area due to increased human activity, they are capable of travelling long distances between roosting and foraging sites. Spotted bats have been documented flying from 6 to 40 kilometers to foraging sites from the roosting site (Rabe et al. 1998, Wai-Ping and Fenton 1989), and abundant open foraging habitat is available in the surrounding landscape outside of Snow King.

Based on these considerations, Alternative 2 may impact individuals but is not likely to cause a trend toward federal listing or loss of viability.

Townsend's Western Big-eared Bat

Potential effects on this species would be similar to those outlined above for the spotted bat. The increase in lighted night skiing would have a limited impact on Townsend's western big-eared bats as this species arouses from hibernation in late spring depending on weather conditions (Dobkin et al. 1995, Gruver and Keinath 2003). It is possible some lighted night skiing could overlap with early emergence, but this species is generally a late-night flyer (Kunz and Martin 1982). Since Snow King's nighttime skiing does not extend beyond 9 PM, the likelihood of impact is low. Section 3.6.3.2.5 outlines the types of disturbance and noise

that would increase under Alternative 2, including increased night-time activity from snowmaking, grooming, and a yurt camp. Therefore, Alternative 2 may impact individuals but is not likely to cause a trend toward federal listing or loss of viability.

Bald Eagle

Alternative 2 would shift the permit boundary to include additional forested areas that may provide roosting habitat for bald eagles. Bald eagles may sporadically enter the project area in search of carrion, but no nesting is expected to occur due to the distance from water that supports fish, the bald eagle's primary prey. Roosting habitat is generic and is not limited in the project area or surrounding area, so the loss of roosting habitat would be negligible. Therefore, Alternative 2 is anticipated to have no impact on bald eagles.

Boreal Owl

While no boreal owls were detected during surveys conducted for this project, some patches of habitat for this species exists in the areas that would be disturbed within the adjusted permit boundary (Table 3-14). The reduction in structural diversity, opening of the canopy, and reduction in forest continuity that would result from the proposed activities would reduce habitat suitability for nesting boreal owls. However, the openings created for these activities may not reduce forage availability, as boreal owls occasionally forage in openings and along forest edges (Hayward and Hayward 2020). Given the large amount of forested habitat that would remain outside of but adjacent to the permit boundary, boreal owls would likely be able to continue to utilize the surrounding habitat for nesting and the habitat within the permit boundary for foraging.

The substantial amount of nesting habitat elsewhere does not preclude the possibility that an individual could choose to nest within the permit area boundary. It would likely not be impacted since boreal owls are generally not sensitive to disturbance by humans (Hayward and Hayward 2020). Nevertheless, removal of forest vegetation under Alternative 2 would reduce nesting habitat to a minor degree.

Snow King currently provides night skiing on the front side of the mountain until 9 PM. Alternative 2 would extend the lighted area on the front side, as well as the ridgetop teaching center on Snow King Mountain and the summit access road/novice skiway. The operating hours would not change. Boreal owls generally hunt when it is dark (Hayward and Hayward 2020). There would be no night skiing on the back side of the mountain. However, the expanded grooming, snowmaking, and yurt camp proposed under Alternative 2 would increase the total area of night-time disturbance compared to existing conditions. Section 3.6.3.2.5 outlines the types of disturbance and noise that would increase under Alternative 2.

As a result, Alternative 2 may impact individuals but is not likely to cause a trend toward federal listing or loss of viability.

Flammulated Owl

While no flammulated owls were detected during surveys conducted for this project, some patches of habitat for this species exist in the areas to be disturbed (Table 3-14). Of the 92 acres of forested habitat disturbance, 32 acres would be gladed. Glading would maintain a forested structure, but with limited understory and structural diversity. Glading may not reduce foraging opportunities for flammulated owls in the proposed project boundary area, which are known to utilize low to medium stem density stands, grasslands, and forest edge for foraging (Linkhart and McCallum 2020).

On the other hand, forests in the area include some of the old-growth characteristics preferred by nesting flammulated owls. Some of this habitat falls within the adjusted permit boundary on the east side and would be impacted by activities in this area, reducing the amount and quality of nesting habitat in the proposed project boundary area.

Snow King currently provides night skiing on the front side of the mountain until 9 PM. Alternative 2 would extend the lighted area on the front side, as well as the ridgetop teaching center on Snow King Mountain and the summit access road/novice skiway. The operating hours would not change. Flammulated owls hunt

at night (Linkhart and McCallum 2020). There would be no night skiing on the back side of the mountain. However, the expanded grooming, snowmaking, and yurt camp proposed under Alternative 2 would increase the total area of night-time disturbance compared to existing conditions. Section 3.6.3.2.5 outlines the types of disturbance and noise that would increase under Alternative 2.

Given this minor impact on potential nesting habitat, Alternative 2 may impact individuals but is not likely to cause a trend toward federal listing or loss of viability.

Great Gray Owl

Patches of nesting habitat for this species exist in areas to be disturbed in the eastern and western boundary adjustment areas (Table 3-14). The reduction in structural diversity, opening of the canopy, and reduction in forest continuity that would result from the proposed activities would reduce habitat suitability for nesting great gray owls. However, the openings created for these activities may not reduce forage availability, as great grey owls sometimes utilize openings and forest edges for foraging (Bull and Duncan 2020, Forest Service 2019d). In addition to the structural changes to the forested habitat in the eastern and western boundary adjustment areas, the increase in disturbance in these areas would also likely reduce the suitability of these areas for nesting. Given the large amount of forested habitat that would remain outside of, but adjacent to, the eastern and western adjusted permit boundary, great gray owls would likely be able to continue to utilize the surrounding habitat for nesting and the habitat within the proposed permit boundary for foraging.

Based on the location data, it appears that great gray owls are currently utilizing the forested habitat on the southern end of the proposed permit boundary area (Figure 3-19). The proposed yurt camp and yurt camp trail are located within this forested habitat. In addition to the habitat lost from the construction of the yurt camp and the trail, the increase in disturbance would reduce the quality of the habitat in this area for great gray owls. However, assuming the entire patch of forested habitat becomes unsuitable for foraging or nesting great gray owls due to habitat modifications and increased disturbance, the forested patch makes up only a small portion of the habitat utilized by great gray owls in the surrounding area (Figure 3-19).

Based on the call-back surveys completed by the Teton Raptor Center in 2014, the forested patch that stretches to the east of the existing permit boundary area may contain a great gray owl nest or a nesting territory. No habitat disturbance or permit boundary expansion is proposed for this area. To ensure the area east of the proposed permit boundary area is not disturbed during sensitive wildlife periods (early spring), a design criterion was added to prohibit bikers using the lift from using upper Skyline trail until July 1. These measures would help reduce any disturbance to great gray owls nesting outside the proposed permit boundary area.

Should a great gray owl choose to locate its nest in an area within the adjusted permit area boundary, it is possible that winter activities would overlap with the courtship period (March through April), and summer hiking and biking activities would overlap with the nesting period (May through July; Teton Raptor Center 2020). Therefore, the habitat within the proposed permit boundary area may not be suitable for nesting great gray owls. However, given the level of disturbance the existing permit boundary area is already experiencing, it is likely the area already has limited nesting suitability.

Snow King currently provides night skiing on the front side of the mountain until PM. Alternative 2 would extend the lighted area on the front side, as well as the ridgetop teaching center on Snow King Mountain and the summit access road/novice skiway. The operating hours would not change. Great gray owls are generally active at dusk, night, and dawn, but also hunt during the day (Forest Service 2019d). There would be no night skiing on the back side of the mountain, which appears to be the highest use area for great gray owls. However, the expanded grooming, snowmaking, and yurt camp proposed under Alternative 2 would increase the total area of night-time disturbance compared to existing conditions. Section 3.6.3.2.5 outlines the types of disturbance and noise that would increase under Alternative 2.

Given the minor loss of potential nesting and foraging habitat, Alternative 2 may impact individuals but is not likely to cause a trend toward federal listing or loss of viability.

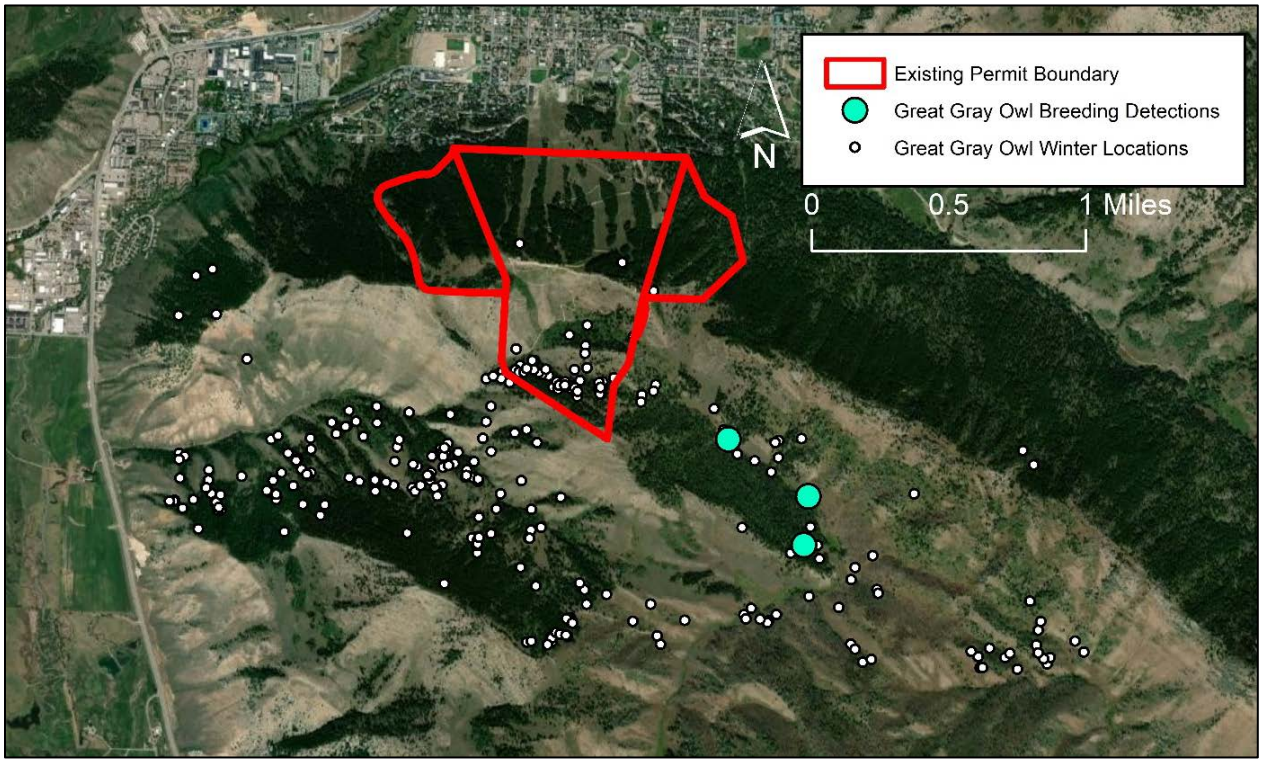

Figure 3-19. GPS location data for two great grey owls in the winter of 2018 and 2019 and breeding detections from 2014 in relation to the proposed boundary expansion area.

Northern Goshawk

Suitable northern goshawk foraging, PFA, and nesting habitat occurs within and adjacent to the proposed boundary adjustment areas and would be disturbed by proposed development (Table 3-15). The reduction in structural diversity, opening of the canopy, and reduction in forest continuity that would result from the proposed activities would reduce habitat suitability for nesting northern goshawks.

Table 3-15. Summary of acreage in the northern goshawk core PFA for Alternative 2.

Analysis Area	Acres
Total Acreage of Goshawk Use During Post-Fledging Period (95th Percentile)	12,091
Core PFA Size (25th Percentile)	2,345
Core PFA Size (5th Percentile)	504.6

Foraging Habitat

The openings created for these activities may not reduce forage availability, as goshawks do utilize openings and forest edge for foraging. Given the limited amount of disturbance compared to available habitat, northern goshawks would likely be able to continue to utilize the habitat within the permit boundary as well as the habitat surrounding the boundary area as foraging habitat.

Post-fledgling Area (PFA)

To determine impacts on habitat within the PFA from the proposed alternatives, we defined a core area of use during the post-fledging period (June 15 through August 31; Northern Goshawk Working Group 2009). There are several ways to define a core area, but they are often an arbitrary percentage of total use. Therefore, we considered the habitat surrounding the known active nest that fell within the 25th percentile the core area of use during the post-fledging period since this is often used in the literature to define a core area (Powell 2000). While this technique is not perfect (Powell 2000), it provides a basis for analyzing impacts on the PFA. In order to disclose impacts on the most crucial habitat within the core area we also analyzed the 5th percentile. This area could be considered the core of the core habitat (Table 3-15).

The core PFA (25th percentile and 5th percentile) overlaps with the proposed permit boundary area (Figure 3-20) and the disturbance footprint of this alternative (Figure 3-21; Table 3-16). For the 25th percentile, forest thinning and glading were not included in the calculations since these actions would not negatively impact foraging goshawks using these areas, as they use a variety of habitat for foraging. However, since the 5th percentile represents the smaller area around the nest with high use by fledglings, particularly in the first few weeks after leaving the nest, we included thinning and glading in these calculations since these actions may impact fledgling goshawks.

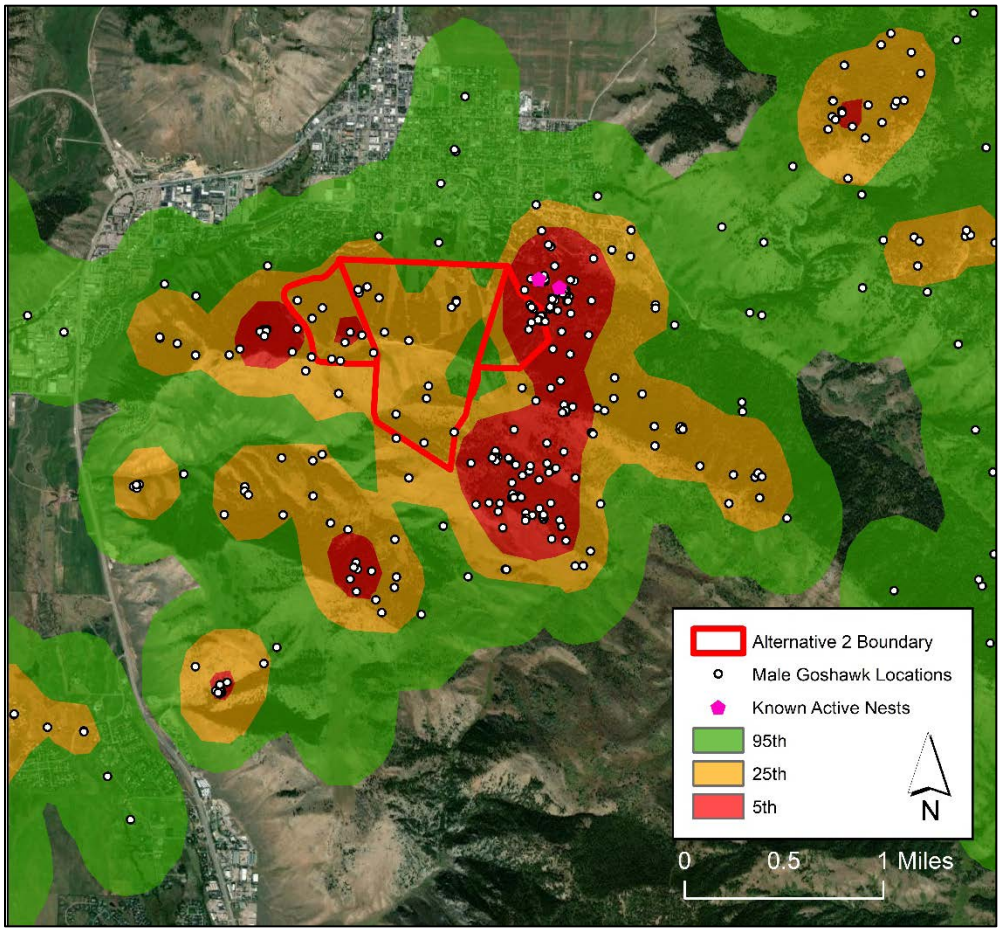

Figure 3-20. Male goshawk use area during the post-fledging period (July 15 through August 31; Northern Goshawk Working Group 2009) in relation to the proposed permit area boundary.

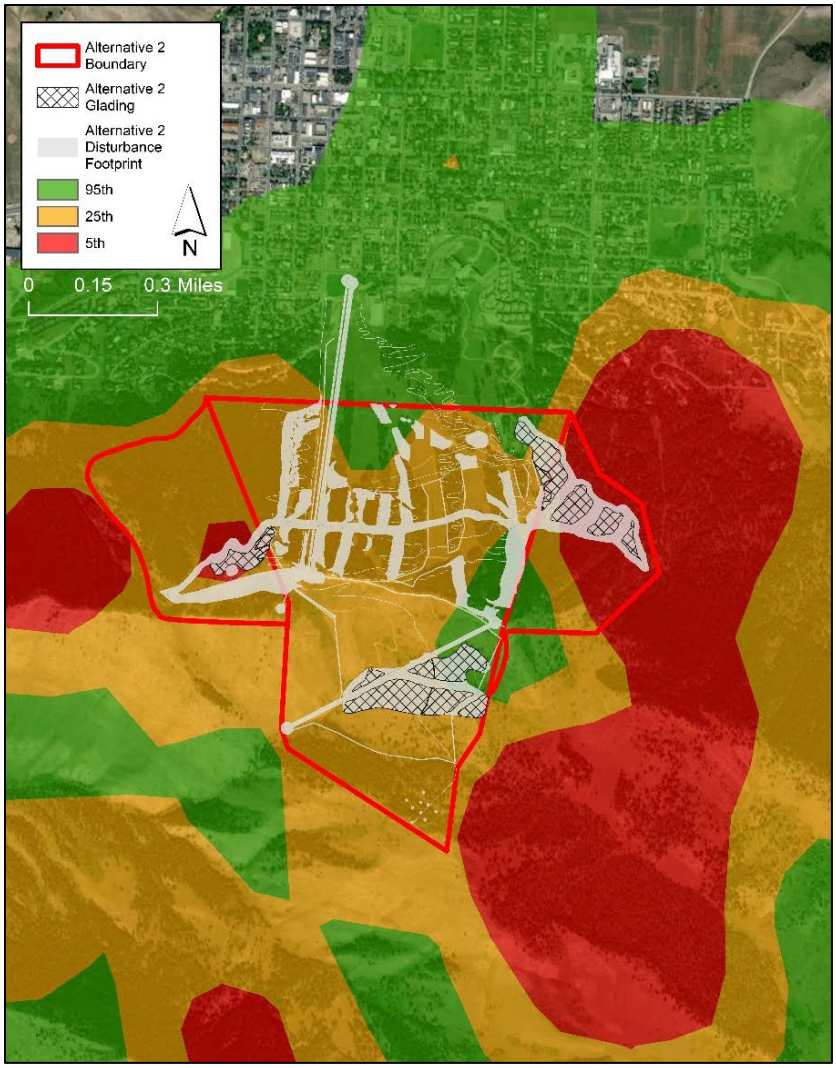

Figure 3-21. The disturbance area for Alternative 2 in relation to the 95th, 25th and 5th percentiles of the core PFA.

Table 3-16. Total acres of overlap with the northern goshawk core PFA (25th percentile and 5th percentile) for Alternative 2.

	Acreage Overlap With 25th Percentile	Percent Overlap With 25th Percentile	Acreage Overlap With 5th Percentile	Percent Overlap with 5th Percentile
Disturbance Area Without Thinning and Glading	85.7	4%	-	-
Disturbance Area With Thinning and Glading	-	-	20.2	4%

The proposed activities would reduce the quality of the PFA within the disturbance footprint of this alternative. However, the disturbance footprint makes up only a small portion of the entire core PFA at both the 25th percentile and the 5th percentile levels. The habitat outside of the disturbance footprint would remain unaltered, and thus suitable for fledgling goshawks.

Core Nesting Area

The core nesting area was calculated the same way as the PFA, but with location data from March through the end of June to determine where the male spent most of its time during the nesting period (Northern Goshawk Working Group 2009; Table 3-17).

Table 3-17. Summary of acreage in the northern goshawk core nesting area for Alternative 2.

Analysis Area	Acres
Total Acreage of Goshawk Use During Nesting Period (95th Percentile)	13.234
Core Nest Size (25th Percentile)	1,958
Core Nest Size (5th Percentile)	403.5

The core nesting area (25th percentile and 5th percentile) overlaps with the proposed permit boundary area (Figure 3-22) and disturbance footprint of this alternative (Figure 3-23; Table 3-18). For the core nesting area analysis, we included all disturbance associated with this alternative, since any activity in this area may impact goshawk activities around the nest.

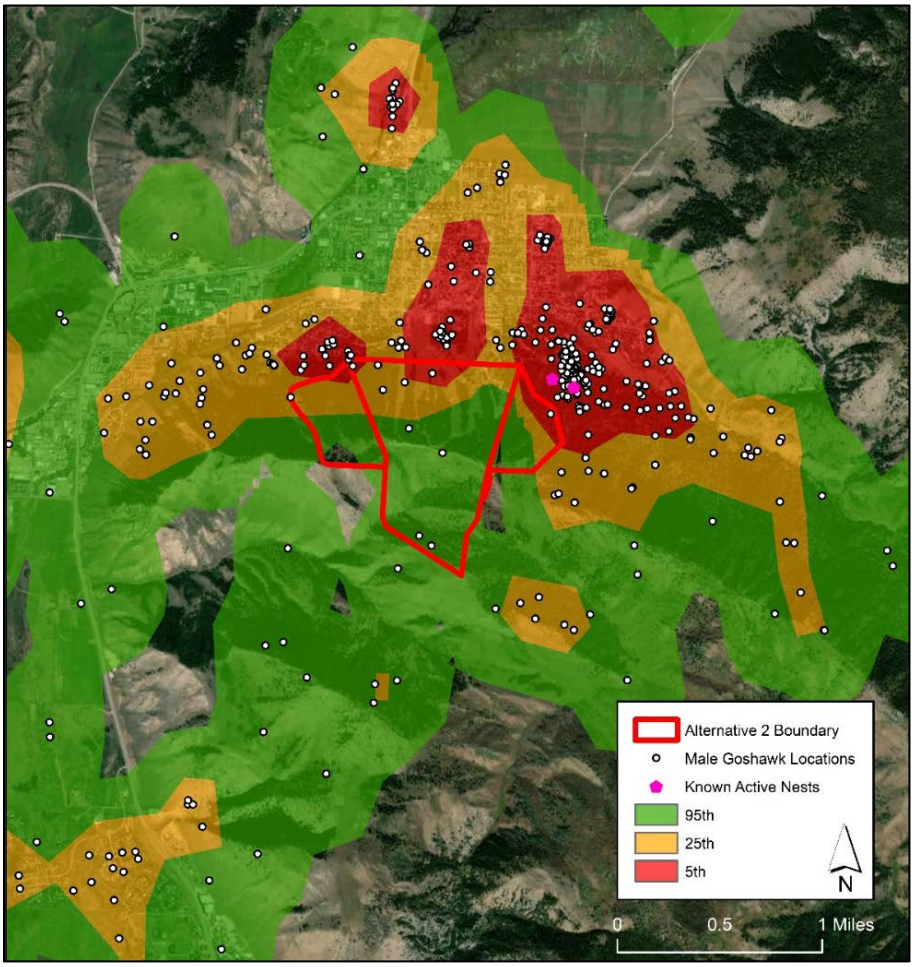

Figure 3-22. Male goshawk use area during the nesting period (March 1st through June 30th; Northern Goshawk Working Group 2009) in relation to the proposed permit area boundary.

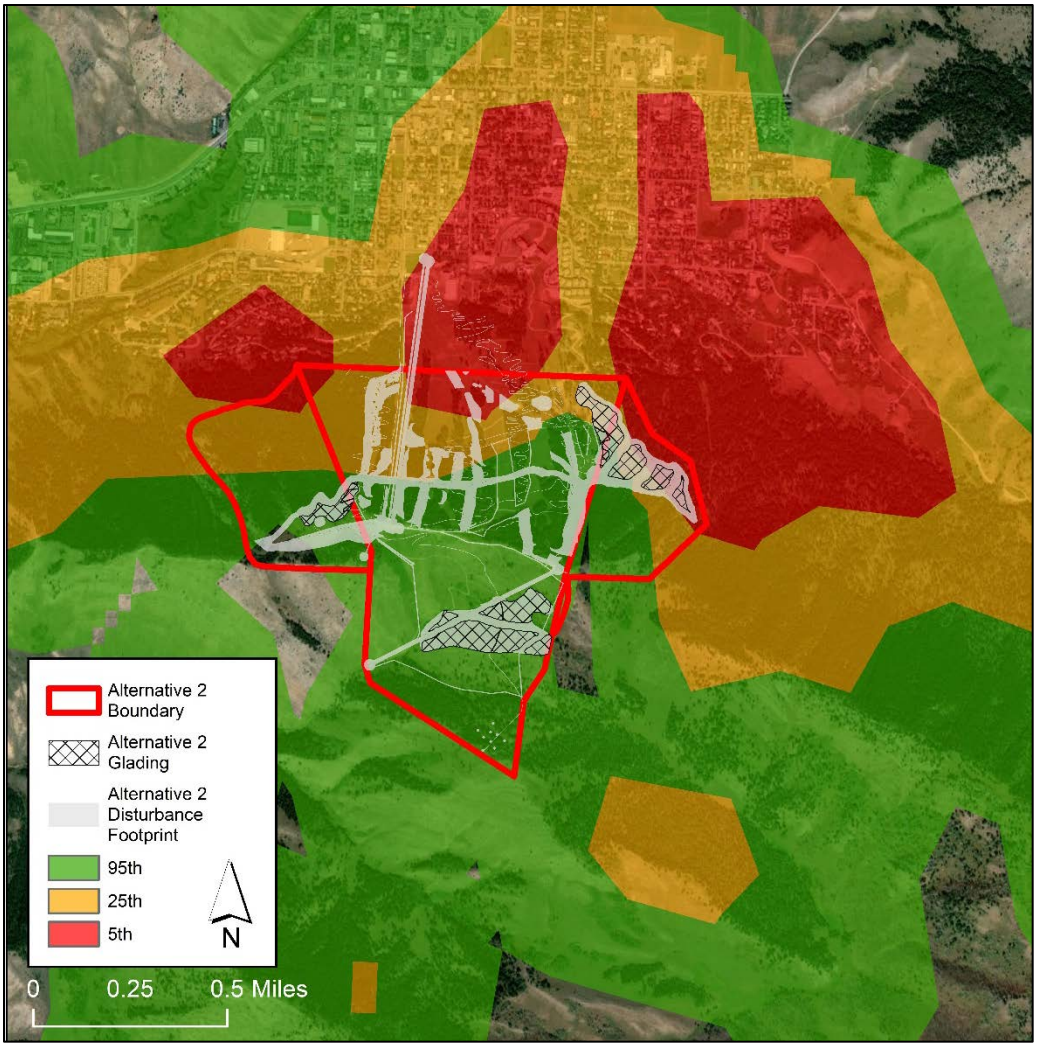

Figure 3-23. The disturbance area for Alternative 2 in relation to the 95th, 25th and 5th percentiles of the core nesting area.

Table 3-18. Total acres of overlap with the northern goshawk core nesting area (25th percentile and 5th percentile) for Alternative 2.

	Acreage Overlap With 25th Percentile	Percent Overlap With 25th Percentile	Acreage Overlap With 5th Percentile	Percent Overlap with 5th Percentile
Disturbance Area	50.5	3%	16.2	4%

However, based on the location data, most of the core nesting area appears to be located further north closer to the Town of Jackson, outside of the proposed permit boundary area. The proposed activities would reduce the quality of the core nesting area within the disturbance footprint. However, the disturbance footprint makes up only a small portion of the entire core nesting area at both the 25th percentile and the 5th percentile levels. The habitat outside of the proposed permit boundary area would remain unaltered, and thus suitable for fledgling goshawks.

Currently, the Hagen Highway trail, which receives an average of 296 users per day during summer, is located less than 300 feet from both active nests. The proposed bike trails and access road would be located more than 1,300 feet from the active nests. While this would increase the overall nesting-season disturbance

in the area, any increase in disturbance would take place further away than the existing source of disturbance to the breeding pair, the Hagen Highway trail.

Should this breeding pair or a future pair choose to locate a nest within the proposed permit area boundary, it is not likely that summer hiking and biking activities would negatively impact this species because they are not usually affected by short-duration disturbance near nests. While goshawks may produce alarm calls and even attempt to drive off intruders, sporadic activities generally do not produce nest desertion or failure (Squires and Reynolds 1997). Indeed, given their high productivity, the current nesting pair appears to be well-adapted to disturbance near their nest. Section 3.6.3.2.5 outlines the types of disturbance and noise that would increase under Alternative 2.

Two known alternative nest sites are located within the proposed boundary area (Figure 3-6). The alternate nest site overlapped by proposed grading would be removed, while the nest overlapped by proposed glading activities may or may not be removed. It is possible that this nest would be abandoned and no longer used by the nesting pair even if the nest tree were not removed. However, goshawks construct multiple alternate nests, and the loss of one alternate nest does not eliminate the possibility of a goshawk nesting in the area (Mahon and Doyle 2005).

A bike trail proposed under Alternative 2 would cross near two known alternative nests. The exact alignment of the trail would not be determined until final design prior to construction. To avoid destruction of a nest tree, a design criterion is in place requiring a survey to ensure that no trees supporting goshawk nests are removed (section 3.6.5).

Conservation Goals

Two of the four conservation goals (see section 3.6.2.2.9) would be met. Goal 1 and Goal 3 would be met by maintaining suitable nesting, post-fledgling and foraging habitat around the active and alternative goshawks nests within and outside the proposed boundary area. Goal 2 and Goal 4 would not likely be met, as elements proposed in Alternative 2 would likely disturb the core nesting area of two alternative nests and potentially the core nesting area of the nest that was active in 2019.

Regional precedent of protection a 30-acre buffer around known active nests would be met, as no habitat disturbance would take place within a 30-acre circle around either of the two known active nests. Habitat would be disturbed within 30 acres of alternative nests.

Given the limited increase in disturbance to the PFA and core nesting habitat of a single nesting goshawk pair, Alternative 2 may impact individuals but is not likely to cause a trend toward federal listing or loss of viability.

Peregrine Falcon

Alternative 2 would not impact any cliff or rocky terrain that may act as nesting habitat for peregrine falcons. Open foraging habitat would increase due to the reduction in forested habitat in the proposed permit boundary area. Given the limited potential for impacts on peregrine falcon habitat, Alternative 2 is anticipated to have no impact on this species.

Three-toed Woodpecker

A few snags that could potentially be used by three-toed woodpeckers may be removed under Alternative 2. Such snag removals would typically occur in areas cleared for ski run development. Snags are already periodically removed throughout the resort for skier safety. Given the already low density of snags, the general absence of three-toed woodpeckers in the project area, and large amount of suitable habitat in areas adjacent to the project area, Alternative 2 may impact individuals but is not likely to cause a trend toward federal listing or loss of viability.

3.6.3.2.3 Migratory Birds

Most of the migratory birds listed in Table 3-12 use habitats that are common at Snow King and in the surrounding areas. Forest nesters would be impacted by Alternative 2 through habitat loss; however, design criteria required for this project would prevent tree cutting and other potential disturbance during the nesting season unless surveys of affected habitat identified no nesting activity prior to construction. This would eliminate direct impacts on nesting (section 3.6.5). The impacts on these species from habitat loss would not be substantial given the large amount of alternative habitat available at Snow King and on adjacent lands, and the relatively small amount of habitat lost. Section 3.6.3.2.5 outlines the types of disturbance and noise that would increase under Alternative 2 that may impact foraging and nesting migratory birds.

Species such as Lewis's woodpecker, Williamson's sapsucker, willow flycatcher, and black rosy-finch use habitats that are less common at Snow King and in the surrounding areas. Both Lewis's woodpeckers and Williamson's sapsuckers use snag habitats similar to those of the three-toed woodpecker, discussed above. Impacts on these two species would be similar to those discussed for three-toed woodpeckers.

3.6.3.2.4 Specialized Habitat

Elk

Winter Range

The first thing to note in assessing potential impacts on elk winter range is that the project area does not support much winter elk use. GPS collar data from 11 elk in 2019 (WGFD 2019b) indicates that elk use of the project area is low compared to the surrounding landscape (Figure 3-12), suggesting that the potential for the proposed recreational development and use to cause notable impacts is correspondingly low. That conclusion puts the following discussion of habitat-based effects in proper perspective.

Alternative 2 would overlap and directly affect crucial winter range for elk on the front side of Snow King, in the eastern boundary adjustment area (Table 3-19; Figure 3-24). Within this area of crucial winter range, Alternative 2 proposes glading, grading, excavation, and clearing. These activities would reduce the forested cover in the area, potentially reducing the value of thermal cover and security for elk. As this area is in close proximity to residences in Jackson and experiences little elk use, no notable direct impact is anticipated.

Table 3-19. Total acres of winter and crucial winter range that overlap the existing permit boundary and the boundary proposed under Alternative 2.

Range Type	Existing	Alternative 2
Winter Range	0	0
Crucial Winter Range	32	81

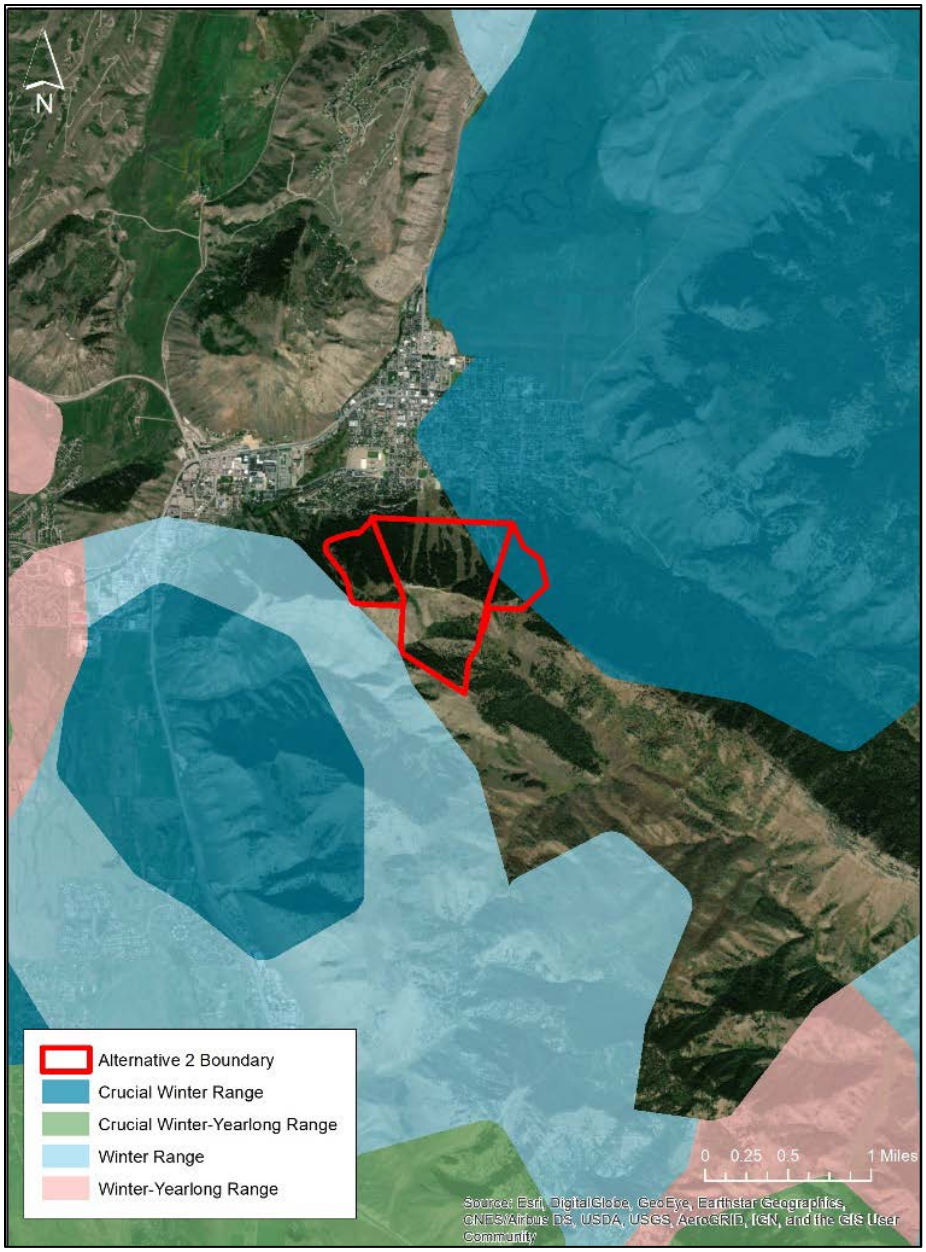

Figure 3-24. Winter ranges for elk in relation to the permit boundary adjustment under Alternative 2 (habitat mapping WGFD 2019a).

The viewshed analysis conducted to identify what areas elk may be displaced from under Alternative 2 (section 3.6.2.4) indicated that the zone of influence, the area where elk would likely be displaced as a result of seeing human activity, would overlap approximately 417 acres of crucial winter range and 141 acres of winter range (Figure 3-25). A large portion of the overlap area occurs to the northeast, within the Town of Jackson. Any avoidance of these areas would be due to disturbance within the town and not due to human activity at the ski area.

The crucial winter range overlapping the zone of visual influence associated with proposed back-side development is located over 1 kilometer away from the ski area permit boundary. While it is possible that elk may retreat from some of this crucial winter range, the long distance from the disturbance may allow elk to habituate to the disturbance and utilize the area at current levels (Figure 3-25).

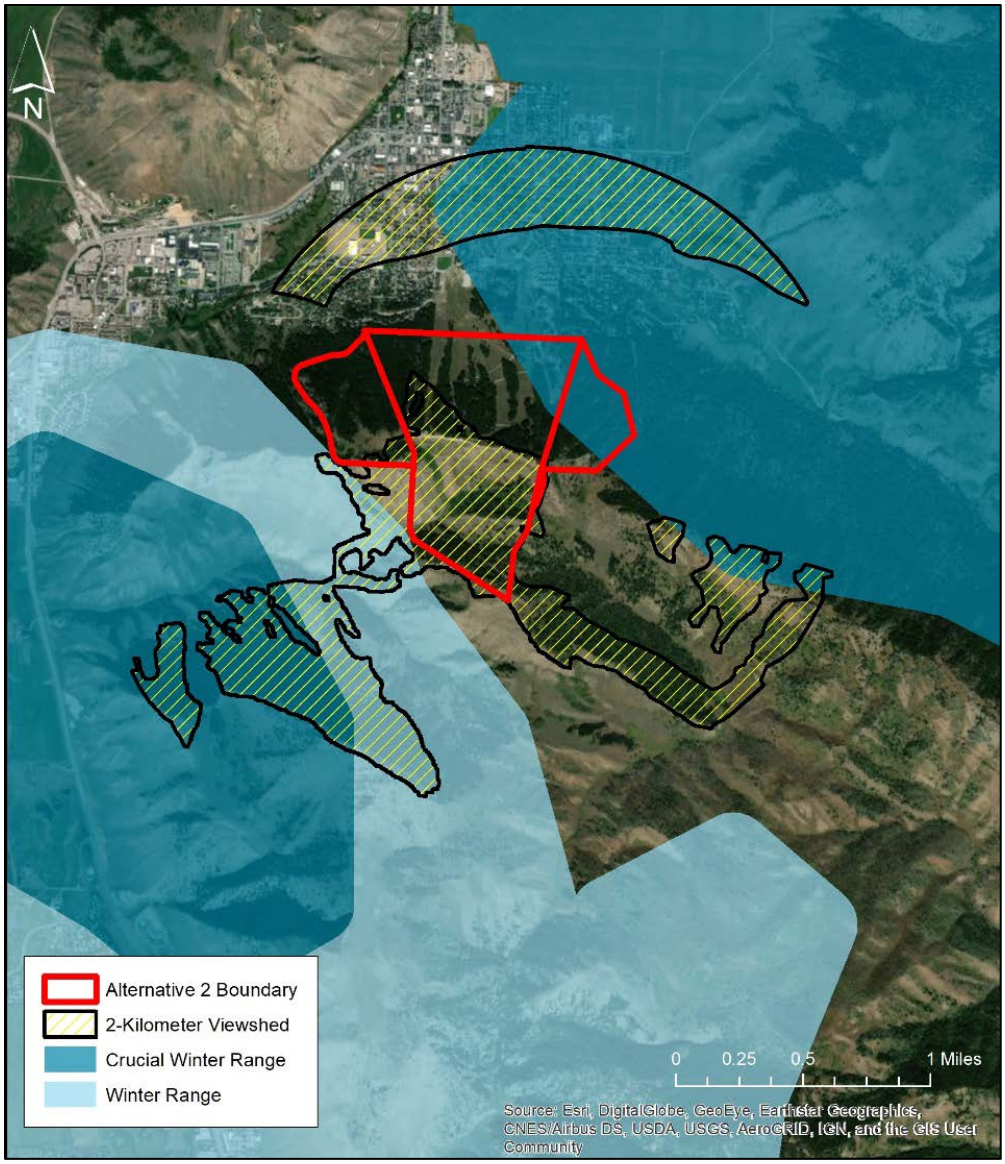

Figure 3-25-. Viewshed analysis of Alternative 2 back-side developments in relation to winter range for elk (habitat mapping WGFD 2019a).

Elk collar data from Wyoming Game and Fish Department (2019b) indicates that winter elk use of the ski area permit area and its zone of visual influence is low (Figure 3-26). However, elk use of the south-facing slopes west of the ski area has been reported by several observers. As shown in Figure 3-26, these areas are shielded from view of the ski area by intervening topography and are thus outside the zone of visual influence.

To minimize the potential to impact any elk that did use habitat adjacent to the proposed back-side development in winter, active skiing hours on the back side would be limited to 9 am – 4 pm. The later start would allow any elk in the area to move to suitable security or foraging areas out of the zone of influence. Terminating skiing at 4 pm would promote elk use of slopes within the zone of the influence during hours of darkness. However, the expanded grooming, snowmaking, and yurt camp proposed under Alternative 2 would increase the total area of night-time disturbance compared to existing conditions. Section 3.6.3.2.5 outlines the types of disturbance and noise that would increase under Alternative 2.

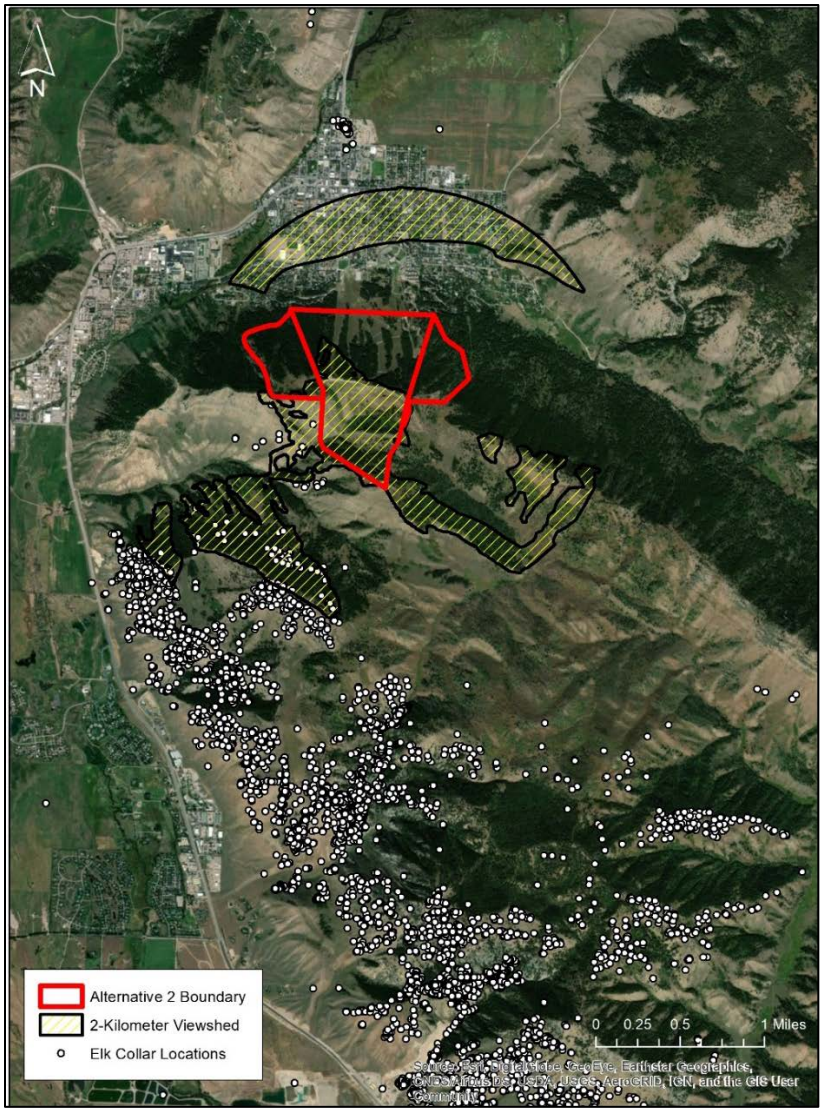

Figure 3-26. Elk use near Snow King, January through June, 2019 (WGFD 2019b), in relation to the viewshed analysis.

Parturition Areas

While there is no designated elk parturition habitat located near the proposed permit boundary (Figure 3-27), anecdotal accounts and personal experience suggest that there may be some calving habitat in Leeks Canyon. Some of this calving habitat in upper Leeks Canyon, Wilson Canyon, and Game Creek would be impacted by construction and operation of the mountain bike zone and Lift A. The proposed biking plan under Alternative 2 allows lift-served bikers to use the existing cross-country trail system, possibly disturbing potential elk parturition habitat in Leeks Canyon, and in Wilson Canyon and Game Creek beyond the permit boundary, likely reducing elk calf survival. To address these concerns, a design criterion was added to prohibit bikers using the lift from traveling down Leeks Canyon road beyond the permit boundary, or using upper Skyline trail until July 1, reducing the potential for disturbance of elk calving that may be occurring outside the permit area. Skyline trail is already closed to biking until July 1 to protect calving habitat east of the ski area. Any parturition occurring within the ski area boundary could be impacted, but impacts would be small in the context of the amount of parturition habitat available to the Fall Creek or Jackson elk herds.

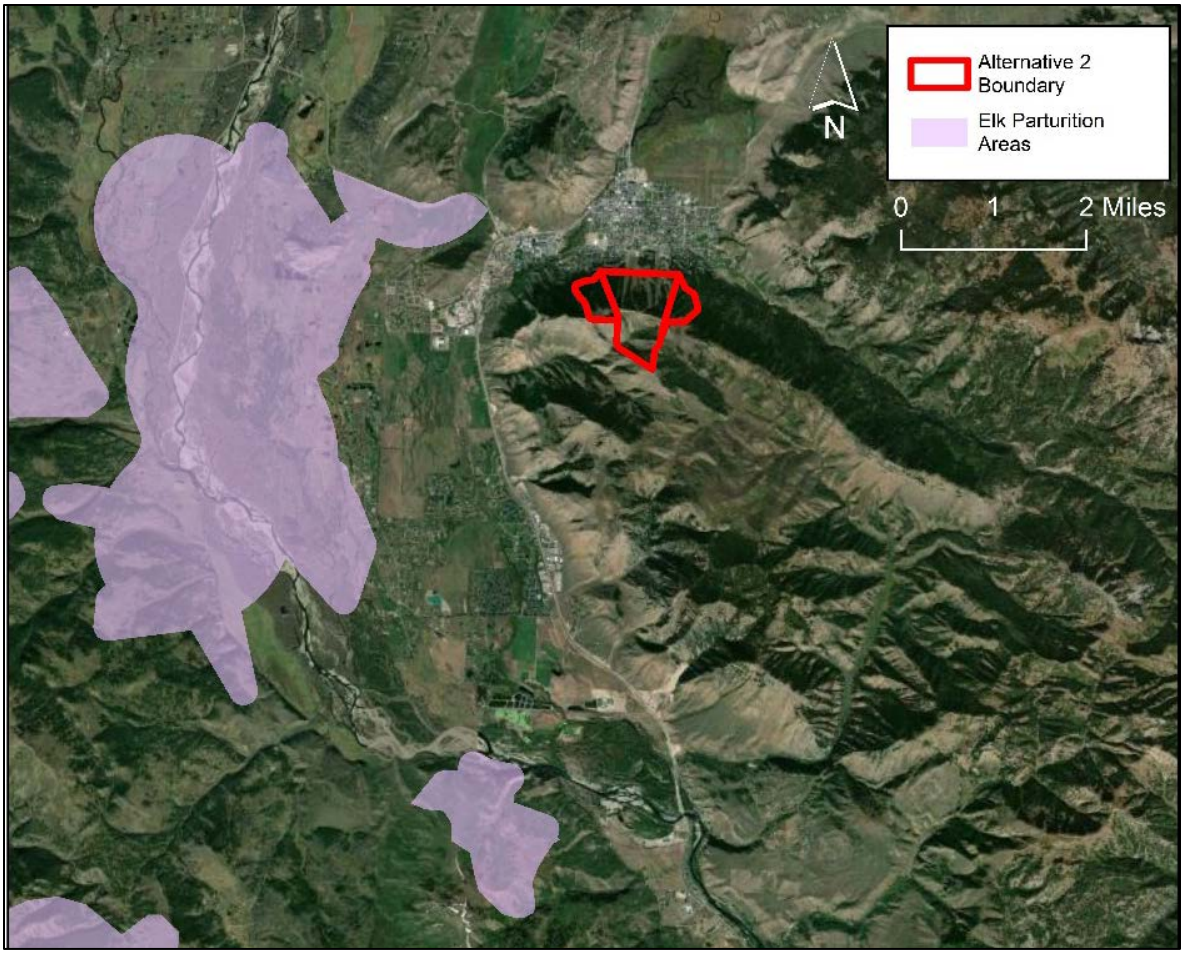

Figure 3-27. Elk parturition areas in relation to the permit boundary adjustment under Alternative 2 (habitat mapping WGFD 2018d).

Migration Routes

Alternative 2 would adjust the eastern and western permit boundary areas but would not intrude into any migration routes for elk. However, the elk migration route to the west of the proposed boundary area would be closer to disturbance compared to existing conditions (Figure 3-28). Additionally, based on the viewshed analysis (Figure 3-25), elk utilizing this migration route may be able to see recreational activity within the proposed development area at points along the migration route, and therefore may travel through these areas more quickly than they do under current conditions.

However, as noted previously, the distance to the disturbance within the proposed development area may allow elk to habituate and continue to utilize the migration corridor at current levels. Limited skiing hours on the back side of the mountain from to 9 AM – 4 PM would also allow for elk to move through the area in the early morning and evening should they not habituate to the disturbance within the proposed permit boundary area.

Based on this analysis, while localized displacement of elk in and around the project area is possible due to disturbance from expanded recreation, there is an abundance of suitable habitat in the surrounding landscape that would provide foraging, thermal cover, and security habitat for the animals affected. Given the relatively low level of habitat loss, the low levels of elk use in both the proposed ski area boundary and the zone of visual influence, and the suggested design criteria (section 3.6.5), the impacts described above may impact individuals but are not likely to result in a measurable impact on elk population numbers.

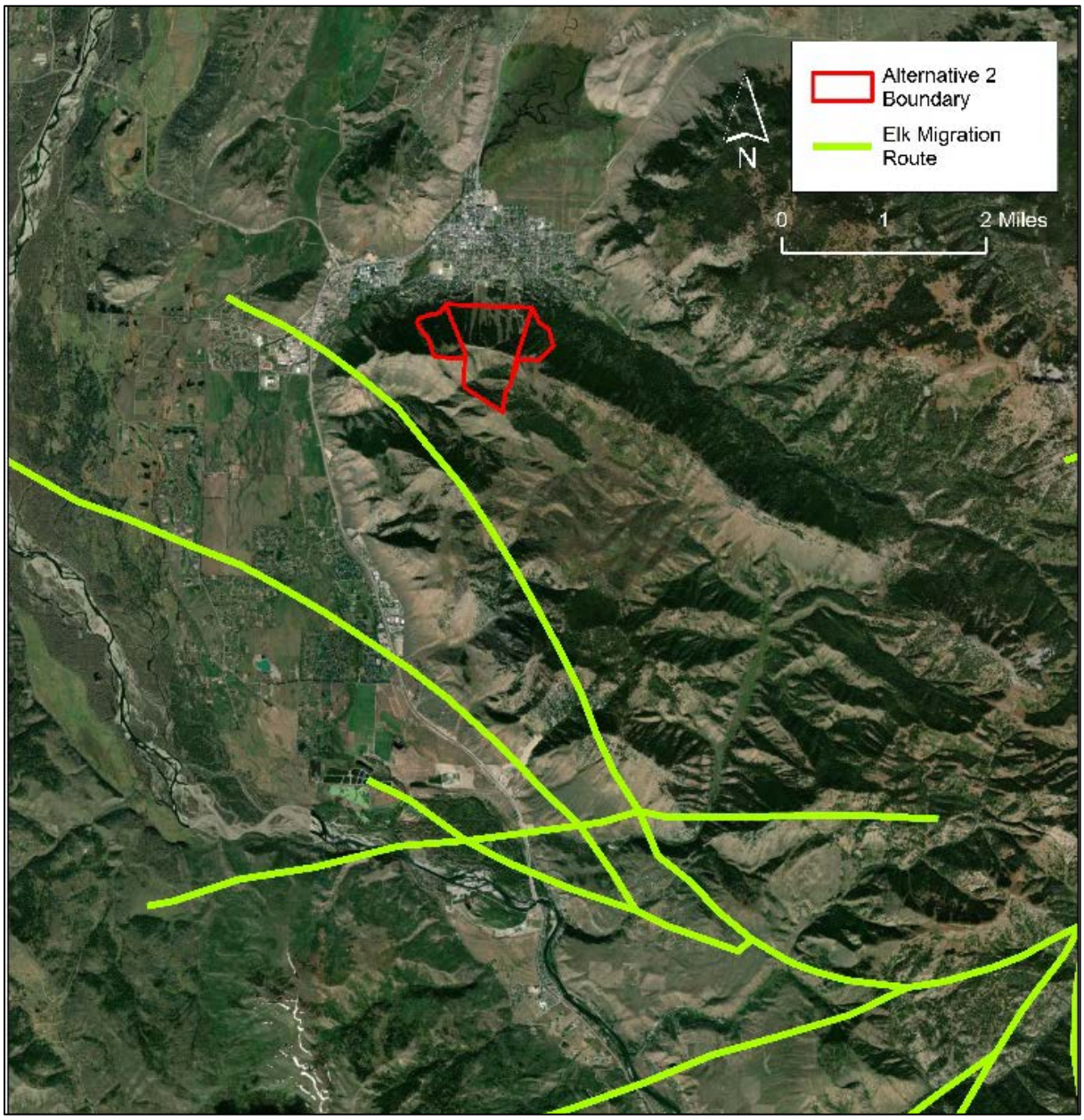

Figure 3-28. Elk migration routes in relation to the permit boundary adjustment under Alternative 2.

Mule Deer

Winter Range

The first thing to note in assessing potential impacts on mule deer winter range is that the project area does not support much mule deer use. Information from the Teton Science School (2013) indicates that mule deer use of the project area is low compared to the surrounding landscape (Figure 3-29), suggesting that the potential for the proposed recreational development and use to cause notable impacts is correspondingly low. That conclusion puts the following discussion of habitat-based effects in proper perspective.

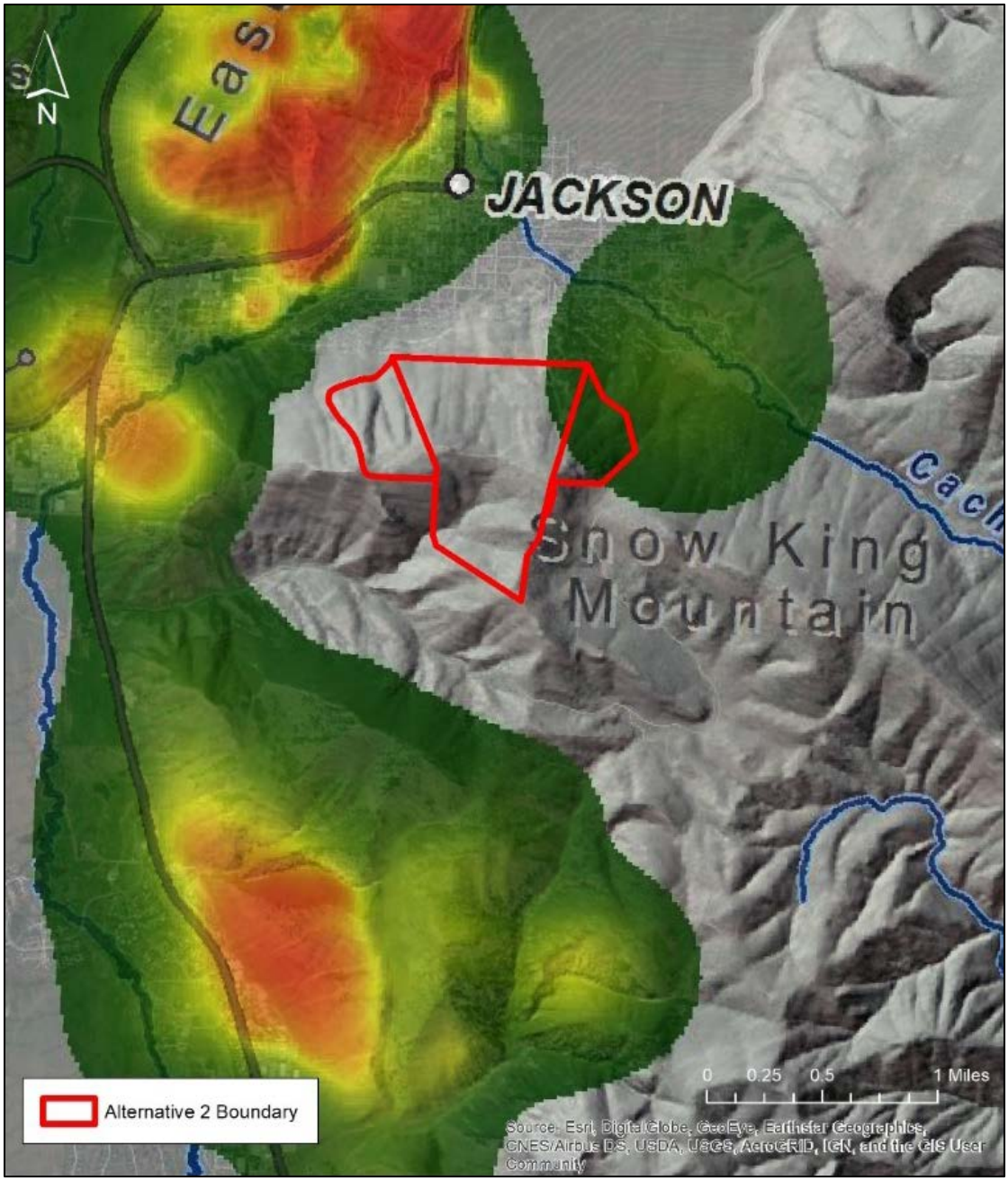

Figure 3-29. Winter use by mule deer indicating high areas of use in red and lower areas of use in green (Teton Science School 2013) in relation to the proposed boundary under Alternative 2.

The Alternative 2 boundary adjustment areas and back-side development would not overlap with any winter or crucial range (Figure 3-30).

The viewshed analysis conducted to identify the areas that mule deer may be displaced from under Alternative 2 (section 3.6.2.4) indicated that the zone of influence, the area where mule deer would be displaced as a result of seeing human activity, would overlap with approximately 118 acres of crucial winter-yearlong range (Figure 3-31). A portion of the overlap occurs to the northeast, within the Town of Jackson. Any avoidance of this area would be due to disturbance within the town and not due to human activity at the ski area.

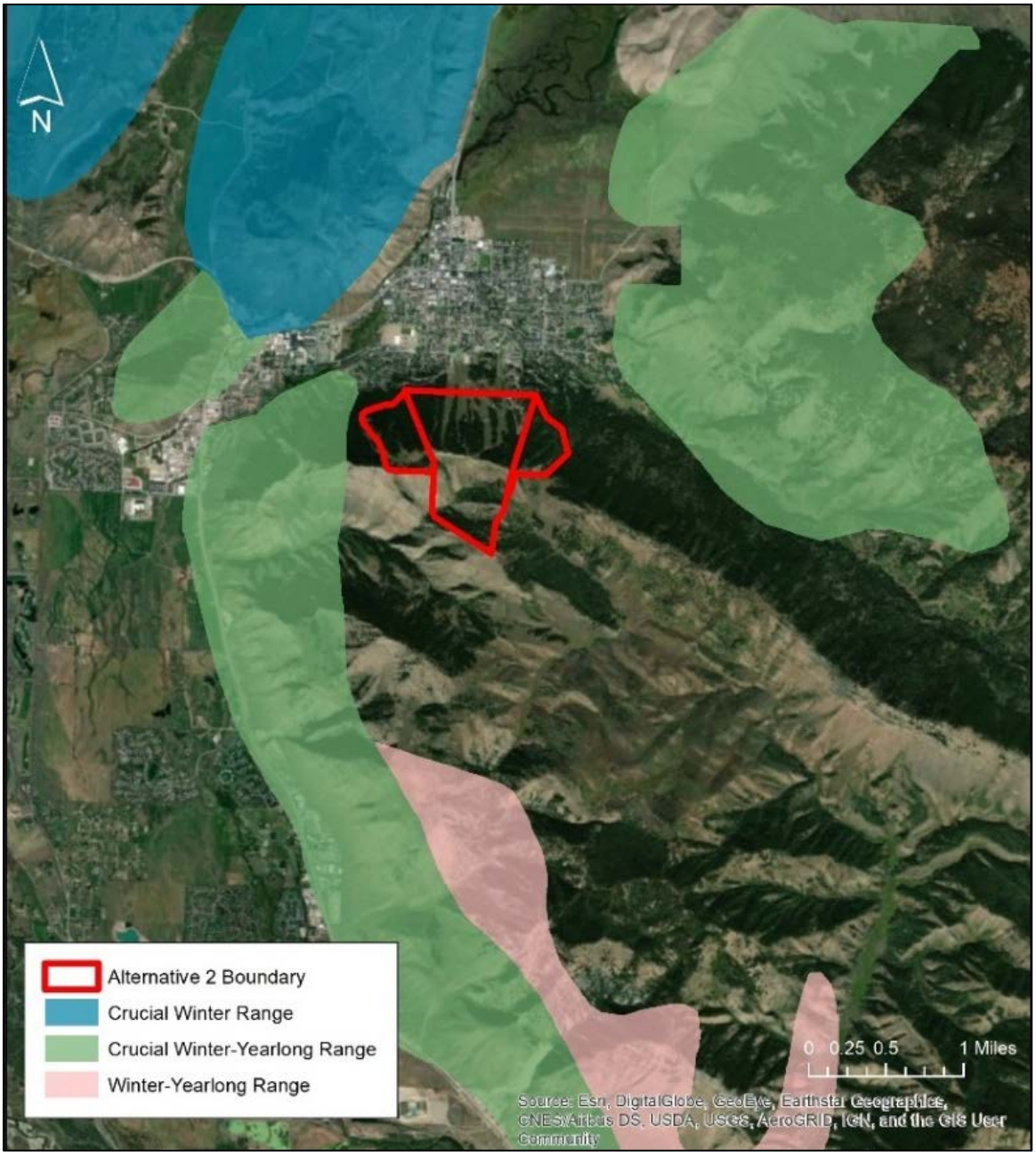

Figure 3-30. Winter range for mule deer in relation to the permit boundary adjustment under Alternative 2 (habitat mapping WGFD 2019a).

The crucial winter-yearlong range overlapping the zone of visual influence associated with proposed back-side development is located over 1 kilometer away from the ski area permit boundary. While it is possible that mule deer may retreat from some of this crucial winter-yearlong range, the long distance from the disturbance may allow mule deer to habituate to the disturbance and utilize the area at current levels (Figure 3-31).

Data from the Teton Science School (2013) indicates that mule deer use of the ski area permit boundary area and its zone of influence is low (Figure 3-32). However, mule deer use of the south-facing slopes west of the ski area has been reported by several observers. As shown in Figure 3-31, this area is shielded from view of the ski area by intervening topography and is thus outside the zone of visual influence.

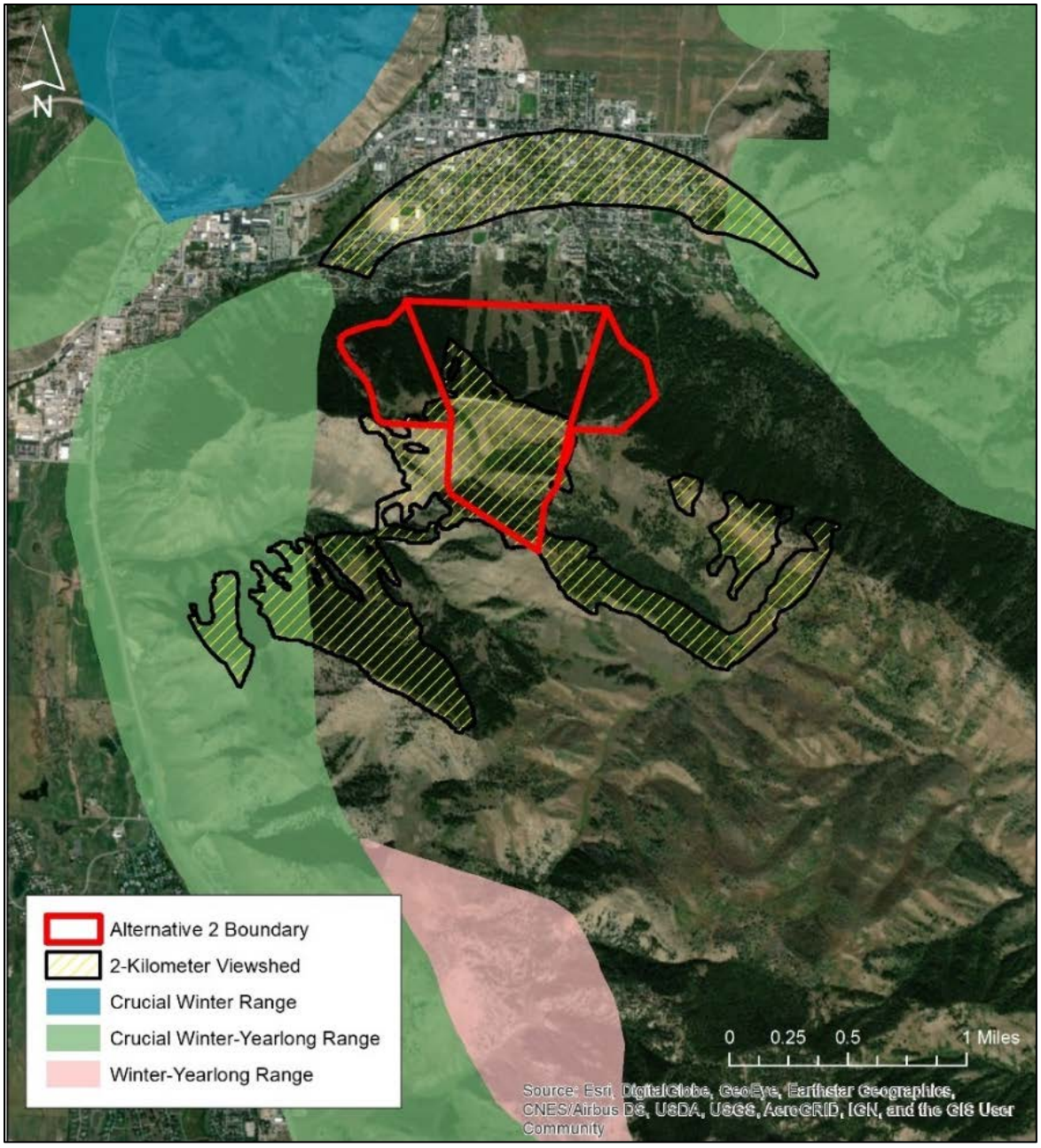

Figure 3-31. Viewshed analysis with seasonal ranges for mule deer in relation to the permit boundary adjustment under Alternative 2 (habitat mapping WGFD 2019a).

To minimize the potential to impact any mule deer that did use habitat adjacent to the proposed back-side development in winter, active skiing hours on the back side would be limited to 9 AM – 4 PM. The later start would allow any mule deer in the area to move to suitable security or foraging areas out of the zone of influence. Terminating skiing at 4 PM would promote mule deer use of slopes within the zone of the influence during hours of darkness. However, the expanded grooming, snowmaking, and yurt camp proposed under Alternative 2 would increase the total area of night-time disturbance compared to existing conditions. Section 3.6.3.2.5 outlines the types of disturbance and noise that would increase under Alternative 2.

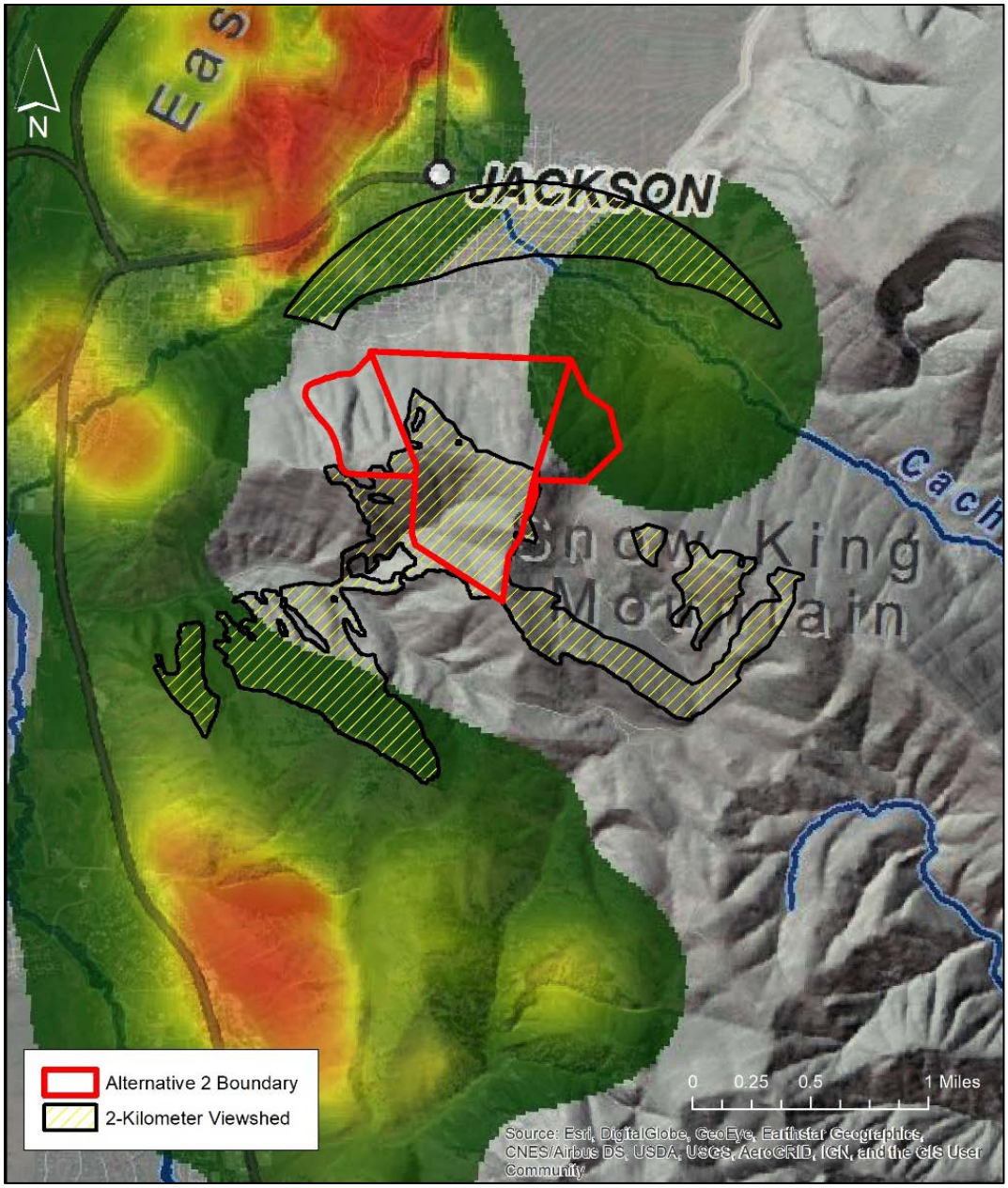

Figure 3-32. Winter use by mule deer indicating areas of high use in red and areas of lower use in green (Teton Science School 2013) in relation to the viewshed analysis.

Migration Routes

The Alternative 2 proposed boundary adjustment area would not likely have a measurable impact on mule deer migration routes to the east and southeast (Figure 3-33).

Based on this analysis, while localized displacement of mule deer in and around the project area is possible due to disturbance from expanded recreation, there is an abundance of suitable habitat in the surrounding landscape that would provide foraging, thermal cover, and security habitat. Given the relatively low level of habitat loss, the low level of mule deer use in both the ski area permit boundary and its zone of visual influence, and the suggested design criteria (section 3.6.5), the impacts described above may impact individuals but are not likely to result in a measurable impact on mule deer population numbers.

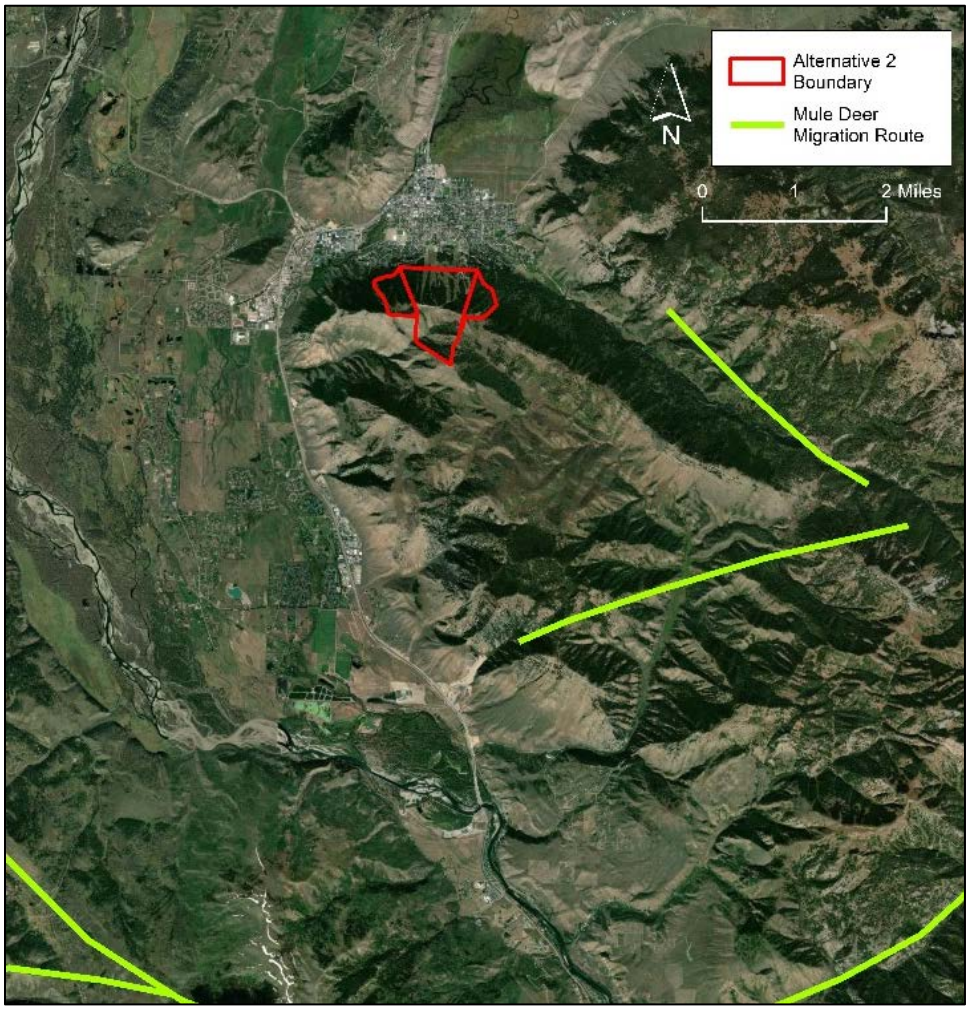

Figure 3-33. Mule deer migration routes in relation to the permit boundary adjustment under Alternative 2.

3.6.3.2.5 Disturbance

Alternative 2 proposes to extend the existing permit boundary area to the east and west on the front side of the mountain and to provide additional recreational activities and a yurt camp on the back side of the mountain. This would increase the total area of disturbance compared to existing conditions.

The areas of concentrated human use would increase during the winter, as use of the new ski runs and gladed areas would increase compared to the current sporadic out-of-bounds use of these areas. Additionally, winter recreation would take place on the back side of the mountain where there is currently little human-use disturbance. Wildlife that tolerated the lower levels of disturbance in these areas may no longer tolerate the increase in human use of the boundary adjustment area. This could reduce the total amount of suitable habitat that is available for use to wildlife if they chose to avoid the area.

Out-of-bounds skiing would still be permitted in some areas, which would further increase the area of disturbance outside of the proposed boundary adjustment area.

In the summer, the addition of the zip line, the mountain bike park, and hiking and biking trails would increase human-use disturbance within the proposed boundary area. Use of local hiking and mountain biking trails would continue outside of the proposed permit boundary.

In addition to the increased daytime use of the proposed boundary adjustment areas, the yurt camp would introduce human use of the back side of the mountain during the night. Campers who stay in the yurt camp could disturb nocturnal wildlife on the back side of the mountain. Lights and noise from the yurt camp may discourage nocturnal wildlife from utilizing the area. Additionally, campers may leave the yurt camp and hike in the area after the resort has closed. This disturbance may displace wildlife as they move around.

Alternative 2 would increase noise levels and the size of the area impacted by noise compared to existing conditions. In the short-term, construction of the proposed facilities would increase noise. As detailed in section 3.9, helicopter use, heavy equipment operation, and blasting would temporarily increase the level of noise in the proposed boundary area. Once construction was complete, these types of noise impacts would only be expected during maintenance of the infrastructure.

In the long-term, Alternative 2 would increase the total size of the area where noise may impact wildlife. In addition to expanding recreational use, snowmaking, and grooming on the front side of the mountain, these activities would also expand to the back side of the mountain. While sporadic recreational noise already occurs in these areas due to recreationists utilizing areas outside of the existing operational boundary, snowmaking and grooming would be expanded into areas where they do not currently occur. However, given the topography within the permit boundary on the back side of the mountain, noise impacts on Leeks Canyon would be limited to those caused by activities taking place on the back side.

The number of explosive devices needed for avalanche control would increase under Alternative 2. The period of time these explosives would be used would remain the same as existing conditions.

Compared to existing conditions, out-of-bounds skiing would likely increase as skiers left the ski area boundary. This increase would likely be most noticeable on the south facing slopes of Leek's Canyon. However, based on low levels of current use due to poor snow conditions (e.g., southern exposure and wind effect) use is not expected to increase substantially.

Wildlife in the area may be impacted by the noise disturbance described above. Some habitat that may be suitable under existing conditions could become unsuitable for species that do not habituate to the noise. Wildlife that do habituate to the noise may experience reduced reproductive success, higher levels of stress, changes in aural communication, and/or changes in habitat use.

Given the limited increase in disturbance, current disturbance levels on the resort, and design criteria that would reduce recreational use outside of the permit boundary area, the impacts described above may impact individuals but are not likely to result in a measurable impact on wildlife population numbers.

3.6.3.3 Alternative 3

In order to provide a clear contrast between Alternative 3 and Alternative 2, the following discussion focuses on how the impacts of Alternative 3 would differ from Alternative 2, described above.

3.6.3.3.1 Threatened and Endangered Species

Impacts on grizzly bear and wolverines would be the same as under Alternative 2.

Canada Lynx

There would be an increase in disturbance of suitable lynx habitat and critical lynx habitat (Table 3-20). The increase is mostly attributed to an additional 154 acres of forest thinning. The thinning included in this alternative is a vegetation treatment but is exempt from the Northern Rockies Lynx Management Direction vegetation standards because it is within a wildland/urban interface zone as defined by the *Teton County Wildfire Protection Plan* (Teton Area Wildfire Protection Coalition 2014). The proposed thinning includes the islands of forested habitat within the existing boundary area that may provide lynx foraging opportunities. Thinning these stands would reduce such opportunities compared to Alternative 2.

Table 3-20. Total acres of lynx habitat disturbance under Alternative 2 and Alternative 3.		
Habitat Type	**Alternative 2**	**Alternative 3**
Suitable Habitat	122	261
Critical Habitat	133	285

The total acreage differs by approximately 1 acre between the first and second options for the bottom terminal of the zip line proposed under Alternative 3. That negligible difference will not be discussed further in this wildlife analysis.

Similar to Alternative 2, as designed Alternative 3 would not be compliant with HU O4 (section 3.6.2.1). A design criterion was added to address this concern (section 3.6.5), which restricts glading between ski runs in the eastern boundary adjustment area. Therefore, with the addition of the design criteria, Alternative 3 is compliant with the objectives, standards, and guidelines found in the *Northern Rockies Lynx Management Direction* for both habitat linkage and movement and habitat quality and effectiveness (see section 3.6.2.1 for a full discussion of objectives, standards, and guidelines).

The increase in habitat disturbance acreage would not change the effect determination for lynx. For the same reasons discussed under Alternative 2 (section 3.6.3.2), Alternative 3 is consistent with the objectives, standards, and guidelines found in the *Northern Rockies Lynx Management Direction*. In accordance with the *Canada Lynx Conservation Agreement* between the Forest Service and the Fish and Wildlife Service, suitable lynx habitat on the Bridger-Teton must be considered "occupied." Under this alternative, suitable habitat would be impacted. Therefore, Alternative 3 may impact the Canada lynx but is consistent with the *Northern Rockies Lynx Management Direction* and its amendment to the Forest Plan.

3.6.3.3.2 Forest Service Sensitive Species

Impacts on bighorn sheep, spotted bat, Townsend's western big-eared bat, bald eagle, peregrine falcon, and three-toed woodpecker would be the same as under Alternative 2 (section 3.6.3.2).

Fisher

Compared to Alternative 2, there would be an increase in the total acreage of forested habitat disturbed under Alternative 3 (Table 3-21).

Table 3-21. Total acres of forested habitat disturbed under Alternative 2 and Alternative 3.		
	Alternative 2	**Alternative 3**
Total Acres	93	230

The increase in disturbance is mostly attributed to an additional 154 acres of forest thinning. The additional impacts in the thinning area would be reduced canopy cover as well as increased human activity. This would reduce habitat suitability for fishers compared to Alternative 2.

This reduction in habitat suitability would not change the effect determination for the fisher. For the same reasons discussed under Alternative 2 (section 3.6.3.2), Alternative 3 may impact individuals but is not likely to cause a trend toward federal listing or loss of viability.

Boreal, Flammulated, and Great Gray Owl and Northern Goshawk

Compared to Alternative 2, there would be an increase in the total acreage of forested habitat disturbed under Alternative 3 (Table 3-21). The increase in disturbance is mostly attributed to an additional 154 acres

of forest thinning. The reduced canopy cover from forest thinning would reduce the amount of nesting habitat for these raptors compared to Alternative 2.

For northern goshawks, Alternative 3 would overlap with the core PFA at the 25th percentile and the 5th percentile (Table 3-22; Figure 3-34). For the 25th percentile, forest thinning and glading were not included in the calculations since these actions would not negatively impact foraging goshawks using these areas, as they use a variety of habitat for foraging. However, since the 5th percentile represents the smaller area around the nest with high use by fledglings, particularly in the first few weeks after leaving the nest, we included thinning and glading in these calculations since these actions may impact fledgling goshawks. For a summary of the total acres in each of the core post-fledgling areas (95th percentile, 25th percentile, and 5th percentile), see Table 3-15 in section 3.6.3.2.2.

Table 3-22. Total acres of overlap with the northern goshawk core PFA (25th percentile and 5th percentile) for Alternative 3.

	Acreage Overlap With 25th Percentile	Percent Overlap With 25th Percentile	Acreage Overlap With 5th Percentile	Percent Overlap with 5th Percentile
Disturbance Area Without Thinning and Glading	84.8	4%	-	-
Disturbance Area With Thinning and Glading	-	-	37.4	7%

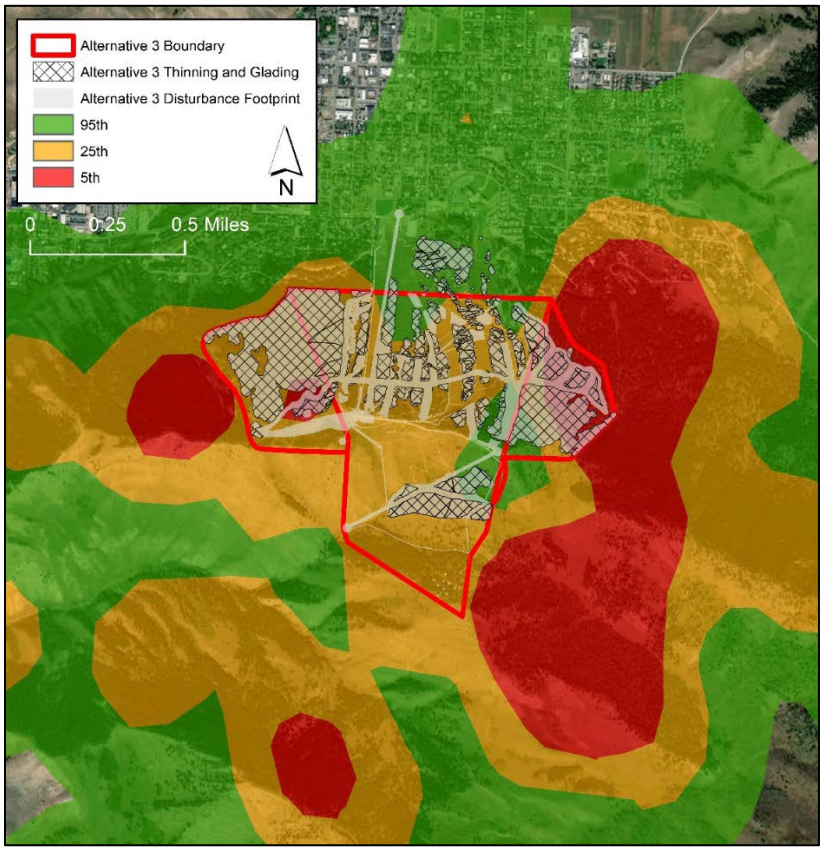

Figure 3-34. The disturbance area for Alternative 3 in relation to the 95th, 25th and 5th percentiles of the core PFA.

It also overlaps with the core nesting area at the 25th percentile and the 5th percentile (Table 3-23; Figure 3-35). For the core nesting area analysis, we included all disturbance associated with this alternative, since any activity in this area may impact goshawk activities around the nest. For a summary of the total acres in each of the core nesting areas (95th percentile, 25th percentile, and 5th percentile), see Table 3-17 in section 3.6.3.2.2.

Table 3-23. Total acres of overlap with the northern goshawk core nesting area (25th percentile and 5th percentile) for Alternative 3.

	Acreage Overlap With 25th Percentile	Percent Overlap With 25th Percentile	Acreage Overlap With 5th Percentile	Percent Overlap with 5th Percentile
Disturbance Area	146.8	7%	42.5	10.5%

The decrease in nesting habitat would not change the effect determination for these raptors. For the same reasons discussed under Alternative 2 (section 3.6.3.2), Alternative 3 may impact individuals but is not likely to cause a trend toward federal listing or loss of viability.

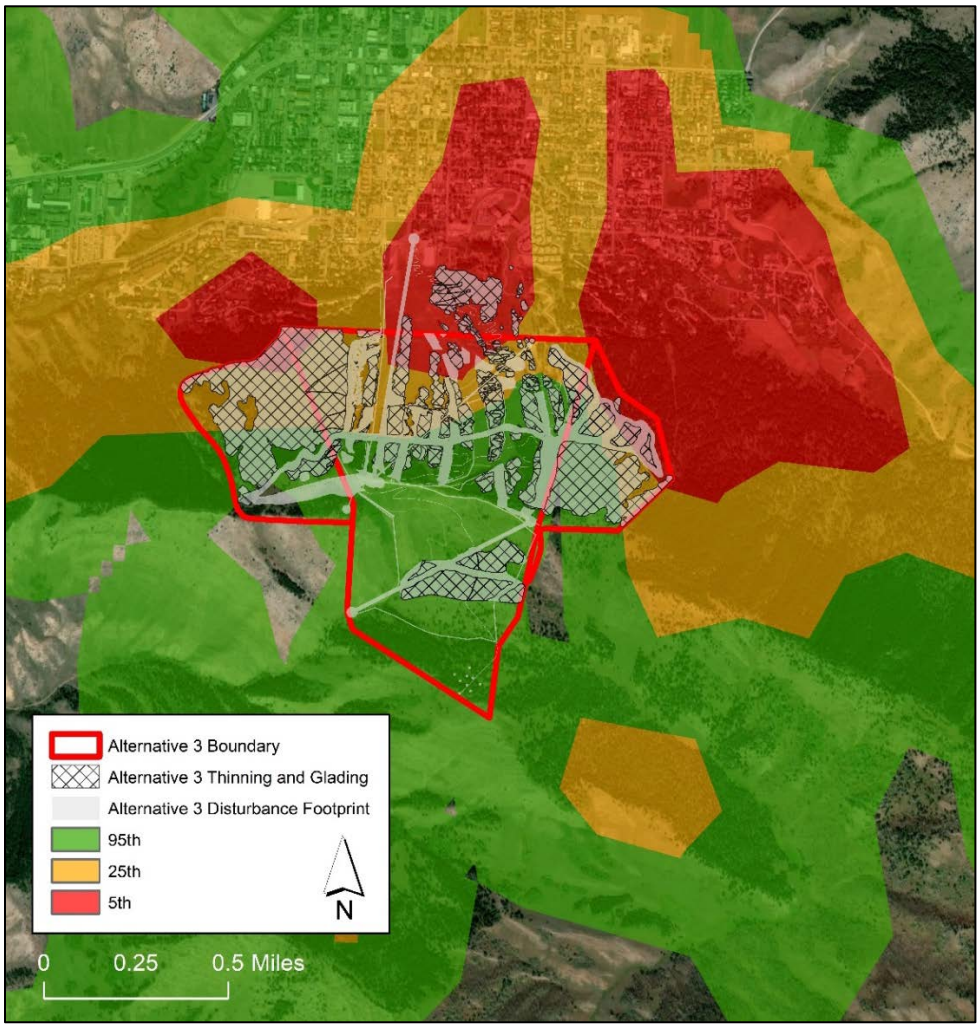

Figure 3-35. The disturbance area for Alternative 3 in relation to the 95th, 25th and 5th percentiles of the core nesting area.

3.6.3.3.3 Specialized Habitat

Elk

Winter Range

Under this alternative the southern boundary of the western boundary adjustment area would be shifted about 100 feet north to the actual ridgeline. This would provide additional visual screening for any elk using the south-facing slope west of the back-side ski area expansion.

This change would be positive but would not change the impact determination for elk. For the same reasons discussed under Alternative 2 (section 3.6.3.2), Alternative 3 may impact individuals but is not likely to result in a measurable impact on elk population numbers.

Parturition Areas

Under this alternative, lift-served bikers would not be allowed to leave the dedicated downhill mountain bike system, as stipulated in section 2.5.4.2. Therefore, there would be no impacts on any potential parturition habitat in the area of the Fall Creek or Jackson elk herds.

Migration Routes

The shift of the southern border of the western boundary adjustment area to the true ridgeline would provide additional visual screening for migrating elk. While this would be a positive change, it would not change the impact determination for elk.

For the same reasons discussed under Alternative 2 (section 3.6.3.2), Alternative 3 may impact individuals but is not likely to result in a measurable impact on elk population numbers.

Mule Deer

Winter Range

The boundary shift described above would provide the same minor benefit to mule deer as to elk. This would not change the effect determination for mule deer. For the same reasons discussed under Alternative 2 (section 3.6.3.2), Alternative 3 may impact individuals but is not likely to result in a measurable impact on mule deer population numbers.

Migration Routes

Impacts would be the same as under Alternative 2 (section 3.6.3.2).

3.6.3.3.4 Disturbance

Under this alternative, lift-served bikers would not be allowed to leave the dedicated downhill mountain bike system, as stipulated in section 2.5.4.2. This would reduce the total area of disturbance compared to Alternative 2.

Regarding construction noise, snowmaking, and avalanche control, Alternative 3 would be the same as Alternative 2. However, under Alternative 3, the zip line would be shifted towards the Rafferty lift, where summer recreation noise already exists. The reduced slope and speed of the zip line may also reduce the level of noise compared to Alternative 2.

For the same reasons discussed under Alternative 2 (section 3.6.3.2) Alternative 3 may impact individuals but is not likely to result in a measurable impact on wildlife population numbers.

3.6.3.4 Alternative 4

In order to provide a clear contrast between Alternative 4 and Alternatives 2 and 3, the following discussion focuses on how the impacts of Alternative 4 would differ from those alternatives, as described above.

3.6.3.4.1 Threatened and Endangered Species

Canada Lynx

There would be an increase in disturbance of both suitable and critical lynx habitat compared to Alternative 2 (Table 3-24). The differences between Alternative 4 and Alternative 3 would be negligible and will not be discussed further.

The increase in disturbance of both suitable and critical habitat relative to Alternative 2 is mostly attributed to an additional 142.9 acres of forest thinning and an additional 15 acres of cleared ski runs. The proposed thinning includes the islands of forested habitat within the existing boundary area that may provide lynx foraging opportunities. Thinning these stands may reduce the foraging opportunities for lynx within the permit boundary area compared to Alternative 2; however, as described under Alternative 3, thinning projects in the WUI are exempt from *Northern Rockies Lynx Management Direction* standards and are therefore in compliance with said standards.

The clearing of additional ski runs would be done in the same way as described in section 3.6.3.2.1, resulting in compliance with direction regarding lynx habitat linkage and movement, and habitat quality and effectiveness. The additional acreage proposed for ski run development under this alternative mostly overlaps the acreage proposed for thinning under Alternative 3. This accounts for the only 3 acres of additional suitable habitat disturbance of lynx habitat shown in Table 3-24.

Table 3-24. Total acres of disturbance to lynx habitat under Alternative 2, Alternative 3, and Alternative 4.

Habitat Type	Alternative 2	Alternative 3	Alternative 4
Suitable Habitat	122	261	264
Critical Habitat	133	285	296

Similar to Alternatives 2 and 3, as described in section 2.6 Alternative 4 would not be compliant with HU O4 (section 3.6.2.1). A design criterion was added to address this concern (section 3.6.5), which restricts glading between ski runs in the eastern boundary adjustment area. Therefore, with the addition of the design criterion, Alternative 4 is compliant with the objectives, standards, and guidelines found in the *Northern Rockies Lynx Management Direction* for both habitat linkage and movement and habitat quality and effectiveness (see section 3.6.2.1 for a full discussion of objectives, standards, and guidelines).

Alternative 4 would increase the amount of disturbance in the proposed permit boundary area. Section 3.6.3.4.4 outlines the types of disturbance and noise that would increase under Alternative 4.

The increase in habitat disturbance acreage and recreational disturbance would not change the effect determination for lynx. For the same reasons discussed under Alternative 2 (section 3.6.3.2), Alternative 4 is consistent with the objectives, standards, and guidelines found in the *Northern Rockies Lynx Management Direction*. In accordance with the *Canada Lynx Conservation Agreement* between the Forest Service and the Fish and Wildlife Service, mapped lynx habitat on the Bridger-Teton must be considered "occupied." Under this alternative, suitable habitat would be impacted. Therefore, Alternative 4 may impact the Canada lynx but is consistent with the *Northern Rockies Lynx Management Direction* and its amendment to the Forest Plan.

3.6.3.4.2 Forest Service Sensitive Species

Fisher

Alternative 4 would impact the highest total acreage of forested habitat compared to Alternatives 2 and 3 (Table 3-25). The differences between Alternative 4 and Alternative 3 would be negligible and will not be discussed further.

Table 3-25. Total acres of forested habitat disturbed for each alternative.

	Alternative 2	Alternative 3	Alternative 4
Total Acres	93	230	234

The increase in habitat disturbance from Alternative 2 to Alternative 4 is mostly attributed to an additional 142.9 acres of forest thinning and an additional 15 acres of cleared ski runs, which would result in decreased structural diversity, increased opening of the canopy, and reduced forest continuity (due to runs 1, 2, 3, and 15). Section 3.6.3.4.4 outlines the types of recreational disturbance and noise that would increase under Alternative 4.

These impacts would not change the effect determination for the fisher due to the large amount of habitat available and the relatively low amount of habitat impacted. For the same reasons discussed under Alternative 2 (section 3.6.3.2), Alternative 4 may impact individuals but is not likely to cause a trend toward federal listing or loss of viability.

Boreal, Flammulated, and Great Gray Owls

Alternative 4 would impact the highest total acreage of forested habitat compared to Alternative 3 (Table 3-25). The increase in disturbance from Alternative 2 to Alternative 4 is mostly attributed to an additional 142.9 acres of forest thinning and an additional 15 acres of cleared ski runs. The reduced canopy cover from forest thinning and new ski runs would reduce the amount of nesting habitat for these owls compared to Alternative 2. Section 3.6.3.4.4 outlines the types of recreational disturbance and noise that would increase under Alternative 4.

The decrease in nesting habitat and increase in disturbance would not change the effect determination for these owls. For the same reasons discussed under Alternative 2 (section 3.6.3.2), Alternative 4 may impact individuals but is not likely to cause a trend toward federal listing or loss of viability.

Northern Goshawk

Alternative 4 would impact the highest total acreage of forested habitat compared to Alternative 3 (Table 3-25). The increase in disturbance from Alternative 2 to Alternative 4 is mostly attributed to an additional 143 acres of forest thinning and an additional 15 acres of cleared ski runs. The reduced canopy cover from forest thinning and new ski runs would reduce the amount of nesting habitat for goshawks compared to Alternative 2.

For northern goshawks, Alternative 4 would overlap with the core PFA at the 25th percentile and the 5th percentile (Table 3-26; Figure 3-36). For the 25th percentile, forest thinning and glading were not included in the calculations since these actions would not negatively impact foraging goshawks using these areas, as they use a variety of habitat for foraging. However, since the 5th percentile represents the smaller area around the nest with high use by fledglings, particularly in the first few weeks after leaving the nest, we included thinning and glading in these calculations since these actions may impact fledgling goshawks. For a summary of the total acres in each of the core post-fledgling areas (95th percentile, 25th percentile, and 5th percentile), see Table 3-15 in section 3.6.3.2.2.

Table 3-26. Total acres of overlap with the northern goshawk core PFA (25th percentile and 5th percentile) for Alternative 4.

	Acreage Overlap With 25th Percentile	Percent Overlap With 25th Percentile	Acreage Overlap With 5th Percentile	Percent Overlap with 5th Percentile
Disturbance Area Without Thinning and Glading	98.9	4%	-	-
Disturbance Area With Thinning and Glading	-	-	37.8	7%

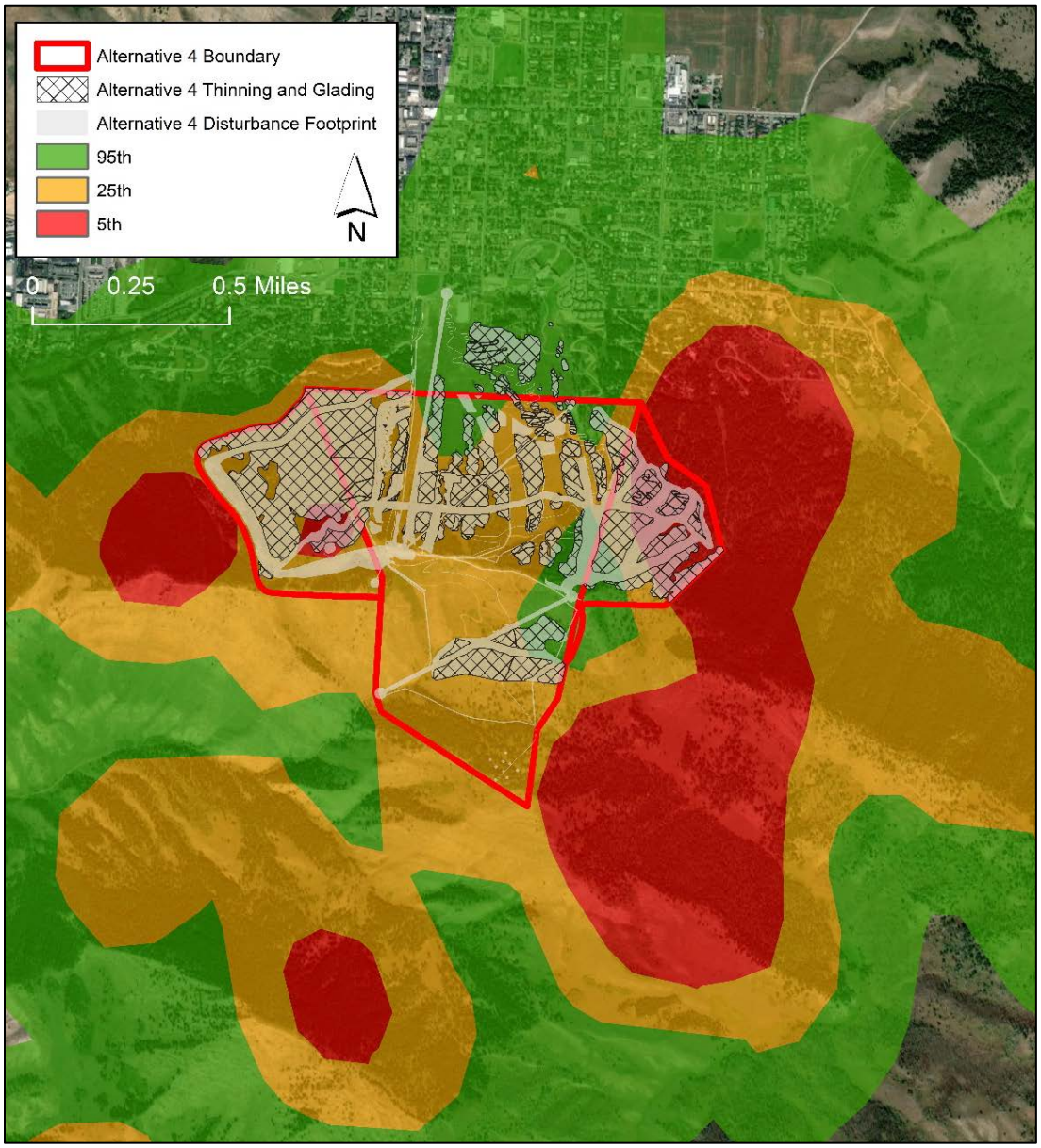

Figure 3-36. The disturbance area for Alternative 4 in relation to the 95th, 25th and 5th percentiles of the core PFA.

It also overlaps with the core nesting area at the 25th percentile and the 5th percentile (Table 3-27; Figure 3-37). For the core nesting area analysis, we included all disturbance associated with this alternative, since any activity in this area may impact goshawk activities around the nest. For a summary of the total acres in each of the core nesting areas (95th percentile, 25th percentile, and 5th percentile), see Table 3-17 in section 3.6.3.2.2.

Table 3-27. Total acres of overlap with the northern goshawk core nesting area (25th percentile and 5th percentile) for Alternative 4.

	Acreage Overlap With 25th Percentile	Percent Overlap With 25th Percentile	Acreage Overlap With 5th Percentile	Percent Overlap with 5th Percentile
Disturbance Area	152.2	8%	42.7	10.6%

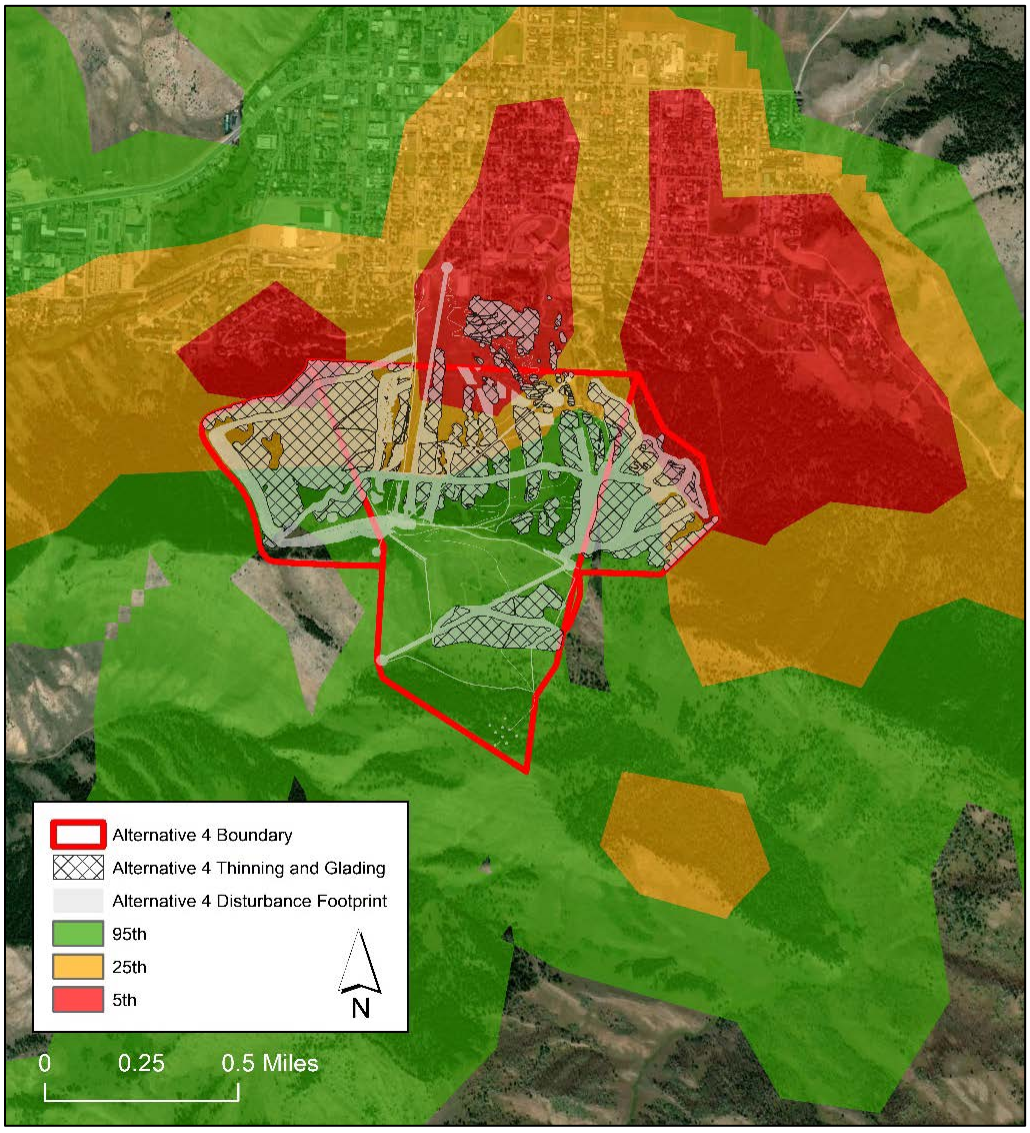

Figure 3-37. The disturbance area for Alternative 4 in relation to the 95th, 25th and 5th percentiles of the core nesting area.

Section 3.6.3.4.4 outlines the types of recreational disturbance and noise that would increase under Alternative 4.

Neither the decrease in nesting habitat, nor the protective measure for nest trees would change the effect determination for these raptors. For the same reasons discussed under Alternative 2 (section 3.6.3.2), Alternative 4 may impact individuals but is not likely to cause a trend toward federal listing or loss of viability.

3.6.3.4.3 Specialized Habitat

Section 3.6.3.4.4 outlines the types of recreational disturbance and noise that would increase under Alternative 4.

Winter Range

Impacts on elk and mule deer winter habitat would be the same under Alternative 4 as under Alternative 3 (section 3.6.3.3).

Parturition Areas

Compared to Alternative 2, Alternative 4 may have reduced impacts on potential parturition habitat located in upper Leeks Canyon, Wilson Canyon, and Game Creek. An adaptive management strategy would be implemented that monitored lift-served mountain biking (see section 2.6). Unlike Alternative 2, this adaptive management strategy would aim to reduce impacts on the existing Game Creek/Cache Creek trail system. This would reduce impacts on any potential elk parturition habitat in the area compared to Alternative 2.

Additionally, boundary marking and signage would be placed along the south boundary of the east-west ridge that closes the south-facing slope to winter recreation. This would limit winter recreation along the south-facing slopes that may be parturition habitat.

Compared to Alternative 3, Alternative 4 could have an increased impact on elk parturition areas, as mountain bikers are not allowed to leave the designated trail systems under Alternative 3.

Migration Routes

Impacts on elk and mule deer migration routes would be the same under Alternative 4 as under Alternative 3 (section 3.6.3.3).

3.6.3.4.4 Disturbance

Alternative 4 would be the same as Alternative 3 regarding avalanche control and construction noise. The construction of Run 15 would shift the location of construction noise to the west compared to Alternative 3. Additional snowmaking and grooming on this run would also increase the level of noise in this area compared to Alternative 3 in the long-term.

Alternative 4 would reduce the amount of summer recreational disturbance outside of the permit boundary area compared to Alternative 2. An adaptive management strategy would be implemented that monitored lift-served mountain biking (see section 2.6). Unlike Alternative 2, this adaptive management strategy would aim to reduce impacts on the existing Cache Creek/Game Creek trail system. This would reduce the amount of disturbance in the area compared to Alternative 2. Compared to Alternative 3, Alternative 4 would have an increased level of summer recreational disturbance, as mountain bikers are not allowed to leave the designated trail systems under Alternative 3.

Alternative 4 would reduce the amount of winter recreational disturbance outside of the permit boundary area compared to Alternative 2. A rope line and signage would be placed along the south boundary of the east-west ridge that indicates the area beyond is important wildlife habitat. While this would reduce the number of out-of-bounds skiers that utilize this area compared to Alternative 3, some people may ignore the boundary limits and ski in these areas regardless of the rules. This would disturb wildlife who may be

using this area during the winter. However, compared to Alternative 3, where no measures are in place, Alternative 4 would have the lowest level of disturbance to wildlife using the area in the winter.

For the same reasons discussed under Alternative 2 (section 3.6.3.2) Alternative 4 may impact individuals but is not likely to result in a measurable impact on wildlife population numbers.

3.6.4 CUMULATIVE EFFECTS

The cumulative effects section addresses those species discussed above that had potential direct or indirect effects from elements proposed in Alternatives 2–4. The size of the cumulative effects area for each species is dependent upon its typical home range size. Due to the long distances travelled by both bat species between their roosting and foraging sites, the analysis area includes the entire Bridger-Teton National Forest. The analysis area for Canada lynx was expanded to include the Lynx Analysis Unit.

As discussed in section 3.1.2, the cumulative actions considered in this analysis are any projects listed in the Bridger-Teton Schedule of Proposed Actions that had, or could have, temporally and spatially overlapping impact on the same resources affected directly or indirectly by these alternatives. Impacts were determined based on our professional judgement regarding the interaction between the proposed alternatives and the cumulative actions. Table 3-28 identifies these projects and summarizes their cumulative effects on wildlife.

Table 3-28. Cumulative effects on wildlife species affected by Alternatives 2–4.

Cumulative Action	Cumulative Effects
Canada lynx (Analysis area: Flat Creek LAU)	
Invasive Plant Management	These projects would not impact denning or foraging habitat, the sensitive portion of Canada lynx habitat. As a result, there is no potential for cumulative effects.
Wyoming Game and Fish Department Game Creek Ditch Permit	
Snow King Lower Elk Lighting	The projects that overlap with the existing permit boundary area for Snow King have already taken place and their impacts, and the conditions those impacts created, are a part of the affected environment descriptions of habitat conditions (see section 3.6.2). Thus, these projects would not have any cumulative effects beyond what is described in the direct and indirect effects discussions (see section 3.6.3).
Snow King Mountain Rafferty Lift Replacement and Ski Trail Construction	
Snow King Mountain Communications Services	
Snow King Mountain Snowmaking Infrastructure	
Snow King Resort Vault Toilet	
Snow King Mountain Aerial Adventure Course	
Fisher (Analysis Area: Individual home range defined as 2 mi. from permit area)	
Invasive Plant Management	This project would not impact denning, resting, or foraging habitat, the sensitive portion of fisher habitat. As a result, there is no potential for cumulative effects.

Table 3-28 (cont'd). Cumulative effects on wildlife species affected by Alternatives 2–4.	
Cumulative Action	**Cumulative Effects**
Snow King Lower Elk Lighting	The projects that overlap with the existing permit boundary area for Snow King have already taken place and their impacts, and the conditions those impacts created, are a part of the affected environment descriptions of existing habitat conditions (see section 3.6.2). Thus, these projects would not have any cumulative effects beyond what is described in the direct and indirect effects discussions (see section 3.6.3).
Snow King Mountain Rafferty Lift Replacement and Ski Trail Construction	
Snow King Mountain Communications Services	
Snow King Mountain Snowmaking Infrastructure	
Snow King Resort Vault Toilet	
Snow King Mountain Aerial Adventure Course	
Spotted bat and Townsend's Western Big-eared Bat (Analysis area: Bridger-Teton National Forest)	
All projects listed in Table 3-5.	These projects would not impact cliff areas, mines, or caves, the sensitive portion of bat habitat. As a result, there is no potential for cumulative effects. The projects that overlap with the existing permit boundary area for Snow King have already taken place and their impacts, and the conditions those impacts created, are a part of the affected environment descriptions of existing habitat conditions (see section 3.6.2). Thus, these projects would not have any cumulative effects beyond what is described in the direct and indirect effects discussions (see section 3.6.3).
Boreal owl (Analysis area: Individual home range defined as 1.5 mi. from permit area)	
Invasive Plant Management	This project would not impact nesting or foraging habitat, the sensitive portion of boreal owl habitat. As a result, there is no potential for cumulative effects.
Snow King Lower Elk Lighting	The projects that overlap with the existing permit boundary area for Snow King have already taken place and their impacts, and the conditions those impacts created, are a part of the affected environment descriptions of existing habitat conditions (see section 3.6.2). Thus, these projects would not have any cumulative effects beyond what is described in the direct and indirect effects discussions (see section 3.6.3).
Snow King Mountain Rafferty Lift Replacement and Ski Trail Construction	
Snow King Mountain Communications Services	
Snow King Mountain Snowmaking Infrastructure	
Snow King Resort Vault Toilet	
Snow King Mountain Aerial Adventure Course	

Table 3-28 (cont'd). Cumulative effects on wildlife species affected by Alternatives 2–4.	
Cumulative Action	**Cumulative Effects**
Flammulated Owl (Analysis Area: Individual home range defined as 0.25 mi. from permit area)	
Invasive Plant Management	This project would not impact nesting or foraging habitat, the sensitive portion of flammulated owl habitat. As a result, there is no potential for cumulative effects.
Snow King Lower Elk Lighting	The projects that overlap with the existing permit boundary area for Snow King have already taken place and their impacts, and the conditions those impacts created, are a part of the affected environment descriptions of existing habitat conditions (see section 3.6.2). Thus, these projects would not have any cumulative effects beyond what is described in the direct and indirect effects discussions (see section 3.6.3).
Snow King Mountain Rafferty Lift Replacement and Ski Trail Construction	
Snow King Mountain Communications Services	
Snow King Mountain Snowmaking Infrastructure	
Snow King Resort Vault Toilet	
Snow King Mountain Aerial Adventure Course	
Great gray owl (Analysis area: Individual home range defined as 2.75 mi. from permit area)	
Invasive Plant Management	This project would not impact nesting or foraging habitat, the sensitive portion of great gray owl habitat. As a result, there is no potential for cumulative effects.
Snow King Lower Elk Lighting	The projects that overlap with the existing permit boundary area for Snow King have already taken place and their impacts, and the conditions those impacts created, are a part of the affected environment descriptions of existing habitat conditions (see section 3.6.2). Thus, these projects would not have any cumulative effects beyond what is described in the direct and indirect effects discussions (see section 3.6.3).
Snow King Mountain Rafferty Lift Replacement and Ski Trail Construction	
Snow King Mountain Communications Services	
Snow King Mountain Snowmaking Infrastructure	
Snow King Resort Vault Toilet	
Snow King Mountain Aerial Adventure Course	
Northern goshawk (Analysis area: Individual home range defined as 2 mi. from permit area)	
Invasive Plant Management	This project would not impact nesting, foraging, or post-fledgling areas, the sensitive portion of northern goshawk habitat. As a result, there is no potential for cumulative effects.

Table 3-28 (cont'd). Cumulative effects on wildlife species affected by Alternatives 2–4.	
Cumulative Action	**Cumulative Effects**
Snow King Lower Elk Lighting	The projects that overlap with the existing permit boundary area for Snow King have already taken place and their impacts, and the conditions those impacts created, are a part of the affected environment descriptions of existing habitat conditions (see section 3.6.2). Thus, these projects would not have any cumulative effects beyond what is described in the direct and indirect effects discussions (see section 3.6.3).
Snow King Mountain Rafferty Lift Replacement and Ski Trail Construction	
Snow King Mountain Communications Services	
Snow King Mountain Snowmaking Infrastructure	
Snow King Resort Vault Toilet	
Snow King Mountain Aerial Adventure Course	
Three-toed woodpecker (Analysis area: Individual home range defined as 0.25 mi. from permit)	
Invasive Plant Management	This project would not impact nesting or foraging habitat, the sensitive portion of three-toed woodpecker habitat. As a result, there is no potential for cumulative effects.
Snow King Lower Elk Lighting	The projects that overlap with the existing permit boundary area for Snow King have already taken place and their impacts, and the conditions those impacts created, are a part of the affected environment descriptions of existing habitat conditions (see section 3.6.2). Thus, these projects would not have any cumulative effects beyond what is described in the direct and indirect effects discussions (see section 3.6.3).
Snow King Mountain Rafferty Lift Replacement and Ski Trail Construction	
Snow King Mountain Communications Services	
Snow King Mountain Snowmaking Infrastructure	
Snow King Resort Vault Toilet	
Snow King Mountain Aerial Adventure Course	

3.6.5 DESIGN CRITERIA

1. Shift the southern boundary of the western boundary adjustment area to the actual ridgeline to provide a buffer between summit development and use and the winter wildlife habitat lower on the slope. Administratively and physically design and control the permit boundary seasonally as needed regarding the sensitive wildlife habitat below.
2. Do not clear, cut, burn, drive on, or park equipment on vegetation that may harbor nesting birds during the breeding season (May 15–July 15). If this is not possible, survey for nesting birds no more than 10 days prior to beginning work. If no nests are found, project activities may proceed. If nests are found, notify the Forest Service permit administrator.
3. Construct mountain biking trails in a way that does not require the removal of any northern goshawk nest trees.

4. Administratively and physically design and control bikers use from the lift down Leeks Canyon beyond the permit boundary or on the Upper Skyline trail until July 1 to protect potential elk parturition areas.
5. Do not glade the islands of forested habitat between runs 4, 5, and 7 in the eastern boundary adjustment area. This does not preclude fuel treatments authorized under this decision or determined to be necessary in the future.

3.7 CULTURAL

3.7.1 SCOPE OF ANALYSIS

3.7.1.1 Historic Landscape

- *How would construction and use of the proposed infrastructure affect Snow King's historic landscape?*

Snow King is one of the oldest ski areas in the US, with its roots in the 1920s when Jackson residents climbed the "town hill" under their own power. The first lift, a rope tow, was constructed in 1939. While most historic infrastructure has been demolished or upgraded, some evidence of the ski area's history remains. In 2014, part of the ski area was recommended as eligible for listing on the National Register of Historic Places as a historic landscape. The Wyoming State Historic Preservation Office concurred with that determination, but the site has not been formally nominated for listing. Construction of the proposed infrastructure could affect the historic resources on which this recommendation was based.

Indicator: Assessment of potential impacts on the resources supporting the eligibility recommendation. Consultation under Section 106 of the National Historic Preservation Act is an ongoing, parallel process.

3.7.1.2 Native American Concerns

- *How would construction and use of the proposed infrastructure affect Traditional Cultural Places or other Native American tribal resources?*

The Jackson Hole area has been used for various purposes by Native Americans for millennia. Tribes who frequented the area include the Crow, Eastern Shoshone, Gros Ventre and Assiniboine, Northern Arapaho, and Shoshone-Bannock. Construction and use of new facilities at Snow King could impact resources or uses important to area tribal groups.

Indicator: Government-to-government consultation with tribal groups with interest in area resources, in accordance with Executive Order 13175.

3.7.2 AFFECTED ENVIRONMENT

3.7.2.1 Historic Landscape

Since the 1920s, the Snow King ski area has played an important role in recreation, commerce and community development in Wyoming and Jackson Hole. As Wyoming's first ski area, Snow King paved the way for similar winter resorts on Forest Service land across the state. Within Jackson Hole, the development of Snow King fostered a community culture built around the enjoyment and skill of winter sports, which eventually made Jackson Hole an international ski destination. Snow King first established Jackson's reputation as a ski town.

Extensive documentation of the ski area has been conducted and includes a full historical context and analysis of the historic integrity and National Register eligibility of the resort (Humstone 2012, Davis 2014). In 2018, a third study was conducted to assess the historic landscape and contributing properties associated

with the current improvement plans to the ski mountain and its associated facilities (Sladek 2019). The following summary is drawn from those studies.

3.7.2.1.1 Early History

Skiing has been part of Jackson Hole culture for more than 100 years. Historic photographs and local histories show that by the early 1900s skiing was established as a means of getting around the valley during the long winter months, and a necessity for carrying the mail. As transportation improved, skiing changed from a necessity to winter recreation. The mountain now known as Snow King offered an ideal location for skiing. It was conveniently located, and its lower slopes were sparsely forested due to a forest fire in 1879, making skiing down viable – if not exactly easy. Starting in the 1920s, skiers began hiking up the mountain – sometimes called Kelly's Hill or simply "the town hill" – and enjoying the steep downhill run. Around this same time, ski jumping became a popular sport on the hill. Mike O'Neil, who moved to Jackson during the winter of 1925-1926 with the Forest Service, built one of the first ski jumps on Snow King.

In 1936, the Civilian Conservation Corps (CCC) constructed a horse and hiking trail to the top of Snow King for the Forest Service, thus making the first of many physical changes to the hill to facilitate its use for recreation. The CCC trail became the first "official" ski run on the mountain. The following year, mountaineer and skier Fred Brown helped to form the Jackson Hole Ski Association which launched a national campaign to promote skiing in Jackson Hole. The ski club was responsible for changing the name of the hill to Snow King in the 1930s.

Neil Rafferty, who came to Jackson in 1930, was instrumental in developing and running the ski area at Snow King for 35 years, earning the moniker "Father of Snow King." In 1939 he won a contract with the Jackson Hole Club, an early chamber of commerce, to build an "uphill" facility on Snow King. He secured a permit from the Forest Service to run the lift to Old Man's Flats, and a new ski era in Jackson began. The lift increased popularity of the mountain which included regular races and other events sponsored ty the Jackson Hole Ski Club. By 1945 Rafferty had added two rope tows and was operating the ski area Wednesday and Thursday afternoons, and weekends from 11 am to 6 PM. Lights were added that allowed for night skiing.

Snow King was one of the first ski areas to be permitted on Forest Service land, and its success laid the foundation for later development of other Forest Service ski areas. The 1939 Teton National Forest "Recreation Master Plan" makes a brief mention of skiing and other winter sports, identifying the "Jackson Winter Sports area" (Snow King) as "easily accessible to school children and local residents."

In 1946 the Jackson Hole Winter Sports Association was formed with its immediate purpose being to take advantage of the post-war boom in the ski industry. With the support of local investors, the association was able to purchase an old tramway which had been used in a gold mining operation near Salida, Colorado, and hired a Denver contractor to construct a lift from it. The lift was installed in 1946–1947 and was an instant sensation; in its first full year of operation (1948–1949), more than 8,500 people rode the lift to the top of the mountain.

The 3,800-foot-long lift rose 1,400 feet through a narrow cut in the trees to the summit of Snow King, and serviced runs such as Belly Roll and Elk Run. Both of these runs still exist today, although somewhat wider than they were 60 years ago. The run called Exhibition today was a winding trail through the trees known as Screwy Schuss; today's Cougar was called The Funnel. There were also two rope tows of 1,000 and 600 feet, respectively, which serviced open slopes, and two jumps. Warming lodges were available at both the top and bottom of the ski area, with a snack shop at the top.

When the lift opened, the upper part of the mountain was quite heavily wooded. Throughout the 1940s and 1950s improvements were made to the runs on the hill, which gradually went from narrow cuts through the forest to bona fide ski runs.

Although the new lift was popular, the ski area was not an immediate financial success. In order to increase use of the lift, the association added a half-way station to enable novice skiers to access suitable terrain

without resorting to a rope tow. They also began serious promotion of summer lift rides to the top of Snow King.

By the late 1950s, the single chairlift was decidedly outdated, and the Winter Sports Association began making plans to upgrade it to a double chair. Work began in fall 1958, and it opened in 1959. The old cable was replaced with an 8,800-pound track cable and a new break-over tower was constructed at the top of the lift for unloading the double chairs. By 1961, Snow King had a summer business that included an alpine slide and chairlift rides to the summit, where one could get a snack and take in the view at the glass-walled restaurant known as the Panorama House.

The upper bull wheel was likely housed in what is now the ski patrol building. The unloading platform was constructed of steel posts and girders, with board decking, ramps and stairs. It still exists in much the same configuration today and is used as an observation deck. On the deck were two small, gable-roofed buildings, a lift service building and the Snack Shack, which sported a sign reading "Order Picnics Here." It appears that the small lift service building was of half-log construction and dated from the earlier lift.

3.7.2.1.2 Recent History

In 1971, Western Standard Corporation of Riverton, Wyoming, purchased the Snow King ski area operation along with 60 acres at the base of the mountain. The corporation's main interest was developing a resort hotel and convention center. At the time of purchase, Western Standard also secured a lease from the town of Jackson on 27 contiguous acres on the mountain and a 20-year Forest Service special use permit for approximately 375 acres of National Forest System land on the mountain above. The double chairlift, the log ski shelter building at the base, and the warming building with a Snack Shack at the summit, as well as the log house known as the Kelly-Murie house and the Alphorn Motel at the base of the mountain were part of the purchase.

In 1976 Western Standard built the current Snow King Lodge and developed the ski area, including a new lift named after Neil Rafferty on the east side (1978). Corporate consolidation of the lodge and ski area occurred in 1979. Other corporate changes occurred over the next 20 years including the partial purchase by Americana Hotels (1981); a repurchase by Snow King Resort (1987) and the corporate restructuring as Snow King Resort, Inc. (1992).

Over the next two decades Western Standard continued to improve the ski area including the expansion of ski runs, night skiing (1980), a double chairlift (1980) and the triple-chair Cougar lift (1994) which provided better access to intermediate terrain.

Over the years, Snow King has played an integral role in the development of Jackson's skiing and outdoor recreation culture, a culture that has valued winter sport competition. Snow King hosted slalom and ski jumping competitions in the 1930s and the Junior Nationals in 1953. The ski area maintains local and national importance as a ski racing venue and in March 2019 hosted its 43nd Annual World Championship Snowmobile Hill Climb.

3.7.2.1.3 Contributing Resources

Figure 3-38 shows the boundary of the Snow King's historic landscape and the area of potential effects on that landscape, defined as the proposed adjusted special use permit boundary. Resources contributing to the historic landscape's eligibility for listing on the National Register are found within the historic landscape boundary. Actions outside that boundary, but within the area of potential effect, could also affect eligibility by altering its setting.

The north face of the mountain overlooking the town of Jackson has been used as a recreational ski area since the 1920s, but no landscape features remain from this early period. Because of extensive development that occurred during the post-World War II era, the only contributing features dating from that early period are the mid-1930s CCC trail and Summit Shelter. Most of the contributing historic resources associated with the ski area were built between 1946 and the mid-1960s, marking the resort's most intensive period of

development. These include 12 of the ski trails, a building (the Panorama House), and a structure (the old Snow King double chairlift unloading platform, now converted to an observation deck). All of these features are within the historic landscape boundaries and contribute to its eligibility.

In her 2014 study, Davis argued that more than 75 percent of the individual component resources on the mountain contributed to the ski area's eligibility and that this number was higher when the ski area was looked at from a spatial perspective. What she found was that the ski area consisted of 19 contributing resources that included 14 sites, four buildings, and one structure. Among the noncontributing resources, she found three sites, one building, and three structures, for a total of seven. Considering that balance, Davis concluded that the non-contributing resources failed to significantly impact the ski area's overall visual and functional cohesiveness, and that it continued to read as a historic recreational landscape.

During the 5 years that have passed since the 2014 study was completed, additional changes have occurred at the ski area. These include the demolition of a few historic resources and the construction of some new features. All the resources on the site were reevaluated in Sladek's (2019) study, resulting in a revised resource count that includes 12 sites (ski runs), two buildings (Panorama House and CCC Summit Shelter), and one structure (Summit lift unloading platform/observation deck). The total number of individually contributing resources has decreased by 22 percent due to demolition of the old Summit lift base drive shelter and Snack Shack along with the re-categorization of the CCC trail and windbreak terrace as noncontributing resources, according to Sladek. The Bridger-Teton has not confirmed this conclusion regarding the CCC trail. The number of noncontributing resources has increased to 16, more than the 15 contributing resources.

Sladek concluded that despite the negative trend of the resource count, Snow King retains its integrity and National Register of Historic Places eligibility because the mountain still reads as a cohesive historic landscape and exhibits much of its historic character from a spatial perspective. The historic landscape continues to be dominated by the broad spatial array of groomed ski runs and forest, features that shape most of the mountain face. That particular arrangement laid out across the landscape remains visible from Jackson and its environs, and it continues to convey the history of the resource as a whole.

The following list provides information on each remaining, contributing resource located within the Snow King historic district drawn from Sladek's 2019 study. The list is grouped by resource type, date of construction, and geographic location. The discussion of direct and indirect effects below (section 3.7.3.1) will assess impacts on these resources.

Ski Runs

- Tow Slope/Holy Land – This intermediate trail was constructed around 1946. It has not experienced any alterations since it was last recorded in 2014.
- Old Man's Flats/Old Lady's Flats – This intermediate run was constructed around 1947. The only change that has taken place there since 2014 has involved grading to decrease the angle of the slope.
- Elk & Lower Elk – This advanced to intermediate run was constructed around 1948. Since 2014, the only change to Elk and Lower Elk has involved the installation of a pump house for the snowmaking waterline located at an approximate midpoint along the run adjacent to the western tree line. Although visible from the base, the building is not readily apparent unless its location is pointed out.
- Belly Roll – This steep, expert run, constructed in 1946, is located toward the top of the mountain, running for a distance of about 1,200 feet from the ridgeline toward the northwest. It eventually merges into the Cougar run. No changes have taken place along this run since 2014.

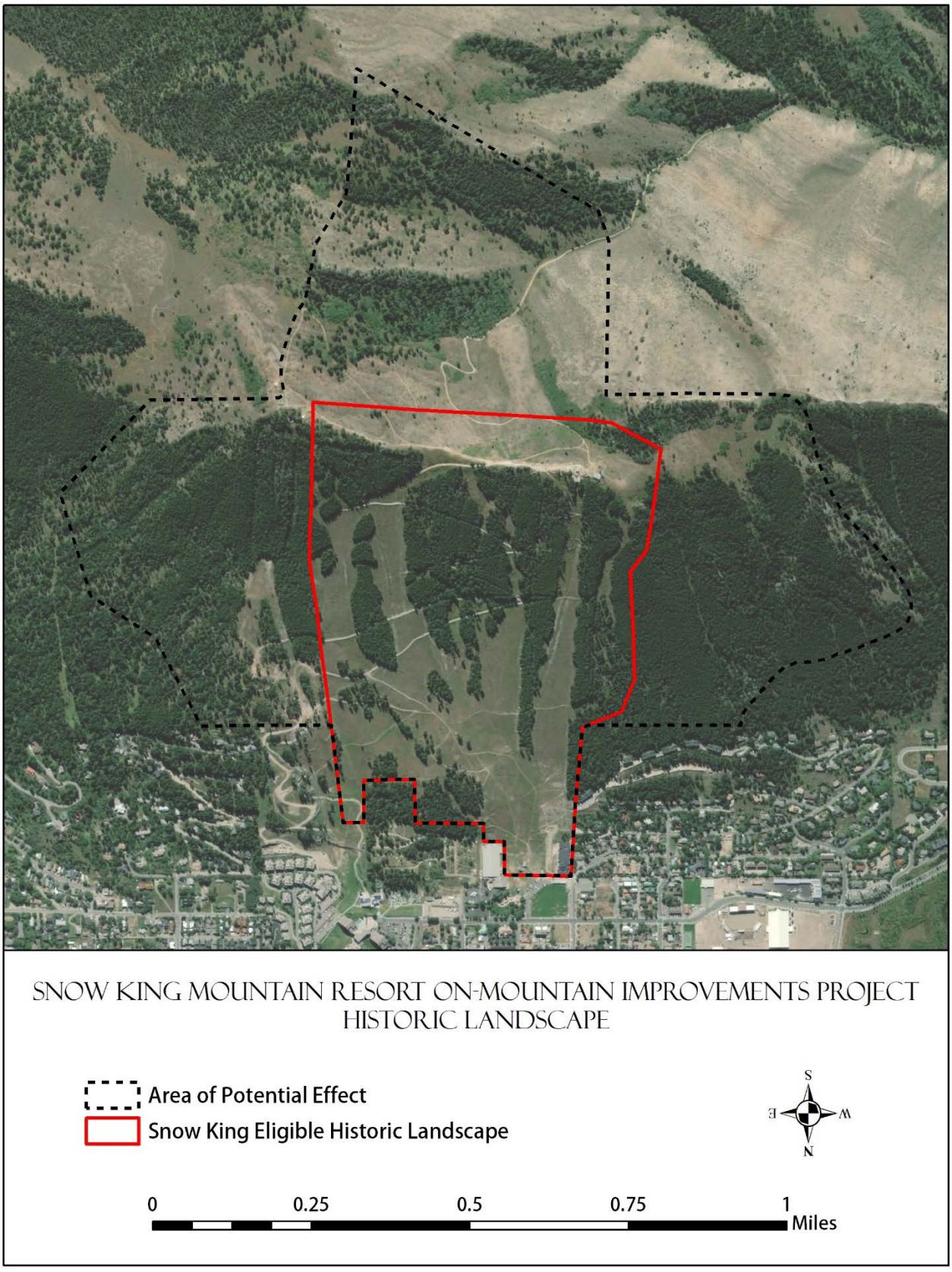

Figure 3-38. Snow King historic landscape and area of potential effect.

- Jump Run – This advanced run, constructed around 1950, is located on the lower flank of the mountain. It runs through the trees on a diagonal for a distance of 600 feet from Old Man's Flats and Turnpike down to the Cougar lift and the Snow King Sports and Events Center. Since 2014, a horse trail was developed along and across this ski run, but this trail is no longer used. Although visible when the site is free of snow, it is being erased by vegetation. In addition, some trees along the run have been thinned, although larger ones have not been removed.
- East and West "S" Chutes – Treated as a single resource, these two steep, curved, parallel expert runs are separated by a stand of trees. Constructed around 1952 and 1959, they are located toward the eastern top of the mountain and run from the ridgeline for a distance of 1,450 feet down to the top of the Grizzly run. No changes have been made to the two runs since 2014.
- Grizzly & Lower Grizzly – This advanced run, constructed around 1958, is in the upper eastern area of the mountain, heading north and then curving to the northwest. It starts at the lower end of the West "S" Chute and runs for a distance of 1,370 feet parallel to Elk and Lower Elk. Lower Grizzly eventually merges into Old Man's Flats. No changes have been made to the run since 2014.
- Cut Off – This short, advanced run, just 400 feet in length, is located in the upper eastern area of the mountain. Constructed around 1959, it starts at the lower end of the East "S" Chute and ends where it merges into the upper Grizzly run. No changes have been made to the run since 2014.
- Cougar – This advanced run is predominantly located in the lower half of the mountain, directly above the Cougar lift. Constructed around 1958, it starts at the lower end of Belly Roll, extending for a distance of 2,475 feet to where it merges into Tow Slope/Holy Land. The Cougar run is aligned on a north-south axis and is bordered by trees to the west and the short, non-historic Bighorn run to the east. Since 2014, the only change has involved the installation of snow guns along its western tree line.
- Exhibition – This advanced run was built around 1947. It starts at the lower end of the non-contributing run known as Upper Exhibition run, constructed in the 1980s. Although there is no visible demarcation between Upper Exhibition and Exhibition, they were treated in the 2012 and 2014 studies as separate runs, and Upper Exhibition is non-historic. Changes made to Exhibition since 2014 have been limited to the installation of lighting along with snowmaking guns.
- Bearcat – This narrow expert run, constructed around 1959, is located toward the top of the mountain, where it starts along the ridgeline west of the Panorama House. From there it drops down 1,200 feet to eventually merge with the Bearcat Glades run. A short connection also diverges to the east to meet the Exhibition run. No changes have been made to the run since 2014.
- Bearcat Glades – This advanced run, built around 1965, is located below the Bearcat run and proceeds through a thinned stand of trees for 1,100 feet before merging with the Exhibition run. No changes have been made to the run since 2014.

Buildings and Structures

- Panorama House – This building, constructed around 1960, is located along the western ridgeline of Snow King Mountain, just west of the unloading station for the Summit lift. It is a manufactured building that was purchased by the ski area and then customized for use in this location. By 2014, the building had experienced alterations that included the introduction of a three-light fixed window in the southeast elevation, an exterior mechanical unit, and rooftop antennas.

  Since 2014, the Panorama House has experienced additional modifications, including replacement of all windows, opening of a few new windows (one used as a ticket window), installation of some wood siding, complete remodeling of the interior, and placement of additional antennas on the rooftop. Despite these alterations, the building is in its original location, and enough of it remains that it continues to convey much about its original design, use, and construction.

- CCC Summit Shelter – This small wood-frame building is located among the trees a short distance southwest of the Panorama House. Although its origins and history could not be confirmed through archival research, it appears to have been constructed during the mid-1930s and used by the CCC. Mounted on skids, it was designed to be moved as needed. No changes have been made to the building since 2014.
- Old Snow King Double Chairlift Unloading Platform – This structure, built in 1959, is located on the ridgeline at the top of the mountain, just northeast of the unloading station for the Summit lift. While the platform remains standing, several historic features were removed in the 1980s after the new Summit lift was constructed. Non-historic chain link fencing has been added between the original pipe railings that run along the platform's perimeter as a safety measure. No changes have been made to the structure since 2014. Despite these alterations, the platform is in its original location and enough of the structure remains that it continues to convey much about its original design, use and construction.

3.7.2.2 Native American Concerns

Native Americans have been on this landscape for 12,000 years. Over the past few decades several publications have discussed their presence in the Greater Yellowstone area in general (Nabokov and Loendorf 2004, Hughes 2000) and Jackson Hole in particular (Wright 1984, Crockett 1999, Walker and Graves 2007). Other earlier studies include Shimkin (1947), Hultkrantz (1961) and Trenholm and Carley (1964). Much of the following section is condensed from these earlier studies which should be consulted for a greater in depth understanding of historic Native American occupation of the region.

Contact between Euroamericans and regional tribes began in August of 1806 with the arrival of the Corps of Discovery (Moulton 1993). A member of Lewis and Clark's expedition, John Coulter, provided tales of sulphur beds, geysers, and thermal pools that led to the naming of this region Colter's Hell when he ventured into Yellowstone in the fall of 1807. Coulter is also reported to have later explored Jackson Hole.

The mountain-dwelling people encountered by the early trappers and explorers were generally referred to as the Sheepeaters and were said to have spoken the Snake language. These people were part of the Shoshone Nation whose language is part of a large linguistic group known as Uto-Aztecan. Members of this group ranged as far north as the Northern Plains and Cascade Mountains south to the western Great Basin and Mexico. The origin of the term Snake is not known but has been argued was a misinterpretation of serpentine hand gesture used to describe their method of constructing grass and brush shelters.

The various terms applied to the Shoshone, such as Sheepeaters, described members of the Eastern Shoshone whose main source of subsistence, at least seasonally, was the mountain sheep. The Tukudika remained high in the mountains and were largely pedestrian until they were forced to the Wind River Reservation around 1868. Other names they called themselves also applied to subsistence patterns. For example, the Kucundicka, buffalo hunters of the Plains; Pa'Iahiadika or elk eaters who hunted on the western slopes of the Tetons; the Do'yia or mountain dwellers of the Yellowstone region (Trenholm and Carley 1964).

For the Shoshone these names did not define rigid political divisions, all were members of the Shoshone nation, but was a means to define an ecological niche that a particular group inhabited. This information was used to convey important information concerning the ecosystem in which they lived, as well as providing clues about the vast and intimate knowledge these people held about these ecosystems. For the Shoshone and other native groups, the separation of the cultural and spiritual with the land does not exist and all is interrelated and connected. (Crockett 1999)

Demographics and group organization were seasonal. During the early 1800s the Wind River Shoshone comprised of between 2,000 and 3,000 individuals. In the winter and spring, they split into three to five smaller groups or bands. Each band consisted of 100 to 200 people with each occupying a different portion

of the Shoshone territory. In the summer months each band divided further into family groups of 10 to 30 people.

With the coming of autumn, individual family groups reunited for the annual communal bison hunt in the intermontane basins and plains. This hunt allowed for these groups to obtain and prepare food and hides for the upcoming winter. With winter came a further division into smaller bands that resided in different portions of the vast Shoshone territory.

In the 1820s and 1830s, it was fur that initially brought Euroamericans to the region. Later, in the 1850s and 1860s, gold strikes in Idaho and Montana brought more, which resulted in the organization of the territories of Idaho (1863), Montana (1864), and Wyoming (1868). In the 1860s, mining expeditions, and later (1870), the first scientific expedition was mounted to explore the region.

Between 1860 and 1877 a series of treaties established reservations for the confinement of regional tribes. These included the Fort Bridger Treaty (1868) which established the Fort Hall Reservation for the Northern Shoshone and Bannock and the Wind River Reservation for the Eastern Shoshone. An executive order by President Ulysses S. Grant (1875) established the short-lived Lemhi Reservation for the Lemhi Shoshone, as well as the Sheepeater Indians (also Shoshone) and Bannocks.

On 1 March 1873, President Grant signed the Organic Act that set aside "the tract of land in the Territories of Montana and Wyoming, lying near the head-waters of the Yellowstone River…as a public park or pleasuring-ground for the benefit and enjoyment of the people…" This desire to establish Yellowstone National Park, despite the nobility of the idea, was tied inextricably to the expansion of the western territories and the resettlement of native groups.

Although the Fort Bridger Treaty permitted the Shoshone and Bannocks access to hunting grounds off the reservation on all unoccupied lands, by the mid-1890s sentiment against the Indians was growing and complaints were being leveled by whites. Theodore Roosevelt may have provided the loudest voice when he published an account of a hunting trip to the Two-Ocean Pass area blaming the Shoshone for his lack of hunting success.

By the turn of the twentieth century, the Shoshone had been on the reservation for over three decades, and their culture had changed considerably. Local interests were encroaching on the reservations, and continued attempts were made to abolish the Lemhi and Fort Hall reservations. The Dawes Severalty Act of 1887 pacified some of the local interests, but reservation lands were continually being eaten away by the allotment, alienation, and homesteading processes. Reduction of the lands into farming plots between 1887 and 1933 was disastrous, since it restricted the Indians to farming plots that were too small to support them adequately. The inadequate water supply saved the Wind River Reservation from encroachment.

While the establishment of Yellowstone National Park was not the sole cause of the decline of the Shoshone who once called it home, it was part of the larger and more complex processes that resulted in this devastation. During the 20th century, an increased awareness of reservation problems, and the increasing presence of Native Americans in the national political debate, made for some improvements in the lives of these groups, although still largely lacking. While tribal leaders continue to wrestle with issues of treaty and agreement rights, along with social and economic issues, they are now frequently consulted on issues of public land policy in the Greater Yellowstone area, a tract of land from which they were forcibly expelled.

Currently many tribes are considered associated with Jackson Hole and consulted by federal land managing agencies on various projects. For this analysis, the Bridger-Teton sent consultation letters to the following tribes: Crow, Eastern Shoshone, Gros Ventre and Assiniboine, Northern Arapaho, and Shoshone-Bannock. No Native American concerns were identified.

Since 1980, 25 cultural resource surveys have been conducted in the Snow King area in compliance with Section 106 of the National Historic Preservation Act, including the most recent in 2018 that was specific to this project (Cannon Heritage Consultants, Inc. 2018). In accordance with the Section 106 Process, all

of these reports have been submitted to the Wyoming SHPO for review and concurrence. No significant Native American sites have been identified within the project area.

3.7.3 DIRECT AND INDIRECT EFFECTS

3.7.3.1 Historic Landscape

3.7.3.1.1 Alternative 1

Under the no-action scenario, the remaining resources contributing to the eligibility of Snow King's historic landscape would be unaffected.

3.7.3.1.2 Alternative 2

Previous studies discussed above (section 3.7.2.1) identified the 12 historic ski runs as the main character defining features of the historic landscape as they are most visible from Jackson and its environs and have changed little over the past 50 years. This alternative includes widening of historic runs Belly Roll, Upper Exhibition, and Bearcat/Bearcat Glades, and addition of new runs 8–14 interspersed among the historic runs within the historic landscape boundary. Sladek (2019) assessed these changes as a direct adverse effect on the historic landscape because of their visual impact on the historic run configuration.

This alternative would also add runs 3–7 east of the historic landscape boundary. Sladek concluded that while run 3 would be screened by trees from the historic landscape, it would be high on the slope and visible from Jackson and northern viewpoints and thus an indirect adverse effect on the setting of the historic landscape. The remaining trails would be lower on the mountain, screened by trees, and in an area already subject to non-historic development. As a result, they would have no effect. As indicated by the scenic analysis completed for this EIS (section 3.12, Figure 3-41), runs 4–7 would be difficult to discern from Jackson.

In regard to contributing buildings and structures, construction of the proposed summit building would require removal of the Panorama House and the old Summit lift unloading platform/observation deck as they lie within the proposed building footprint. Sladek identified removal of the Panorama House as loss of a contributing resource and a potential direct adverse effect, pending State Historic Preservation Office concurrence that it is still contributing despite recent modifications. The same conclusion would likely hold for the lift unloading platform/observation deck.

Sladek also noted that collectively the proposed development on the summit could adversely affect the historic district if it were not designed and built in a way that minimized its visual impact. As discussed in the scenic resources analysis (section 3.12.3.1.2), design criteria would be in place to avoid this potential adverse effect, and these new features would not be visually discernible from the base area, the historic landscape area, or Jackson.

The back side of Snow King is outside the Jackson viewshed. While proposed development there would be within the area of potential effect, it would have no impact on the historic landscape.

In summary, implementation of Alternative 2 would adversely affect 14 of the 15 contributing resources: the 12 historic ski runs by modification and/or alteration of their visual signature through construction of intermingled new runs, and the Panorama House and unloading platform/observation deck by removal. The CCC Summit Shelter would not be affected.

3.7.3.1.3 Alternative 3

The effects of this alternative on the historic landscape would be the same as those discussed above for Alternative 2 with one exception. Under Alternative 3, Snow King would develop an interpretive program focusing on the history of the ski area. The CCC Summit Shelter would house interpretive displays, and more interpretive information may be provided in the summit building. This is intended to offset the adverse effects of other elements of this alternative.

3.7.3.1.4 Alternative 4

Reducing impacts on Snow King's historic landscape was one of the objectives in developing Alternative 4 (sections 2.2 and 2.6). The difference from Alternative 3 in this regard is the elimination of most proposed new ski runs in and adjacent to the historic landscape to protect the visual integrity of the historic ski runs. Runs 8 and 10–12 would not be developed, leaving only the very short run 9, widening of upper Exhibition, Belly Roll and Bearcat, and clearing of new run 13 within or adjacent to the historic landscape boundary.

To provide downhill capacity in balance with the increased uphill capacity provided by the proposed Summit gondola, Alternative 4 also includes development of new runs 1, 2, 3, and 15. Runs 1 and 2 would be on the east side of a sub-ridge that would provide a visual buffer for the historic landscape and largely block views from Jackson. Run 3 would be adjacent to the historic landscape but separated by a band of dense forest. Run 15 would be relatively narrow, screened by tree canopy, and distant from the historic landscape.

Overall, this alternative would reduce the adverse effects on the signature historic ski runs and thus on the historic landscape. Impacts on the contributing buildings and structures would be the same as under Alternative 3.

3.7.3.2 Native American Concerns

3.7.3.2.1 Alternative 1

As discussed above 3.7.2.2, Tribal consultation for this project identified no Native American concerns, and no significant Native American sites have been identified within the project area. As a result, no impacts on this resource are anticipated under this alternative.

3.7.3.2.2 Alternative 2

As discussed above 3.7.2.2, Tribal consultation for this project identified no Native American concerns, and no significant Native American sites have been identified within the project area. Design criteria 1–3 (section 3.7.5) would protect any undiscovered heritage resources or sites encountered during construction. Based on these considerations, no impacts on this resource are anticipated under this alternative.

3.7.3.2.3 Alternative 3

Same conclusion discussed above under Alternative 2.

3.7.3.2.4 Alternative 4

Same conclusion discussed above under Alternative 2.

3.7.4 CUMULATIVE EFFECTS

Of the cumulative actions identified in section 3.1.2, one past project and one current project have the potential to effect Snow Kings historic landscape in a cumulative way, overlapping the direct and indirect effects of the alternatives considered here. The 2015 Rafferty lift replacement and ski trail construction resulted in visible alteration of terrain east of the historic landscape. However, this development is separated and screened by an intervening forest stand, reducing its impact. The cumulative effect of this project is addressed through its inclusion, as appropriate, in the description of the affected environment (section 3.7.2.1).

The current project is the Snow King Lower Elk Lighting project, which will complete the effort begun in 2015 to reduce light pollution in the sky with energy efficient magnetic induction lights. As night skiing has long been a part of Snow King (since 1980), this would not constitute an adverse impact. (See section 3.12 for a detailed discussion of night lighting effects.)

As this analysis identified no direct or indirect effects on Native American concerns, there is no potential for cumulative effects on this resource.

3.7.5 DESIGN CRITERIA

The MOA resulting from consultation on impacts to Snow King's historic landscape under Section 106 of the National Historic Preservation Act identified the following stipulations. These measures will be included in the Bridger-Teton's decision regarding this project as conditions of approval for any authorized actions.

1. Documentation of the Snow King Ski Area Historic District 48TE1944
    a. Prior to project implementation of new construction, Snow King shall obtain professional photography of the Historic District which shall include UAV (Unmanned Aerial Vehicle/drone) video of the summit and digital photography of the district (MOA Appendix B).
    b. The photographer will follow National Park Service HABS/HAER/HALS Photography Guidelines found at: https://www.nps.gov/hdp/standards/PhotoGuidelines.pdf
    c. Copies of the photo documentation will be provided to the Bridger-Teton, the Teton County Historic Preservation Board (TCHPB), the Jackson Hole Historical Society and Museum (JHHSM), and the Wyoming SHPO for a 30-day review. Snow King will then have 30 days to respond to the comments. The final version of the photo documentation will be submitted within 2 years of execution of the MOA.
2. Rehabilitation of the CCC Shelter into a Historic Center
    a. Snow King shall work with appropriate professionals to ensure design and construction documents meet the "Secretary of Interior's Standards for Rehabilitation" to stabilize and restore the CCC Summit Shelter prior to authorization of demolition of the Panorama House. The plans will be provided to the Bridger-Teton and the TCHPB for a 30-day review. Once the plans have been reviewed by the Bridger-Teton and TCHPB, the plans will be provided to the SHPO for a 30-day review. With written permission from Snow King, the plans may be provided to the public by the Bridger-Teton.
        i. At the time of construction of the new Summit Building, the Snow King Resort will be responsible for implementing the approved design and construction plans for the CCC Summit Shelter.
    b. Snow King will contract with a professional museum (such as the JHHSM)/interpretive design firm to develop an interpretive plan for the Historic District. Interpretive panels/materials will be created for display at the CCC Summit Shelter by the design firm. Historical documentation, artifacts, photographs, oral histories, etc. are available from the JHHSM and the Bridger-Teton.
3. New Summit Building
    a. Snow King will provide building plans for the new summit building to the Bridger-Teton.
    b. The BTNF shall submit design plans at the early conceptual, mid, and near final stages for the new construction to afford the SHPO and TCHPB the opportunity to comment. The Bridger-Teton and Snow King shall ensure that the design for the new construction is compatible with the historic character and materials of the historic properties within the Historic District.
    c. The SHPO shall have 30 days upon receipt of the complete design submittal package to review and comment on the design of the new construction. If no response is received within 30 days of confirmed receipt of the early conceptual, mid, and near final design stage submittal packages, the Bridger-Teton and Snow King may assume that the SHPO has no comment.

4. Historic Interpretive Materials Developed and Available to the Public
    a. Snow King shall use existing and develop new baseline interpretative materials including, at a minimum:
        i. Interpretive materials on display at the CCC Summit Shelter Historic Center described in stipulation 2b.
        ii. Professionally developed historic interpretive video (the interpretive video is distinct from, but may include, the technical photo and video described in stipulation 1 above.)
        iii. Five new oral history interviews from individuals recommended by the JHHSM.
        iv. Documentation of Snow King ski run use and changes over time. Documentation shall include qualitative descriptions of at least eight contributing runs and may include stories and events. Documented changes over time shall include historic changes as well as before-and-after documentation of the current project.
    b. Historic materials will be repurposed for display or reuse by Snow King at a minimum of one location. The location should be available to the public and may be within or outside of the historic district. Examples of locations include the new gondola base or the JHHSM.
    c. Appropriate areas to display historic interpretive materials include the new CCC Shelter Historic Center described in stipulation 2 above. Additionally, Snow King shall ensure historic interpretive materials shall be displayed in at least two of the following physical locations: the new summit building, gondola base, gondola cars, the JHHSM or other public locations. Snow King shall also ensure historic interpretive materials are available to the public via a minimum of two of the three following digital venues: Snow King Mountain Resort's website, the JHHSM website, and social media.
    d. Historic themes appropriate for interpretation are listed in MOA Appendix C.
    e. Snow King shall move the memorial monument to Neal Rafferty to a new location. The new location should be publicly visible and ideally maintained next to the new ski patrol area.

In regard to Native American concerns, the following design criteria should be implemented to protect any undiscovered heritage resources:

5. If any previously unidentified prehistoric or historic cultural resources are identified or encountered at any time during construction, protect the resource(s) until the Forest Service permit administrator is notified and the Forest Service fulfills its consultation requirements, including consultation with the appropriate Tribal representatives.

6. If unmarked human remains are encountered at any time during construction, stop all work in the vicinity of the find, notify the County Sheriff shall, protect the remains, and notify the Forest Service permit administrator immediately to begin proper notification and consultation procedures with the Wyoming State Historic Preservation Office, Native American Tribes, and other local officials as needed (e.g., County Coroner) to determine to what time period and ethnic group the skeletal material may be ascribed and the appropriate treatment.

7. If any previously unidentified Traditional Cultural Places or sacred sites are identified or encountered at any time during construction, protect the resource until the Forest Service permit administrator is notified and the Forest Service fulfills its consultation requirements, including consultation with the appropriate Tribal representatives.

3.8 LAND USE

3.8.1 SCOPE OF ANALYSIS

- *How would construction and use of the proposed infrastructure affect grazing?*

The southern expansion area, which is within Snow King's current ski area special use permit boundary, is overlapped by an active grazing allotment, which is also permitted by the Bridger-Teton. Construction and use of the proposed summer infrastructure could affect forage availability, disturb or displace livestock, or otherwise impact the grazing permittee's operation.

Indicator: Review of utilization levels and patterns of livestock use to assess how proposed activities would impact forage availability and grazing operations.

3.8.2 AFFECTED ENVIRONMENT

The southern portion (back side, south of the ridgeline) of Snow King's permit area lies within the Leeks Canyon Allotment (allotment). The allotment was closed to livestock grazing by the Forest Supervisor in 1918 to protect big game winter range. More recently, permits authorizing livestock use of the allotment have been in effect since 1981 (Forest Service 1981), with the first 10-year permit being issued in 1985 (Forest Service 1985).

The current permit for the allotment allows for 12 saddle horses with a season of use from June 11 through October 16 (128 days or approximately 51 head months), annually. While there have been periods when use did not occur, in recent years livestock use has been at the permitted level. The allotment includes approximately 1,554 acres. Steep terrain combined with limited water sources restrict use of much of the allotment by horses, as discussed below. Note that neither the grazing permit nor the ski area special use permit grant the holder exclusive use rights.

The allotment contains steep canyon terrain with riparian areas in the canyon bottoms, uplands supporting primarily grasses and sagebrush on the south-facing slopes, and aspen and conifers on the north-facing slopes. Permitted forage utilization levels for riparian areas and uplands in the allotment are currently limited to 50 percent with a residual stubble height of 4 inches (Forest Service 2019f).

Two water sources (lower Leeks Canyon and upper Smith Canyon) provide drinking water for the horses. Streams in the main canyons within the allotment are listed as intermittent and do not provide surface water during the grazing season.

The permittee is required to keep livestock contained within the allotment as livestock have been known to enter the Wilson Canyon area due to lack of fencing or terrain barriers. Fencing limits egress of the livestock from the canyon to the west, but much of the allotment boundary is unfenced. Salt and herding as required are also used to contain horses and manage proper utilization rates.

Reflecting these constraints, livestock use occurs primarily along the bottom of Leeks Canyon and in various flatter areas to the south and west. Forage utilization in these areas is light to moderate (35 percent or less). Steeper slopes and areas higher in the watershed exhibit little to no forage utilization (Forest Service 1986b).

The portion of the Snow King permit area contained within the allotment is approximately 135 acres (about 9 percent of the allotment) and is in the northeast corner of the allotment. It abuts the allotment boundary in the extreme northeastern corner, at the top of Leeks Canyon. During a site visit in the fall of 2018, vegetation within the ski area permit boundary showed no sign of livestock use; however, some older horse manure was observed on the Leeks Canyon Road near the ski area permit boundary.

Recreational activities also occur in the allotment. Access into the allotment is restricted from US Highway 26 (Highway 89/187) where the mouth of the canyon is private property and closed to the public. The access

road from US Highway 26 extends into the Snow King permit area and up to the Snow King ridgeline. Mountain bikers ride along the allotment boundary between the summit and Josie's Ridge to the west. An additional road in the northeast corner of the allotment, within the Snow King permit area, provides access to cellular towers near the summit. This road is also used by mountain bikers entering or exiting the permit area and Wilson Canyon (section 3.10). Some mountain bikers ride down Leeks Canyon on the existing road, but the road is steep and dead ends at a locked gate at the private property line, so the way out is back up the canyon on the same road. This reduces the attraction of the route and currently receives very light use.

3.8.3 DIRECT AND INDIRECT EFFECTS

3.8.3.1 Alternative 1

Under Alternative 1, no improvements would be authorized within the southern portion of the Snow King permit area. Therefore, no new impacts on the grazing allotment would occur as a result of ski area activity and utilization rates would be unchanged.

3.8.3.2 Alternative 2

Under Alternative 2, two new lifts, new ski runs (with and without clearing), snowmaking, glading, a yurt camp, an ADA yurt trail, and the mountain bike zone would be added within the southern portion of the Snow King permit boundary. Except for some of the new ski runs, these improvements would temporarily disturb the soil and vegetation to varying extents. Construction activities would occur during the summer months, and recreational activity would be basically year-round, with short gaps during the shoulder seasons. Access to and egress from the improvements would occur from the summit and not via Leeks Canyon Road.

Potential impacts on livestock grazing include forage reduction and disturbance or displacement of livestock which could affect utilization rates in some areas. Effects on forage availability would likely be negligible due to the low level of livestock use that high in the watershed. Beyond that, any forage impact that did occur would be temporary, lasting only until disturbed areas were revegetated naturally or through reseeding.

Livestock disturbance and displacement would potentially be more important issues. Summer activities including construction, mountain biking, and use of the yurt camp could displace livestock from the Snow King permit area. However, the low level of livestock use would make any such displacement a minor impact. In fact, summer infrastructure and activity could constitute an effective barrier to livestock leaving the Leeks Canyon Allotment and crossing into Wilson Canyon through the Snow King permit area.

Potential livestock disturbance or displacement outside the permit area would be a more important matter. Under Alternative 2, lift-served mountain bikers would be free to leave the dedicated downhill trail system and use existing trails and roads. They could ride down Leeks Canyon on the existing road into areas where grazing is concentrated. The allotment is currently permitted for horses, which are typically not disturbed by human activity. However, the horses could become startled when approached by mountain bikers, and continual exposure could cause them to avoid the area, thereby potentially increasing utilization rates in other portions of the allotment.

As discussed above (section 3.8.2), mountain bikers who venture down the Leeks Canyon Road are stopped by a locked gate at the private property line and must retrace their route back up the canyon or trespass to get out. Under current conditions, this entails riding clear back up the canyon, likely to Ferrin's trail, and back to Jackson. However, under Alternative 2, not only would there be many more bikers on the back side relative to Alternative 1, but the A Lift would provide access back to the summit. This would increase the appeal of a trip down-canyon.

As discussed in the recreation analysis (section 3.10), most lift-served bikers would be riding the new dedicated downhill bike trails and not be interested in going down Leeks Canyon for a number of reasons (e.g., their heavy, downhill bikes and safety equipment, and the fact that they had paid to ride high-quality, purpose-built flow trails not two track roads). However, given this alternative's free access to trails outside the permit area, some cross-country bikers might opt to ride the lift specifically for easier access to the existing road and trail system.

Based on these offsetting considerations, it seems likely that there would be additional mountain bike traffic down Leeks Canyon Road under Alternative 2 than Alternative 1, and therefore more potential to disturb and displace horses in the lower portion of the canyon which could result in higher utilization rates in other portions of the allotment. However, additional mountain bike use would be limited due to the steepness of the road and the dead end at the bottom.

Hikers from the yurt camp could also venture down Leeks Canyon, but they would pose less risk of disturbing livestock for three main reasons. First, the camp would host primarily organized activities, often involving groups, so informal walks down the road would be less likely. Second, walkers would move more slowly and be less likely to startle horses. Third, walkers generally do not travel as far as bikers, limiting the extent of any impact they might cause.

To put these potential effects in context, the allotment is of sufficient size to ensure adequate amounts of forage for the number of livestock involved, even if some displacement of animals occurred. This could incrementally increase the level of management required of the permittee to comply with the terms of the grazing permit ensuring utilization rates would meet the annual standard.

3.8.3.3 Alternative 3

Under Alternative 3, changes in infrastructure and activities in the southern portion of the ski permit area would be the same as under Alternative 2, so projected impacts would also be the same. The exception would be mountain biking. Under Alternative 3, mountain bikers would be restricted to the dedicated downhill mountain bike trail system. They would not be allowed to travel down Leeks Canyon Road. This would preclude any new impact on livestock or management of the allotment and reduce the potential to affect utilization rates outside the ski area.

3.8.3.4 Alternative 4

Under Alternative 4, changes in infrastructure and activities in the southern portion of the permit area would be the same as under Alternative 3, so projected impacts would also be the same. The exception would be mountain biking. This alternative, like Alternative 2, would create the potential for more bike traffic down Leeks Canyon, which could impact livestock or management of the allotment as well as utilization levels. However, the adaptive management approach for the mountain bike program would address this impact should it arise, likely through closure of the road below the permit boundary.

3.8.4 CUMULATIVE EFFECTS

The cumulative effects analysis area is defined as the Leeks Canyon Allotment. Of the cumulative actions listed in section 3.3, only the ongoing Invasive Plant Management project would have impacts on the allotment that overlap the direct and indirect effects of the proposed action and action alternatives discussed above.

The purpose of the Invasive Plant Management project is to reduce noxious weeds and invasive species on the Bridger-Teton. When combined with the control efforts discussed in vegetation analysis above (section 3.5) and efforts made by the grazing permittee, the Invasive Plant Management project would cumulatively strengthen weed management efforts and thus maintain the allotment's forage base.

3.8.5 DESIGN CRITERIA

This analysis of potential impacts on grazing did not identify the need for any design criteria, beyond the terms of the alternatives, to avoid or reduce adverse effects.

3.9 NOISE

3.9.1 SCOPE OF ANALYSIS

- *How would construction and use of the proposed infrastructure affect noise levels around the ski area?*

Snowmaking, explosive avalanche control, and summer activities such as the mountain coaster generate noise that is audible to visitors and residents in areas adjacent to the resort. While some may accept increased noise levels as a consequence of being close to a mountain resort, the noise associated with the proposed snowmaking expansion, zip line, and increased avalanche control activities may be an annoyance to some.

Indicators: Review of noise levels associated with these activities, then a largely qualitative assessment of impacts on area visitors and residents based on the projected noise levels, timing, duration, and frequency.

3.9.2 AFFECTED ENVIRONMENT

Noise is a concern for Jackson residents, particularly those near Snow King. A variety of activities at the ski area currently produce noise including snowmaking, explosive avalanche control, and noise from summer activities. At times, all of these can be heard beyond the boundaries of the ski area, depending on the ambient noise level and the distance from the source.

Noise levels are measured in A-weighted decibels (dBa) since that weighting of sound pressure best represents the range of human hearing. Sound pressure dissipates according to the inverse square law at a rate of roughly 6 dBa per doubling of distance. For example, if a sound is measured at 70 dBa at a distance of 50 feet, by 100 feet it will have diminished to 64 dBa, and at 200 feet to 58 dBa, and so on. The Town of Jackson has a noise ordinance (Ordinance 1196 [L]) that stipulates noise levels must not exceed 65 dBa at the property line for commercial operations such as Snow King. This limitation does not apply to National Forest System land, but it is used as a threshold in this analysis because the Bridger-Teton strives to be a good neighbor.

Another important property of noise is that it is not additive. For example, if a noise source of 70 dBa occurs as the same time as a noise source of 60 dBa, the resulting noise measurement would be 70 dBa since the louder noise overwhelms the softer one.

As discussed in detail in section 3.4.2.1, snowmaking at Snow King generally begins the first week of November at lower elevations and ends early in January. The opportunity to begin making machine-made snow depends largely on daily air temperature. If air temperatures are low and natural snow is plentiful, then ski runs are covered quickly, and snowmaking ends earlier compared to a relatively warm and dry winter. During a high snowfall year, little snowmaking occurs above the top of Cougar lift.

In general, machine-made snow is first applied to areas below the top of the Cougar lift and downslope of Slow Trail, including beginner terrain, terrain parks, and the Tube Park. Priority areas for snowmaking during the season include the lower Elk ski run, Cougar lift pod to the base, Rafferty lift pod from mid-station to base, and the Tube Park.

Snowmaking machines of the type used at Snow King produce a maximum of 70 dBa measured at a distance of 20 meters (65.6 feet) from the machine, dropping below 65 dBa at a distance of 35 meters (114.8 feet; TechnoAlpin 2019). Noise from snowmaking occurs at a continuous level while machines are operating.

Current Snow King snowmaking operations on private land have been tested by authorities on several occasions and found to be in compliance with applicable Town of Jackson ordinances (Stanley 2019a).

Explosive avalanche control takes place at Snow King 5 days a year, on average (Stanley 2019a). On those days, approximately 15, 5-pound hand charges are detonated early in the morning on the upper portions of the mountain. No precise measurements of decibel levels for hand charges are available, but it is likely that some charges momentarily exceed the 65-dBa threshold at the property line.

Noise from summer activities at Snow King is centered around the Rafferty lift in the eastern portion of the ski area. Noise levels in this area vary from day to day, and over the course of a day, and no precise measurements are available. Some noise arises from guests yelling or screaming, but the primary source of is from the alpine slide when the sleds hit the joints in the track. This produces a "clack" noise that can be heard beyond the ski area boundaries.

3.9.3 DIRECT AND INDIRECT EFFECTS

3.9.3.1 Alternative 1

Under this alternative, there would be no change with regard to the level of noise at Snow King relative to the conditions described in section 3.9.2.

3.9.3.2 Alternative 2

Under alternative 2, there would be additional noise due to several project elements. The first would be the additional noise caused during construction of the proposed infrastructure. Most of the time, construction noise would not be noticeable above ambient levels for Jackson in the summer. However, any blasting needed for construction of the summit access road/novice skiway would be noticeable, likely as momentary exceedances of Town of Jackson noise ordinance. Also, helicopter noise from the installation of the gondola towers would be noticeable during the short period where such work was taking place. In the loading area where towers where attached to the helicopter line, the Town of Jackson noise ordinance would likely be exceeded.

With regard to snowmaking noise, under this alternative all new snowmaking would be higher on the mountain than existing snowmaking and therefore would generally not lead to increased noise, since the machines on the lower portions of the mountain would be perceived as louder and noise levels are not additive.

Explosive avalanche control would still be needed under this alternative. The number of days this work would be needed would generally remain the same, but the number of explosives used could double to approximately 30 per day. The timeframe in which explosives were used during the morning would likely remain the same as well, with a lower time interval between explosions. As under the existing scenario, these explosions could momentarily exceed the limit imposed by the Town of Jackson.

Under this alternative, the landing of the zip line in Phil Baux park would add substantially to the summer recreation-related noise on the western side of the ski area. This would be primarily due to the mechanical noise of the zip line trolley moving along the cable but would also likely include exuberant shouts of riders, considering the slope and speed of the zip line.

3.9.3.3 Alternative 3

With regard to construction, snowmaking, and avalanche control noise, this alternative would be the same as Alternative 2. Under this alternative, the zip line noise would be shifted more toward the Rafferty lift area, where noise of summer activities is already present. The launch location of the top of the Summit gondola would remain the same, but noise from that distance would diminish substantially before it reached the property line. Furthermore, the slope and speed of the zip line under this alternative would be greatly

reduced, making it less likely to elicit the same level of noise as the zip line proposed under Alternative 2. The Option 2 zip line alignment would further reduce noise levels, as it would be even lower slope and speed.

3.9.3.4 Alternative 4

With regard to avalanche control and summer activity noise, this alternative would be the same as Alternative 3. The addition of run 15 in this alternative would change the situation with regard to construction and snowmaking noise. The operation of chainsaws to clear trees for run 15 would take place within 200 feet of houses adjacent to the ski area. A typical chainsaw, while cutting, produces 95 dBa measured at 8 feet from the saw (Forest Service 2010). By the time the sound reached property line at the nearest point of run 15 to the property line, the sound of the chainsaw would be reduced to approximately 63 dBa. This would be due to an approximately 27-dBa reduction due to distance, and a 5-dBa reduction due to vegetation screening (Peng et al. 2014). eBikes generate little more noise than a conventional bike.

Snowmaking noise would be similarly reduced. By the time the noise reached the property line the 70-dBa noise, measured at 20 meters (65.6 feet), would be reduced to approximately 57 dBa. This would be due to an approximately 8 dBa reduction due to distance, and a 5-dBa reduction due to vegetation screening (Peng et al. 2014).

3.9.4 Cumulative Effects

Two past projects described in section 3.1.2, the 2014 snowmaking infrastructure project and the 2015 mountain aerial adventure course, interact cumulatively with the direct and indirect noise effects of the action alternatives. Their contributions are reflected in section 3.9.2's discussion of current noise associated with snowmaking and summer activities at the Rafferty mid-station. As discussed in section 3.9.3, cumulative noise would be consistent with the mountain resort environment and not likely exceed any local standards.

3.9.5 Design Criteria

This analysis of potential noise impacts did not identify the need for any design criteria, beyond the terms of the alternatives, to avoid or reduce adverse effects.

3.10 RECREATION

3.10.1 Scope of Analysis

3.10.1.1 Terrain Mix

- *How would the proposed ski terrain development affect Snow King's terrain mix?*

Most ski terrain at Snow King is steep, which limits use to advanced or expert skiers. Accordingly, a central element of the purpose and need for action is to develop terrain accessible to lower ability-level skiers. This would be conducive to integrating beginning skiers into the sport and to accommodating families and groups with varying ability levels.

Indicator: Comparison of the terrain mix resulting from proposed development to the mix of ability levels in the skier market.

3.10.1.2 Existing Ski Runs

- *How would the proposed summit access road/novice skiway affect existing ski runs?*

The proposed access road/ novice skiway crosses the major front-side ski runs high on the steeper portions of the slope where substantial cut and fill would be required. Existing access roads/novice skiways

including Fast Trail, Slow Trail, and Elkhorn Trail also cross these ski runs, so the added access road/novice skiway would potentially constitute and additional impediment to smooth skier flow on these runs.

Indicator: Review of preliminary design of the access road/novice skiway, then largely qualitative assessment of its potential impact on skier flow, in conjunction with other features crossing these runs.

3.10.1.3 Existing Trail System

- *How would the proposed downhill mountain bike trails and zone affect the existing Cache Creek/Game Creek trail system and its users?*

The popular, well-developed and maintained Cache Creek/Game Creek multi-use trail system includes trails that cross or pass near Snow King's permit area. The proposed lift-served mountain biking could adversely affect this trail system and its users by increasing bike traffic inside or outside the permit boundary.

Indicators: Assessment of the likely number of lift-served mountain bikers that would use the existing trail system, the existing system's capacity to absorb any additional use, and the effects of that use on cross-country bikers and hikers. Some variables, such as the number of intersections of proposed and existing trails, will be quantified.

3.10.1.4 Phil Baux Park

- *How would the proposed summit gondola and zip line affect users of Phil Baux Park?*

Phil Baux Park is an old, well established and well used town park adjacent to Snow King's private-land base area. Under the proposed action, the bottom terminals of the proposed summit gondola and zip line would be located in the park, eliminating the parking lot.

Indicator: Primarily qualitative assessment of the impact of siting these facilities in the park on the recreational uses and users of the park.

3.10.2 AFFECTED ENVIRONMENT

3.10.2.1 Terrain Mix

As indicated in Table 3-29, only 12 percent of Snow King's currently developed ski terrain falls into the beginner, novice, and low intermediate skier ability categories. This reflects primarily the ski area's topography, which cannot be altered, but it limits Snow King's ability to meet the needs of the broad skier market. This, in part, explains the low skier-visit numbers relative to capacity that are the norm at Snow King. In particular, the lack of lower ability-level terrain impedes the ski area's function in bringing new skiers into the sport, which is especially important for a "town hill," where children and families are a large part of the potential user group.

The ability level of a ski run is mostly on the basis of its steepness, and there is very little low angle terrain within the ski area's current operating boundary. At this point, there is very little Snow King can do to provide more opportunity for lower ability-level skiers without adding new terrain.

3.10.2.2 Existing Ski Runs

The issue here is how access road/novice skiway crossings affect the recreational experience of skiers on developed ski runs. Six existing upper-mountain ski runs would be crossed by the proposed summit access road/novice skiway, including three black diamond ski runs (Cut Off, Grizzly, and Elk), and three double black diamond ski runs (Belly Roll, Upper Exhibition, and Bearcat).

Table 3-29. Current terrain mix compared to skier market.

Skier Ability Level	Trail Area (acres)	Trail Area (%)	Skier Market (%)
Beginner	0.5	0%	5%
Novice	5.1	4%	15%
Low Intermediate	11.5	8%	25%
Intermediate	42.9	32%	35%
Advanced	17.3	13%	15%
Expert	58.4	43%	5%
Total	**135.6**	**100%**	**100%**

Grizzly and Elk are two of the most popular runs at Snow King and are currently crossed by two and three sections of skiways, respectively. Grizzly is crossed by Slow Trail and Fast Trail. Elk is crossed by Elkhorn Trail, Slow Trail, and Fast Trail. Of the double black diamond runs, Upper Exhibition receives the most use followed by Bearcat and Belly Roll. Upper Exhibition and Bearcat are currently not crossed by any sections of skiway, and Belly Roll is crossed by four: Elkhorn Trail (twice) then Slow and Fast trails.

These skiway crossings are managed by Snow King using a combination of engineering and design (e.g., creating appropriately graded cut and fill slopes above and below the skiways), maintenance (e.g., grooming to ensure there are no berms or other obstacles to skier passage), and warnings to skiers of the approaching hazard on both the run and the skiway (e.g., signage, flags, and rope lines, as appropriate).

Skiways crossing ski runs are a common situation, occurring at most ski areas and often unavoidable. As a local example, Gros Ventre run at Jackson Hole Mountain Resort crosses skiways four times, and most runs on the upper mountain cross skiways at least once. Measures similar to those noted above are implemented to minimize the impact on skiers' experience and safety (section 3.11.3.2), but these interruptions in ski runs, particularly those in more advanced ability-level categories, are an adverse recreational impact.

3.10.2.3 Existing Trail System

The issue here is how the proposed lift-served, downhill mountain bike program would affect the Cache Creek/Game Creek trail system and its users. Snow King lies within, and is intersected by, an extensive and highly used system of multi-use, non-motorized trails referred to as the Cache Creek/Game Creek trail system. It can be conveniently accessed from several trailheads in or near town, and it is valued for its scenery and the opportunity it provides to observe wildlife, birds, flowers, and other natural features (Forest Service 2002).

The system currently includes approximately 53 miles of non-motorized trail. Overall use is estimated at 1,526 people per day between June 1 and August 31 (Friends of Pathways 2019a). Trails are actively maintained and managed to a high-quality standard with very active community involvement. Considerable trail work has been done since 2002. Several trails have been rerouted to more sustainable locations. All existing trail structures have been replaced or modified within the last 10 years, and many new structures have been built. New signage and several new kiosks have been constructed at junctions and trailheads. Several new trails have been constructed to improve the experience and reduce conflicts. In 2015-2016, the Skyline trail, Nelson Knoll trail, bike/hike-specific Putt trail, horse/hike-specific Woods Canyon trail, and Kelly's hiking loop were built or re-designed. Figure 3-39 shows the central portion of the trail system.

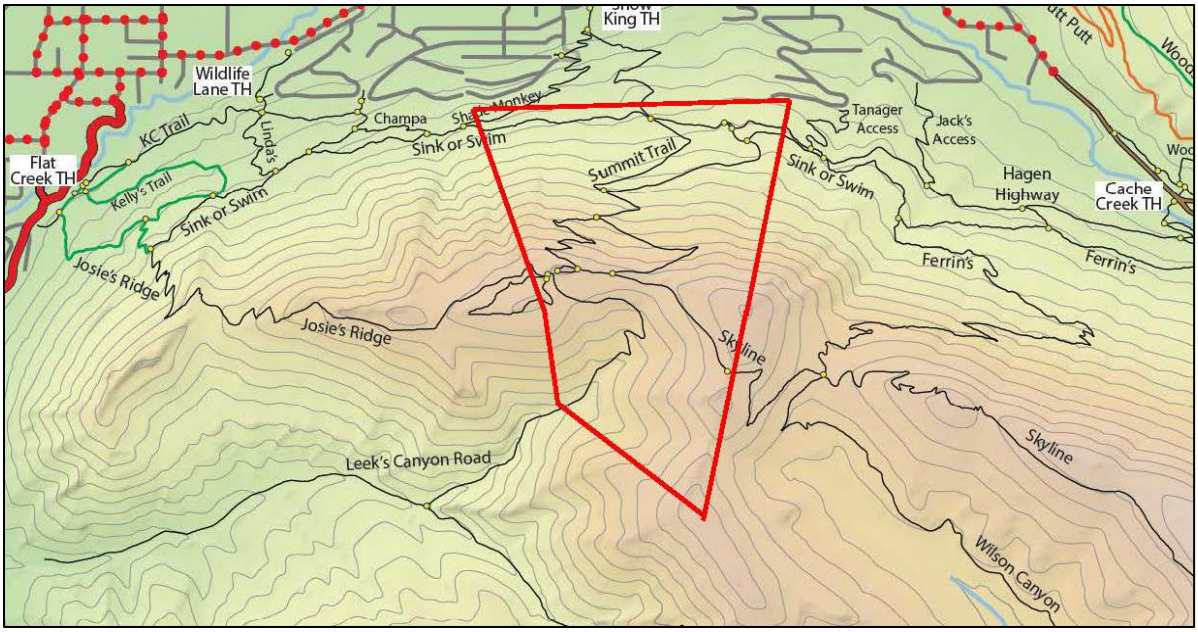

Figure 3-39. Central portion of the Cache Creek/Game Creek trail system (Snow King permit boundary in red).

Trailhead counter data (Friends of Pathways 2019b) indicates that pedestrian use (i.e., hikers, runners, and dog walkers) accounts for about 60 percent of the traffic entering and leaving the trail system. Bicycle use accounts for roughly 25 percent, and horse use another 1–2 percent. The chuck wagon dinner operation offered by Bar-T-5accounts for most of the balance, all on the Cache Creek/Game Creek trail. Bridger-Teton trail patrol figures for 5 years between 2007 and 2014 indicate a higher percentage of bike use than the Friends of Pathways data, with 54 percent of total users being bikers (Forest Service 2019e).

Use is heavily concentrated in the first mile from trailheads, where walker and dog walker use are highest. More distant trails within the system see much lighter use, with the majority by bikers. The trail system is maintained in generally good condition, in part with the assistance of a large cadre of local volunteers. Mountain bikes have the least impact on trail surfaces and horses have the most. Damage associated with bikes is generally widening of trails, particularly at turns. Pedestrian use tends to generate more corner cutting and creation of shortcuts. The greatest impact from all types of use occurs when soils are wet. Varying degrees of social conflict and wildlife impact are also associated with trail use (Hennings, 2017). Trail realignments and other improvements over the past 10 years have facilitated trail maintenance. (Friends of Pathways 2019b)

The 2015 decision approving Cache Creek/Game Creek trail system improvements described the following desired condition for the system (Forest Service 2015b, Appendix A):

> A sustainable, well-developed, maintained trail network with associated trailhead facilities are provided to concentrate visitor use and visitor impact and visually blend with the environment. Shared use occurs on the majority of the trail system; however, some use separation may occur in congested areas. Access to the trail system is encouraged through town portals that allow people to walk or bike without driving to the extent possible. Although recreation use is high compared with other areas in the Bridger-Teton National Forest, a diversity of experiences is still available ranging from places where social interaction predominates to places where interaction with other people is less frequent and the area feels somewhat remote. Visitors have opportunities to connect with nature through natural sounds and smells, and viewing largely undeveloped natural landscapes, especially in those areas further away from town and trailheads. Interactions among trail users are

> positive with a sense of mutual enjoyment and unity in the privilege of having access to a beautiful natural place. Opportunities to learn about nature and participate in the care of the area are readily available and visitors act in a way that conveys respect for wildlife and the land. Wildlife populations continue to thrive and conflicts with lions, bears, and moose are avoided so that animals and people are not harmed. Plant communities retain natural integrity with the presence of weeds is confined to small localized spots that can be readily treated. Streams are free-flowing and are relatively free from human sources of sediment or pollutants.

Only about 5 percent of the Cache Creek/Game Creek trail network is within the ski area boundary. Trails located within the boundary include the Summit trail and about 0.5 mile of the Sink or Swim trail. Small portions of the Hagen trail, Nature trail, and Shade Monkey trail are also within the ski area boundary. A service road connecting the summit to the saddle leading to Ferrin's, Skyline, and Wilson Canyon provides a critical connection (see map). The Leeks Canyon road is lightly used due to the presence of private land at the mouth that restricts public access. During the winter, the Hagen trail provides a historically important groomed ski connection between the resort and Cache Creek. More detailed information on key trails follows. (Use figures from Friends of Pathways 2019a.)

- Snow King Summit trail – this is actually the current ski area service road accessing the summit of Snow King Mountain, with some user-created shortcuts. It is the only trail that is located entirely within the ski area boundary and is a popular workout trail that people use for daily exercise. The estimated summer use is 216 people per day, dominated by people hiking, often with dogs. Other user-created foot trails to the summit have been created (notably the "stairway") but to date these trails have not been maintained or managed.

- Sink or Swim trail – this is an important east-west single-track trail that connects the network of trails in the Cache Creek drainage with the network of trails in the Josie's Ridge area. The trail is heavily used by bikers, runners, and hikers. No trail counter data is available for this trail since it is an "interior" trail. It connects Ferrin's at its east end and Josie's Ridge at its west end, with several other access points in between.

- Shade Monkey trail – this trail is located largely below the National Forest boundary on Snow King property. Estimated use for this trail is 45 people per day. It was originally constructed in 2011 to offer a bike-friendly trail connection directly from town. The beginning of the trail was later re-located so that the entry point was at the base of Snow King.

In addition, three primary trails extend beyond the resort permit boundary from the summit of Snow King: Josie's Ridge trail to the west, Skyline trail to the east, and the short nature trail at the summit. Skyline trail accesses the Ferrin's and Wilson Canyon trails.

- Nature trail – this is a short interpretive nature trail designed to offer an easy walk for people taking the chairlift up to the summit of Snow King. The trail was improved in 2010. It is managed for hiking, and estimated use is unknown. Various interpretive brochures have been developed for the trail, but full development as an interpretive trail has not occurred.

- Josie's Ridge – This is a steep switchback trail that is very popular with those looking for a strenuous climb after work. The estimated summer use is 158 people per day. It is designed and used primarily by hikers, often with dogs. The upper section is open to mountain biking with the lower portion open only for hiking (mountain bikes are diverted onto the Sink or Swim trail). Significant work is currently underway to stabilize the trail and reduce erosion. The entire trail is closed to all human use December 1 – April 30 to reduce disturbance to wintering wildlife.

- Skyline trail – This trail connects Ferrin's saddle with Game Creek saddle. The trail section from Ferrin's Saddle up to the Snow King permit boundary, where it ties into the existing service road to the communications towers on the summit, is referred to as upper Skyline. It is also known as

the Connector trail and existed prior to development of the rest of Skyline. Public review of the Skyline trail proposal in 2011 indicated considerable public support but also raised significant issues, primarily related to the potential for wildlife disturbance and expansion of recreation use into new areas. Following further analysis and discussion, the trail was authorized in May 28, 2015, and completed with substantial community funding and labor support over the next three seasons. The following three stipulations were among the conditions of approval:

(a) The trail is closed to all human use May 1–July 1 to reduce human disturbance during the calving season for elk, deer, and other wildlife.

(b) Lift-served bike access from the summit of Snow King is not permitted.

(c) The trail is designed for shared use. As a highly scenic ridge trail, the trail is designed in a way to take advantage of viewpoints, encourage slow bike speed and promote people taking the time to absorb the scenic beauty.

No trail counter data is available since it is an "interior" trail. Field-based monitoring indicates that 15–25 people use the trail per day, with use dominated by a mix of trail runners and bicyclists (with some hiking use).

- Ferrin's trail – This trail connects Snow King and the Cache Creek trailhead (via the Hagen trail) with the Ferrin's saddle located just east of the radio towers on Snow King Mountain. Trail planning and construction occurred in 2005, with community funding and labor support. The trail was designed as an uphill route for mountain biking to reduce the potential for conflict on the primary uphill hiking trails (Summit and Josie's Ridge), to provide a connection to the base of Snow King and reduce vehicle traffic to the Cache Creek trailhead, and to provide a sustainable replacement for old fall-line, user-created trails. No trail counter data is available since it is an "interior" trail. Field-based monitoring indicates that 25–40 people use the trail per day, with use dominated by bicyclists. The trail has become popular for both uphill and downhill riding. The steep side slopes make passing difficult which has led to some conflicts due to near-miss collisions.

- Wilson Canyon trail – this trail connects Ferrin's saddle with the pathway south of Jackson. The West Game trail splits from Wilson Creek providing access to the Game Creek drainage. The upper portion of the Wilson Canyon trail was reconstructed in 2003 with high-school volunteers. Following the Horsethief Fire in 2012, the bulk of the upper section was reconstructed entirely through a series of volunteer events. The lower portion of Wilson Canyon is managed as a more primitive trail catering to a mix of hike, horse, and bike use since it is very steep and rocky. West Game Creek is less technical and receives mostly bike use. These are both popular trails but receive less use than trails in the lower Cache drainage and west face of Snow King. The lower portion of Wilson Canyon is closed to all human use December 1–April 30.

The Forest Service Recreational Opportunity Spectrum (ROS) provides a framework for stratifying and defining different classes of outdoor recreational environments, activities, and experience opportunities. The Forest Plan assigns Snow King permit boundary and its surroundings, including most of the Cache Creek/Game Creek trail system area, an ROS classification of Roaded Natural, defined as follows (Forest Service 1986c):

> Area is characterized by predominantly natural-appearing environments with moderate evidences of the sights and sounds of man. Such evidences usually harmonize with the natural environment. Interactions between users may be low to moderate, but with evidence of other users prevalent. Resource modification and utilizations practices are evident but harmonize with the natural environment. Conventional motorized use is provided for in construction standards and design of facilities.

Section 3.10.3.3 employs the ROS framework to assess the direct and indirect effects of the alternatives on the Cache Creek/Game Creek trail system and its users.

3.10.2.4 Phil Baux Park

Phil Baux Park is a municipal recreation facility operated by the Teton County/Jackson Parks and Recreation Department at the base of Snow King. Amenities include a baseball field; playground; picnic shelter and tables; bouldering walls; horseshoe pits; open space used for concerts, the People's Market, and other activities; and a parking lot. Use figures have not been compiled, but the park is consistently used through the summer and at capacity during events such as the People's Market and concerts.

The Snow King Sports and Events Center and ski slopes adjoin the park to the south. Mixed residential and commercial properties lie to the west and north, across Snow King Avenue. Snow King recreational developments adjoin the park to the east. The park is an island of well-used public land surrounded by private land that, with the exception of ski slopes to the south, is developed.

3.10.3 DIRECT AND INDIRECT EFFECTS

3.10.3.1 Terrain Mix

3.10.3.1.1 Alternative 1

Under the no-action alternative, no new ski terrain would be developed, and Snow King's terrain mix would remain as described above, with only 12 percent in the beginner, novice, and low intermediate categories. The ski area's ability to meet the needs of the broader skier market and to bring new skiers into the sport would remain limited.

3.10.3.1.2 Alternative 2

Under Alternative 2, Snow King would develop an additional 117.8 acres of new ski terrain, roughly a third of it (39.8 acres) in in the beginner, novice, and low intermediate categories. Most of the lower ability-level terrain would be associated with the teaching center, on top of Snow King Mountain or on the back side. The three new runs in the eastern boundary adjustment area would provide low intermediate terrain accessible from either the summit (via the summit access road/novice skiway) or the Rafferty lift. These additions would increase lower ability-level terrain at the ski from the current 12 percent to 22 percent.

Intermediate terrain would also increase by 20.8 acres, primarily in the back-side bowls. This terrain would be accessible from the teaching center, making an easy step up for skiers advancing in ability there.

Snow King's terrain mix would remain heavily skewed toward advanced and expert terrain, but these additions would bring it substantially closer to the skier market profile and provide a better progression in terrain categories for people learning the sport (Table 3-30).

3.10.3.1.3 Alternative 3

In terms or terrain mix, Alternative 3 would be the same as Alternative 2.

3.10.3.1.4 Alternative 4

In regard to beginner, novice, and low intermediate terrain, Alternative 4 would closely match Alternative 3 since most of the proposed lower ability-level terrain is on the summit and back side (Table 3-31). Alternative 4 also changes the configuration of advanced and expert runs on the front side, but these changes do not notably alter the terrain mix.

Table 3-30. Alternative 2 terrain mix compared to skier market.			
Skier Ability Level	**Trail Area (acres)**	**Trail Area (%)**	**Skier Market (%)**
Beginner	4.4	2%	5%
Novice	38.7	15%	15%
Low Intermediate	13.8	5%	25%
Intermediate	63.7	25%	35%
Advanced	43.8	17%	15%
Expert	89.1	35%	5%
Total	**253.4**	**100%**	**100%**

Table 3-31. Alternative 4 terrain mix compared to skier market.			
Skier Ability Level	**Trail Area (acres)**	**Trail Area (%)**	**Skier Market (%)**
Beginner	4.4	2%	5%
Novice	38.7	14%	15%
Low Intermediate	15.5	6%	25%
Intermediate	61.9	23%	35%
Advanced	43.8	16%	15%
Expert	104.9	39%	5%
Total	**269.2**	**100%**	**100%**

3.10.3.2 Existing Ski Runs

3.10.3.2.1 Alternative 1

Under the no-action alternative, no new ski runs or skiways would be constructed. As discussed above (section 3.10.2.2), Grizzly would be crossed by Slow Trail and Fast Trail. Elk would be crossed by Elkhorn Trail, Slow Trail, and Fast Trail. Upper Exhibition and Bearcat would not be crossed by any skiways, and Belly Roll would be crossed by Elkhorn Trail (twice) then Slow and Fast trails. That is a total of nine skiway crossings on the upper portion of the mountain. These crossings would continue to be managed to minimize their impact on skier flow, but there would still be an impact.

3.10.3.2.2 Alternative 2

Under Alternative 2, most of Elkhorn Trail would be obliterated, leaving the top segment, and the new summit access road/novice skiway would be built. In terms of existing runs, this would add a crossing to Grizzly, Upper Exhibition, and Bearcat; maintain the same number of crossings on Elk; and reduce the crossings on Belly Roll by one. This would be a net increase of two crossings of existing runs. The crossings of Belly Roll and Upper Exhibition would be longer due to proposed widening of these runs. The new summit access road/novice skiway would also cross new runs 3 and 13, and the new run 11 would be crossed once by Slow Trail and once by Fast Trail, bringing the skiway crossing total to 15.

The impact on skier flow on existing runs would vary by run. A skiway crossing of the steep, uninterrupted portion of Grizzly would be added. Skier traffic on Upper Exhibition and Bearcat would be interrupted by a crossing when it has not been before. The single crossing of Elk's steep upper section would shift further

down the slope. Belly Roll would be improved by having one crossing removed. All in all, this would be a marginal adverse effect on skier flow on existing runs, slightly increasing the impacts discussed above (section 3.10.2.2). Those conditions would be replicated on new runs 3 and 13.

The situation would not be ideal but, again, skiway crossings are a common and manageable issue at ski areas.

3.10.3.2.3 Alternative 3

The situation under Alternative 3 would be the same as described for Alternative 2 except removal of Cougar lift would allow obliteration of two additional skiways, Slow Trail and Fast Trail. For existing runs, this would eliminate two crossings each on Grizzly, Elk, and Belly Roll, or six crossings less than Alternatives 1 and 2 (resulting in three and five total crossings of existing runs, respectively, for these two alternatives). That would be a notable improvement in skier flow on existing runs. The scenario for new runs would not change. The total number of skiway crossings would be nine.

3.10.3.2.4 Alternative 4

Skier flow on existing runs under this alternative would be affected relative to Alternative 3 by retaining Slow Trail, with three crossings of existing runs (Grizzly, Elk, and Belly Roll). New trails would be the same except that run 2 may merge onto run 4, creating a new crossing of the summit access road/novice skiway. Run 11 would not be developed, eliminating one skiway crossing. The total number of skiway crossings would be 12.

3.10.3.3 Existing Trail System

3.10.3.3.1 Alternative 1

Under the no-action alternative, no lift-served, downhill mountain bike trails would be developed. Use levels would increase at roughly the rate of local population growth (1–3 percent), and there would be no potential created for adverse effects on the Cache Creek/Game Creek trail system or its users.

3.10.3.3.2 Alternative 2

This alternative would provide summit access for bikers via the Summit gondola. The primary reason for providing this access is to support dedicated downhill mountain bike trails on the front side and the mountain bike zone on the back side. However, access to the existing Cache Creek/Game Creek trail system from the summit would be allowed. As a result, both downhill and cross-country bikers would likely take advantage of lift access to the summit. The question is how many bikers of both types, and from the several hybrid types in between, would likely opt to use the existing Cache Creek/Game Creek trail system.

First, downhill mountain biking is a specialized activity, involving heavy, full-suspension bicycles (roughly 40 pounds) that are more difficult to ride uphill or even across flats. Riders typically wear full-face helmets, gloves, protective arm and leg pads, and often neck braces, which further hamper cross-country riding. Participants pay for lift access in order to ride purpose-built downhill trails designed and built by specialists to provide a thrilling experience keyed to the ability level of the rider. A good run is said to involve neither pedaling nor braking.

Because of these differences in equipment and desired experience, downhill bikers generally have little interest in cross-country trails. Downhill bike parks are common at ski resorts, and more are being developed every year. Most of these parks overlap to some degree with cross-country trails, but little overlap in use occurs. In some instances, a cross-country trail that maintains a good downhill grade may be used by downhill bikers to leave the bike park and get home or back to a car parked at a trailhead. The Mill Creek trail at Grand Targhee is a good example of this scenario. The Cache Creek/Game Creek trails accessible from the Snow King summit may have added appeal, since Ferrin's, Josie's Ridge, and Skyline have generally downhill grades and would return riders back to town and the base of the resort, so no vehicle shuttle would be required.

Snow King projects that the proposed front-side trails and back-side mountain bike zone will attract 6,000 riders per season within 5 years of completing the proposed trails and bike zone. To ensure a conservative analysis, we will address 10,000 downhill bikers per season, or an average of 109 per day for a June 1–August 31 season. Grand Targhee Resort estimates that up to 20 percent of park riders may leave their downhill trail system to ride a cross-country trail (Williams 2019). If that figure held at Snow King, it would equate to 22 new riders per day on Cache Creek/Game Creek trails. Some of these could make more than one lap on the cross-country trails, increasing this count somewhat.

Second, most cross-country bikers who used the gondola to access the summit would do so to access the Cache Creek/Game Creek trail system via upper Skyline trail to the east or Josie's Ridge the west. Initially, in the first few seasons following construction of the lift, most of these riders are anticipated to be locals looking for an alternative way to enjoy the Cache Creek/Game Creek trail system and perhaps try some downhill trails in the mountain bike zone as well. Since these local cyclists would be using the trail system already, without summit lift access, this would not equate initially to an increase in use of the Cache Creek/Game Creek trail system as a whole.

Third, over time, it is likely that this opportunity for lift-served access to the Cache Creek/Game Creek trail system would become better known, attracting more riders from outside the community. This opportunity could become a destination attraction in itself, but it would not likely equal the draw of the downhill trails and mountain bike zone. Evolving technology is also a factor. For example, while the use of e-bikes is currently not permitted on non-motorized trails within the National Forest, there is increasing pressure to provide more opportunities for e-bike travel. Mountain resorts with bike trails are likely to be one of the first places where this use is considered appropriate. Conservatively, this analysis assumes that this new opportunity might attract a third the number of bikers as the downhill system, roughly 3,300 per season or 36 per day.

Based on these calculations, Alternative 2 is projected to add 58 bicyclists per day to the Cache Creek/Game Creek trail system, 22 leaving the downhill system and 36 new cross-country riders. Compared to the current average of 1,526 users per day (section 3.10.2.3), this would be about a 4 percent increase, well within the overall capacity of the trail system.

However, despite this minor effect on the number of trail users, provision of lift access to the summit would likely generate a significant shift in use patterns. It would make the higher-elevation, more distant trails much more accessible to new and existing cross-country users alike. All 58 of those new riders would access the Cache Creek/Game Creek trail system from the top rather than the bottom and ride trails such as Skyline, Ferrin's, Wilson Canyon (via Lift A), and Josie's Ridge (via the gondola). This would be a significant increase in use of these currently lightly used trails. For example, if 25 percent of this use was on Ferrin's, that would equate to 2.7 to 4.3 times current estimated use (i.e., 25–40 users per day; section 3.10.2.3).

Josie's Ridge trail is not designed for bike use but is sometimes ridden by those seeking a technical downhill trail or a strenuous uphill training ride. Current bike use is minimal on this trail, so any increase in downhill bike use would create conflict with hiking use.

This change in use patterns would alter the recreational experience provided by the Cache Creek/Game Creek trail system substantially. Relative to the stated desired condition of the system (section 3.10.2.3), the shift could benefit recreationists accessing the trail system from Jackson trailheads. Bicycle traffic on those heavily used lower trail segments would be reduced, decreasing crowding and trail damage.

However, increased mountain bike use of more remote trails and trail segments would grow proportionally. This would increase human interactions, reduce the sense of remoteness and the associated sounds, smells, and views of undisturbed nature. Disturbance of wildlife would increase, as would the potential for negative encounters with bears and lions. The possibility of damage to plant communities and water bodies would also increase in proportion to increased use. As discussed above (section 3.10.2.3), the Cache Creek/Game

Creek trail system is generally well maintained now, and this increase in use would not necessarily change that assessment in terms of resource conditions. Higher levels of use would, however, affect the recreational experience.

Ferrin's, Skyline, Wilson Canyon, and Josie's Ridge would be most affected. Conflicts between uphill hiking and biking use and increased downhill traffic would be the main issues, particularly on Ferrin's due to the popularity and narrow width of the trail, and on Josie's Ridge, which currently supports limited bicycle use. These impacts could make substantial changes necessary, such as separating uses, allowing use in only one direction, or creation of new trails.

To avoid or minimize resource impacts and user conflicts, Snow King would develop a trail management plan detailing their efforts to monitor and address resource impacts and user conflicts on Cache Creek/Game Creek trails prior to constructing the back-side mountain bike zone.

Overall, these changes would remain consistent with the Roaded Natural Recreational Opportunity Spectrum classification (section 3.10.2.3), but they would constitute a notable degradation in the recreational opportunity provided by the Cache Creek/Game Creek trail system in the eyes of many users.

3.10.3.3.3 Alternative 3

The main change in terms of effects on the Cache Creek/Game Creek trail system and its users is that lift-served mountain bikers would not be allowed access to the existing trail system. The Sink or Swim trail would still be open to mountain bikers seeking to connect trails in the Cache Creek area with trails such as Shade Monkey, Linda's, and K-C but would not be open to lift-served bikers. Section 2.5.4.2 describes the combination of rider information, trail design, enforcement, and changes to allowed use of existing trails that would be employed under this alternative to restrict lift-served bike use to the dedicated downhill trail system and mountain bike zone. Closure of upper Skyline and Josie's Ridge trails to bicycle use would provide a clear separation between the intensive bike activity within the ski area and the desired less-intensive, more nature-based experience outside of the ski area.

The main focus of these efforts would be bikers leaving the lifts, both the Summit gondola and Lift A. These people will already have been thoroughly informed of the prohibition on using the existing cross-country trail system. At the tops of the lifts, cyclists would be congregated at locations where the tops of both the downhill and cross-country trail systems were readily accessible (via the communications tower service road in the case of access to the eastern portion of the cross-country network at the Skyline trailhead). Tickets would be checked, and lift-served bikers would be directed through signage, barriers, and staff direction to the dedicated downhill trails. Only one downhill trail would leave the summit on the front side, near the gondola terminal, making that access point easy to observe and control. This would be similar to in-bounds terrain closures for skiers at Forest Service permitted ski areas, which are a common and effective practice.

The other focus for maintaining the restriction of lift-served bikers to the downhill trail system would be where downhill trails crossed popular front-side cross-country trails such as Sink or Swim, or where downhill trails off Lift A crossed the communication tower service road in the back side mountain bike zone, which would provide access to the Skyline trailhead. Depending on final trail design, there would be several such crossings.

As discussed above (section 2.5.4.2), intersections with cross-country trails would be designed with approach angles and grades that made it difficult to leave the downhill trail. Intersections would be located in open, visible areas so infractions were more easily detected, and bridges or underpasses would be used as necessary to physically separate downhill trails at intersections. Given the desire of most downhill mountain bikers to stay on high-quality, purpose-built downhill trails, these basic design criteria for intersections are anticipated to be effective in keeping the large majority of lift-served bikers from leaving the downhill system by accident or intentionally. Closing upper Skyline and Josie's Ridge to bike use would eliminate the attraction of using the lift to access the larger Cache Creek/Game Creek trail system. Doing

it proactively, as soon as the new gondola was in operation, would avoid the risk of riders establishing a pattern of use in ignoring the prohibition on lift-served bikers leaving the dedicated downhill trail system.

Overall, the two main questions here are whether the closure of the Cache Creek/Game Creek trail system to lift-served bikers, implemented through rider information, trail design, enforcement, and proactive change in allowed use of upper Skyline and Josie's Ridge trails would avoid an increase in use of the Cache Creek/Game Creek trails sufficient to violate the desired condition for the Cache Creek/Game Creek system. This analysis suggests that the four-tiered approach would be sufficient to manage use and avoid user conflicts and resource impacts that could occur under Alternative 2. This scenario would be consistent with the Roaded Natural ROS designation of the area as well as the desired condition and trail objectives for the Cache Creek/Game Creek trail system.

Nevertheless, monitoring would be necessary to bear that conclusion out. Monitoring is an important part of management of the Cache Creek/Game Creek trail system, carried out by the Forest Service and community partners. Monitored variables include user conflicts and various resource impacts. If this monitoring indicated that additional action was necessary to avoid notable conflicts or resource impacts, the Bridger-Teton could implement additional administrative changes to trail management, both within and outside the permit boundary.

3.10.3.3.4 Alternative 4

Alternative 4 would provide an adaptive approach to developing and operating Snow King's downhill mountain bike program. It would make all of the management options included in Alternatives 1–3 available (sections 2.3, 2.4.8.2, and 2.5.4.2) to be applied as appropriate trough annual operating plans based on monitoring of actual experience. This approach would also avoid impinging unnecessarily on current users and use patterns (e.g., closing upper Skyline and Josie's Ridge to bicycle use) or on the recreational potential created by lift access to the summit for a wide range of mountain bikers (e.g., local and visiting cross-country as well as downhill riders).

As indicated in the preceding sections addressing Alternatives 2 and 3, analysis of this issue is inherently speculative, and potential methods of managing impacts may have adverse side effects. This adaptive management approach would address both of those constraints. It would 1) limit development of new trails and infrastructure, including the back-side mountain bike zone, until monitoring indicated success in managing any adverse effects; 2) allow flexibility to tailor management approaches to the actual issues that arise; and 3) adjust the scale of the program based on real-world experience, or curtail it entirely if adverse effects could not be controlled at any point.

Beyond the change in management approach, some additional assurance that adverse impacts on the Cache Creek/Game Creek trail system and its users would be gained by reducing the extent of the front-side mountain bike trail system and confining it mostly to the Rafferty area. Access would still be from the Summit gondola, via a single beginner downhill trail off the summit. An advanced trail would spur off of the beginner trail below the summit ridge. The trail system would terminate near the gondola bottom terminal. It would cross Sink or Swim trail only once. This trail system would be about 14 percent shorter than that proposed under Alternative 3. It would be mostly on lower-angled terrain with more beginner terrain. See section 2.6.3 for a more detailed description.

These changes may reduce the initial appeal of Snow King's downhill mountain bike program to a degree by potentially slowing or limiting its development and by decreasing the size and difficulty level of the front-side trail system.

Overall, this alternative is projected to be more effective in protecting the Cache Creek/Game Creek trail system and users than Alternative 3, mostly due to its flexibility in matching management options to observed issues to efficiently avoid adverse direct and indirect effects.

Other benefits under this alternative would be that it would reduce construction and maintenance costs as well as visual impact relative to the Alternative 2 and 3 trail system due to its reduced size and location in

a lower-angle, more forested part of the permit area. This variation too would be consistent with the Roaded Natural ROS classification of the project area.

3.10.3.4 Phil Baux Park

3.10.3.4.1 Alternative 1

Under the no-action alternative, there would be no impact on Phil Baux Park or park users associated with ski area. The park, including its parking lot, would continue to be integrated into the recreation-oriented zone at the base of Snow King.

3.10.3.4.2 Alternative 2

Under this alternative, the bottom terminals of the proposed Summit gondola and zip line would be built in what is now the parks' parking lot. This would result in elimination of the parking lot, so parking needs would have to be met elsewhere. This would result in a net increase in open green space available for recreational activities in the former parking lot area. However, when the gondola and zip line were in operation, the lift maze and bystanders might occupy a substantial amount of the additional space.

The gondola would also provide uphill access for mountain bikers using the new front- and back-side trails, and the front-side trails would also end at the gondola terminal. This would bring an added level of bustle and energy to the area.

Collectively, these high-profile facilities would fundamentally change the recreational opportunities the park currently provides. The level of activity, excitement, and noise (section 3.9) would overshadow the quieter, more and relaxed atmosphere that is currently characteristic of the park.

3.10.3.4.3 Alternative 3

Under this alternative, no new infrastructure would be sited in Phil Baux Park. Cougar lift would be removed, and the bottom terminal of the gondola, with all its associated activity, would be shifted to the site of the Cougar bottom terminal. The zip line bottom terminals would be moved to the Rafferty mid-station area.

These changes would eliminate the main adverse effects on the park. The parking lot would remain intact, avoiding the indirect effects of parking elsewhere. While the gondola terminal would not be far away, shifting it up the slope and moving the zip line terminal to the Rafferty area would help maintain the park as an island of relative calm.

3.10.3.4.4 Alternative 4

Effects on Phil Baux Park under this alternative would be basically the same as discussed above under Alternative 3. The minor exception would be that mountain bike infrastructure would be developed more slowly, so the level of bike-related activity around the nearby gondola bottom terminal would initially be less.

3.10.4 CUMULATIVE EFFECTS

Of the cumulative actions described in section 3.1.2, the 2015 Rafferty lift replacement and ski run development project had cumulative effects on recreation, specifically by altering Snow King's terrain mix. It added needed intermediate terrain to offset the strong skew toward advanced and expert terrain on the front side. This effect is reflected in the existing terrain breakdown described in section 3.10.1.1.

Beyond that, the 2015 aerial adventure course added to the general congestion on trails passing through the area of the Rafferty mid-station, particularly Sink or Swim (section 3.10.2.3), affecting the experience of trail users.

3.10.5 DESIGN CRITERIA

1. Design and construct all buildings in accordance with the *Accessibility Guidebook for Ski Areas Operating on Public Lands – 2012 Update* (Forest Service 2012b). Confirm compliance through Forest Service engineering review prior to construction.
2. Prepare and submit to the Bridger-Teton a trail management plan addressing trail maintenance and management of user conflicts prior to development of the back-side mountain bike zone.
3. Follow industry standards and coordinate with Forest Service guidance for trail layout, design and construction.

3.11 SAFETY

3.11.1 SCOPE OF ANALYSIS

3.11.1.1 Safety of Summer Visitors

- *How would the proposed mountain bike trails and mountain bike zone affect the safety of other summer visitors?*

Snow King's permit area supports summer recreational use of various types, including resort infrastructure such as the mountain coaster, alpine slide, and ropes course accessed from the Rafferty lift mid-station, as well as numerous formal and user-created hiking and biking trails throughout the permit area. The proposed mountain bike zone and trail network overlaying these other recreational uses could create collision risks and other safety issues.

Indicator: Review of the integration of existing and proposed summer recreation infrastructure with proposed mountain bike park and trails network to qualitatively assess safety risks.

3.11.1.2 Skier Safety

- *How would the proposed summit access road/novice skiway affect skier safety?*

This issue has two aspects, the safety of skiers using the skiway, and the safety of skiers crossing the skiway on the front-side runs. In the first case, the steepness of the slope adjacent to the skiway could make it dangerous for beginners or others who skied off the skiway. They could slide down the groomed runs or be trapped in deep snow in the forested patches. For skiers crossing the skiway, the cut and fill slopes necessary to construct it could block smooth skier flow and pose a hazard to skiers attempting to cross it at speed.

Indicator: Generally qualitative assessment of the design of the skiway and the efficacy of measures to minimize these risks, based on experience at Snow King and elsewhere.

3.11.1.3 Avalanche

- *How would the proposed ski run clearing and summit access road/novice skiway affect avalanche hazard?*

Snow King's steep slopes lie directly above the base area and adjacent commercial and residential development, making avalanches an important concern. The proposed expansion and associated ski run clearing could increase this hazard and the level of effort required to manage it. The steep cut and fill slopes along the proposed summit access road/novice skiway could create new starting zones and add to the problem.

Indicator: Qualitative assessment of the current avalanche situation and snow safety program, followed by analysis of the impact of proposed infrastructure on the hazard level and the effectiveness of the snow safety program to manage it.

3.11.2 AFFECTED ENVIRONMENT

3.11.2.1 Safety of Summer Visitors

A substantial number of summer visitors currently recreate at Snow King. Records or estimates of visitor numbers exist for two somewhat overlapping but generally separate user groups. The first is recreating members of the public using trails in the Cache Creek/Game Creek system that intersect, or lie within, the Snow King special use permit boundary. The second is paying visitors using Snow King's summer recreation amenities. According to estimates of users in the first group, provided in section 3.10.2.4, there are approximately 140,000 recreating members of the general public using the Cache Creek/Game Creek trail system each year between June 1 and August 31. These include both hikers, runners, dog walkers, and mountain bikers. Some are traversing the ski area on popular trails such as Sink or Swim, and some are recreating entirely within the ski area, such as those using the Summit and Stairway trails. Currently, a high density of trails, and trail users, meet and diverge in the area above the Rafferty mid-station. The Skyline trail passes through the permit area on the back side and supports light but consistent use.

With regard to paying visitors using Snow King's summer recreation amenities, records from previous years indicate that approximately 85,000 people per season use the mountain coaster, alpine slide, ropes course, and Summit chairlift. Scenic rides are offered on the Summit lift, but the majority of paying summer visitors use the facilities around and below the Rafferty mid-station. Currently there is almost no use by paying visitors in the back-side portion of the permit area. A few Summit lift riders hike on a nature trail loop on the ridgetop to the west of the Summit lift top terminal, but other trails off the summit are very lightly used by this group.

In the concentrated use area around the Rafferty mid-station, the minimal existing signage is focused on directing visitors to various activities. This signage is intended to keep visitors engaged in different activities separated. There is currently no signage notifying trail users of trail intersections or advising caution in these areas. However, most visitors in this area are on foot, or are bikers traveling at low speeds due to flat and rough terrain, so the level of collision risk in this area is fairly low, despite the lack of signage at trail intersections and number of visitors using the area.

3.11.2.2 Skier Safety

Currently beginner-level skiers do not access the summit of Snow King since there is no easy way for them to get down, as clearly indicated by signage in the loading area. The existing skiway off the summit is steep, narrow, and turns enough that it is primarily used by more advanced skiers to reach various parts of the mountain and serves very little utility for lower ability-level skiers.

Six existing upper-mountain ski runs could be crossed by the proposed summit access road/novice skiway, three black diamond runs (Cut Off, Grizzly, and Elk), and three double black diamond runs (Belly Roll, Upper Exhibition, and Bearcat). Grizzly and Elk are two of the most used runs at Snow King and are currently crossed by one and two skiways (or sections of the same skiways), respectively. Of the double black diamond runs, Upper Exhibition receives the most use followed by Bearcat and Belly Roll. Upper Exhibition and Bearcat are currently not crossed by any skiways, and Belly Roll is crossed by four.

3.11.2.3 Avalanche

Avalanche risk at Snow King is generally low due to low elevation and low average snowfall, even though the slopes are generally steep. Over the past decade the ski area has averaged 5 days a year when explosives, typically 5-pound hand charges, are used for avalanche control. The remaining days, avalanche hazard is reduced by ski cutting (i.e., ski patrol cross cutting starting zones to release small instabilities in the snowpack) and skier compaction preventing the formation of slabs.

There have been two notable in-bounds avalanche events in recent years, both occurring under similar weather conditions. In 2015 and 2017 there were point-break, wet-slide avalanches triggered by skiers on

Belly Roll and Upper Exhibition, respectively. In each case, the slow-moving slides ran a short distance, approximately 100 feet on Belly Roll, and approximately 140 feet on Upper Exhibition. Weather conditions leading up to these events were rainy and warm, causing the normally stable snowpack to slide under the increased weight of water-saturated snow and skiers. Since these events, standard procedure is to close the steep slopes on the upper mountain during, and immediately after, prolonged rainy and warm conditions, thereby substantially reducing the likelihood of a slide.

Despite a lack of avalanche control work on the back side, in the southern portion of the permit area, no significant avalanche events have been observed there in the last decade. This is due to the predominately low slope angle of that terrain and the up-canyon winds that generally promote stable snow conditions in this area.

3.11.3 DIRECT AND INDIRECT EFFECTS

3.11.3.1 Safety of Summer Visitors

3.11.3.1.1 Alternative 1

Under this alternative, there would be no development of additional mountain bike trails at Snow King. As a result, the situation with regard to safety of summer visitors would remain as described in the affected environment section (3.11.2.1).

3.11.3.1.2 Alternative 2

As described in section 3.10.3.4.2, it is estimated that up to 10,000 people per season (roughly June 1 through August 31) would use the lift-served mountain bike trails at Snow King, representing a 7 percent increase over current levels of trail use in and around the ski area. The vast majority of this use would occur on new designated downhill trails maintained by the ski area.

As discussed in section 2.4.8.2, trail alignments and difficulty levels are conceptual at this point and have not been optimized for the terrain or for minimizing crossings with existing trails. However, as currently laid out, the proposed trails cross existing trails multiple times. While intersections would likely be reduced in final design, some crossings of existing trails would remain.

Unmanaged, some crossings could present a substantial collision risk due to the high speed of bikers on the new downhill-biking trails and the high density of pedestrian users and bikers on the existing trails being crossed. Design criteria would be required to reduce this risk to an acceptable level.

Design criteria would include a combination of signage warning users of both trails that they were approaching an intersection, and features designed to slow riders would be added on the downhill trails. Multiple signs would be used, and each successive sign would indicate the distance to the crossing. Slowing features on the downhill bike trails could include narrowing of the trail, sharp turns, obstacles, less steep grades, or turning the trail uphill and paralleling the existing trail for a short period. The type of slowing feature used would be based on the characteristics of the crossing, as not every measure would be appropriate for each crossing.

Trail design would ensure that the intersection was visible from an adequate distance and that mountain bikers on the new downhill trails could see up and down the existing trail before arriving at the intersection. If no appropriate slowing feature was feasible and good sightlines could not be achieved, bridges or underpasses could be utilized to take users of the new downhill trail over the top of the existing trail without risking a collision. With the design criteria detailed in section 3.11.5 in place, the collision risk for summer visitors under this alternative would remain low.

3.11.3.1.3 Alternative 3

With regard to the safety of summer visitors, impacts of this alternative would be the same as those described above for Alternative 3.

3.11.3.1.4 Alternative 4

While this alternative would reduce the number of trail crossings, the design criteria discussed above (section 3.11.3.1.2) would reduce collision risk to a negligible level, and the number of trail crossings would be less relevant from a safety perspective. Impacts of this alternative would be marginally less than those described above for Alternative 3 due to the reduced number of crossings.

3.11.3.2 Skier Safety

3.11.3.2.1 Alternative 1

Under this alternative, the summit access road/novice skiway would not be constructed, and the situation regarding safety of lower ability-level skiers on existing skiways and skiers crossing the existing skiways would be as described above under affected environment (section 3.11.2.2).

3.11.3.2.2 Alternative 2

Under this alternative, lower ability-level skiers would be accessing the summit area using the Summit gondola, and the novice skiway would provide emergency egress in the event of the gondola being closed for unforeseen reasons. Typically, true beginner skiers who were not ready to advance from Lift B and C terrain to Lift D terrain would download the gondola to return to the base, while skiers who had gained basic skills would likely take the skiway.

The layout of the skiway and the beginner terrain area would generally prevent skiers who were not ready for the skiway from entering, since the top of the skiway is 1,200 feet from the bottom of Lift B. A skier capable of skiing 1,200 feet of beginner terrain and making the turn at the bottom of the beginner terrain to enter the skiway should have the skill necessary to navigate the skiway, since it was designed at a maximum 10 percent grade suitable for novices and has only one sharp corner. Signage at the bottom of Lift C would advise beginners to take the carpet lifts back to the gondola.

It is to be expected that signage would sometimes be ignored, and skiers of very low ability level would end up on the skiway. While there is steep terrain adjacent to it, the skiway would be wide enough at 16 feet for a multiple skier-width margin on the downhill side that a skier would have to cross to leave the skiway. Techniques such as slightly angling the skiway toward the slope could also help keep beginners on the skiway.

As described in section 3.10.3.3, this alternative would generally represent an improvement over the existing conditions with regard to the number of skiway crossings at Snow King. Ski runs crossing skiways are ubiquitous at ski areas throughout the world, and proper construction and signage practices have been well established as industry standards. While skiways crossing ski runs do present a safety issue, it is well in line with the inherent risks of skiing as a sport.

With regard to skier safety, this alternative would create more risk than Alternative 1. However, the circumstances of lower ability-level skiers using skiways that cross steep terrain and advanced skiers needing to cross skiways are not unique to Snow King or this alternative, and do not present safety hazards beyond the industry norm, with standard safety practices in place.

3.11.3.2.3 Alternative 3

With regard to the safety of beginner skiway users and skiers crossing the skiway, impacts of this alternative would be the same as those described above for Alternative 2.

3.11.3.2.4 Alternative 4

With regard to the safety of beginner skiway users and skiers crossing the skiway, impacts of this alternative would be the same as those described above for Alternative 3.

3.11.3.3 Avalanche

3.11.3.3.1 Alternative 1

Under this alternative, no additional ski runs would be developed at Snow King. As a result, the situation with regard to avalanche hazard would largely remain as described in the affected environment section (3.11.2.3). Over the long term, climate change may lead more often to conditions that have caused in-bounds avalanches in the past. No avalanche control would take place on slopes above residential areas immediately east and west of the current permit boundary.

3.11.3.3.2 Alternative 2

Under this alternative, all new terrain would be subject to the avalanche hazard reduction practices in place for existing ski runs, as described in section 3.11.2.3. The only difference with regard to control practices would be that more charges would be necessary on days when explosives were used due to the increased area subject to avalanche control.

With Snow King's standard avalanche hazard reduction practices in place, small wet-slide avalanches would likely continue to occur with roughly the same frequency as they have in the past. Avalanche starting zones associated with new terrain or the summit access road/novice skiway would be at least 1,500 feet away from any structures below the ski area. This represents an unprecedented movement distance for an avalanche at Snow King and is highly unlikely to occur since the slope, aspect, elevation, and precipitation levels for any new starting zones above structures would be similar to those already existing at Snow King. Avalanche control activities, including skier compaction, would be extended into the east and west boundary adjustment areas, including the Ferrin's slide path, providing additional protection to structures below.

As discussed in more detail in section 3.10.3.2.2, the number of skiway crossings of runs on the upper mountain would be reduced due to closure and obliteration of existing skiways made unnecessary by the new summit access road/novice skiway and removal of Cougar lift. This would reduce the potential for creation of unsupported slabs relative to current conditions. Transitional grading upslope of the summit access road/novice skiway would be done to reduce the formation of unsupported slabs. Finally, Forest Service review of Snow King's winter operations plan would include review and approval of the ski area's avalanche hazard management program, and any deficiencies would be addressed in that review.

Avalanche hazard on the back side would be lower than under Alternative 1 due to additional hazard reduction practices as well as a higher level of skier compaction.

Overall, this alternative represents a slight increase in avalanche hazard relative to Alternative 1 simply due to the increase of skiable terrain where avalanches could occur in proximity to in-bounds skiers at the ski area.

3.11.3.3.3 Alternative 3

With regard to avalanche hazard, impacts of this alternative would be essentially the same as those described above for Alternative 2. Obliteration of the Slow and Fast trail skiways would marginally decrease the risk associated with unsupported slabs forming above skiways.

3.11.3.3.4 Alternative 4

With regard to avalanche hazard, impacts of this alternative would be the similar to those described above for Alternative 3. Slow Trail would not be obliterated, marginally increasing the locations where slabs could form above skiways. The only other difference would be where the new front-side ski runs would be cut. These different locations would not substantially change the level of avalanche hazard relative to Alternative 3. Therefore, like Alternative 3, this alternative represents a slight increase in avalanche hazard relative to Alternative 1, simply due to the increase of skiable terrain where avalanches could occur in proximity to in-bounds skiers at the ski area.

3.11.4 CUMULATIVE EFFECTS

Table 3.1.2 describes two projects with the potential to add cumulatively to the direct and indirect recreation effects of the action alternatives. In terms of the safety of summer visitors, the 2015 aerial adventure course added to the general congestion in the area of the Rafferty mid-station due to the concentration of summer activities there, including the aerial adventure course. This situation is described in section 3.11.2.1, setting the baseline for discussion of safety impacts in section 3.11.3.1. Section 3.11.5 lists design criteria anticipated to effectively address these cumulative effects.

In terms of skier safety, the 2015 Rafferty lift replacement and trail development project resulted in two crossings of Slow Trail skiway on the intermediate runs off the top of Rafferty. These are included in the discussion of the affected environment in section 3.11.2.2, which brings their cumulative impact into the analysis. The analysis concludes that these effects on skier safety are routine at ski areas and manageable through standard design and operational practices.

3.11.5 DESIGN CRITERIA

1. Use at least four signs on the downhill trails to notify riders of each intersection of a downhill trial with an existing trail. Space signs approximately 100, 50, 25, and 0 feet from the intersection. Additional signs may be used if deemed necessary.
2. For each intersection, use two signs on the existing trail, one facing each direction, to notify users of the existing trail of the intersection.
3. Where appropriate, use slowing features to reduce the speed of downhill trail users at intersections with existing trails.
4. When determining the final layout of downhill trails, ensure that users of the trail can see at least 20 feet up and down the existing trail from a distance of 30 feet away from the intersection.
5. In circumstances where the design criteria above cannot be implemented, use bridges, or underpasses, to take users of the new downhill trail over, or under, the existing trail without risking a collision.

3.12 SCENERY

3.12.1 SCOPE OF ANALYSIS

3.12.1.1 Scenic Quality

- *How would the proposed infrastructure affect the scenic quality of Snow King Mountain?*

The front side of Snow King is the southern backdrop of the town, where scenic quality is a widely held value. While the resort is already part of that backdrop, additional infrastructure, individually and collectively, on the front side and the summit could result in an even less natural appearing view from the town.

Indicator: Assessment of the impact of the proposed infrastructure using the methodology established in the Forest Service's Visual Management System (Forest Service 1974).

3.12.1.2 Lighting

- *How would the proposed lighting for night skiing and operation of summit facilities affect the nighttime view and dark sky?*

While lighting for night skiing, grooming, and other on-mountain activities has been part of the nighttime setting on the mountain for some time, the proposed expansion of night lighting and addition of summit lighting would constitute a greater departure from the natural setting.

Indicator: Review of the current setting and applicable local regulations regarding lighting, then assessment of the extent, intensity, and duration of the proposed change, in the context of those local regulations. (While local regulations do not apply to National Forest System lands, we consider them in this analysis in our efforts to be a good neighbor.)

3.12.2 AFFECTED ENVIRONMENT

3.12.2.1 Scenic Quality

3.12.2.1.1 Management Direction

The goal of landscape management on all National Forest System lands is to maintain the highest possible scenic quality, commensurate with other appropriate public uses, costs, and benefits. Since the mid-1970s, the Forest Service has operated under the guidance of the Visual Management System (AH-462, National Forest Landscape Management, Volume 2, Chapter 1, issued April 1974) for inventorying, evaluating, and managing scenic resources on National Forest System lands. The Visual Management System provides a system for measuring the inherent scenic quality of any forest landscape and the degree of alteration for use in inventory and management.

Under this system, Visual Quality Objectives (VQOs) are based on the physical characteristics of the landscape and the sensitivity of the setting as viewed by humans. VQOs define how the landscape will be managed, the level of acceptable changes to the landscape character permitted in the area, and under what circumstances management activities or recreational development may be allowed.

Different VQOs may apply to different distance zones. Applicable VQOs are based on land allocations established by the Forest Plan. The Bridger-Teton Forest Plan assigns the VQOs of modification and partial retention to the Desired Future Condition 9B, Special Use Recreation Area, zone that includes Snow King (p. 306). Those VQOs are defined as follows:

> Modification: Under the modification visual quality objective management activities may visually dominate the original characteristic landscape. However, activities of vegetative and land form alteration must borrow from naturally established form, line, color, or texture so completely and at such a scale that its visual characteristics are those of natural occurrences within the surrounding area or character type. Additional parts of these activities such as structures, roads, slash, root wads, etc., must remain visually subordinate to the proposed composition.
>
> Activities which are predominately introduction of facilities such as buildings, signs, roads, etc., should borrow naturally established form, line, color and texture so completely and at such scale that its visual characteristics are compatible with the natural surroundings.
>
> Partial Retention: Management activities remain *visually subordinate* to the characteristic landscape when managed according to the partial retention visual quality objective.
>
> Activities may repeat form, line, color, or texture common to the characteristic landscape but changes in their qualities of size, amount, intensity, direction, pattern, etc., remain visually subordinate to the characteristic landscape.

> Activities may also introduce form, line, color, or texture which are found infrequently or not at all in the characteristic landscape, but they should remain subordinate to the visual strength of the characteristic landscape.

Landscapes can also be described in terms of their existing visual condition (EVC). EVC describes the visual appearance of the landscape at the time the project area scenery assessment is conducted. It excludes the context of whether the landscape is seen or not seen from sensitive roads, trails or recreation use areas. EVC indicates the amount of change that has occurred in the past, and what level of change may be acceptable in the future.

The relevance of EVC for this analysis is to use the present visual condition of the project area as a baseline to evaluate the acceptable desired future condition and cumulative effects outlined in the Forest Plan management prescription criteria. Six levels are used to describe the landscapes existing visual condition ranging from pristine to intensively modified:

> **Type I:** Landscapes where only ecological change has occurred, except for trails needed for access. Landscapes appear to be untouched by human activities.
>
> **Type II:** Landscapes where change is not noticed by the average forest visitor unless pointed out. These landscapes have been altered but changes are not perceptible.
>
> **Type III:** Landscapes where changes are noticeable by the average forest visitor, but they do not attract attention. Changes appear to be minor disturbances.
>
> **Type IV:** Landscapes where changes are easily noticed by the average forest visitor and may attract attention. Changes appear as disturbances but resemble natural patterns in the landscape.
>
> **Type V:** Landscapes where changes are very noticeable and would be obvious to the average forest visitor. Changes tend to stand out, dominating the view of the landscape, but are shaped to resemble natural patterns.
>
> **Type VI:** Landscapes where changes are in glaring contrast to the landscape's natural appearance. Changes appear as dramatic, large scale disturbances that strongly affect the average forest visitor.

In regard to building aesthetics, agency direction is provided in *The Built Environment Image Guide for the National Forests and Grasslands* (BEIG; Forest Service 2001c). The BEIG was prepared by the Forest Service for use by those involved in planning, designing, constructing, repairing, maintaining, and authorizing facilities on National Forest System lands, including architects and landscape architects. An important aspect of the BEIG is that it considers not only the natural environment but also the cultural and economic contexts:

> The proper fit of Forest Service facilities into their natural, cultural, and economic contexts requires careful consideration of many aspects of design, including scale, proportion, and selection of building materials. (p.5.)
>
> The built environment should reflect the context of its surroundings, including its physical setting, social context, and long-term economic effects… (p.6.)

Snow King lies in the BEIG's Rocky Mountain province, and the BEIG provides specific guidelines regarding siting, design, and materials specific to this province that are to be considered in engineering review of final building plans prior to construction.

The final point of management direction to note is the provisions of the *Jackson/Teton County Comprehensive Plan* dealing with scenic quality. While National Forest System land does not fall under the purview of this plan, the Bridger-Teton strives to be a good neighbor and accommodate local planning

goals and objectives, and protection of scenic resources is component of the comprehensive plan, including the Snow King Slope subarea.

Most relevant to this analysis is the plan's direction regarding construction on skylines, given current and proposed facilities on the top on Snow King Mountain. Policy 1.3.a of the plan states "Buttes, ridgelines, and mountains are the most prominent aspects of our landscape. Development along butte tops and ridgelines will be avoided or minimized so that key skyline viewsheds retain a natural appearance uninterrupted by built forms."

3.12.2.1.2 Current Setting

This analysis focuses on the front side of Snow King, as the back side is not visible from any sensitive viewpoints. The modification VQO is applicable to foreground views of the ski area, adjacent to the base area at Snow King, around the National Forest boundary land. Partial retention describes the higher reaches of Snow King Mountain, viewed in the middle ground and background from Jackson. In the modification zone, the area around the Rafferty mid-station has been developed for summer as well as winter recreation, with summer infrastructure the most visible variation from the natural landscape. In addition to the mid-station of Rafferty lift itself, the tops of the alpine slide and mountain coaster lie on or just below National Forest System land, as does the ropes course.

In terms of winter infrastructure, there are several ski runs that roughly parallel the Rafferty lift, and other runs are arranged across the front side of the mountain, running together in the generally open toe of the slope near and below the National Forest boundary. They comprise about 135.6 acres of cleared ski terrain. The Rafferty and Cougar lifts cross from the private base area onto National Forest System land and end mid-way up the slope. The Summit lift runs to top of the mountain from the western base area. The ski runs are the most visible feature in the partial retention zone. The lifts, lift terminals, and access roads are less visible from vantage points at the base area, in the town, and to a lesser degree on highways approaching the town.

Overall, Snow King maintains the visual aesthetics that viewers expect from one of the first ski areas permitted by the Forest Service in the US. That permit has been in effect since 1936, and Snow King is a widely recognized and appreciated feature of the local landscape. It has even been identified as eligible for listing on the National Register of Historic Places as an historic landscape (section 3.7).

In terms of compliance with the VQOs assigned by the Forest Plan, the permit area from the National Forest boundary to the summit of Snow King is clearly identifiable as a ski area. No major land-form alteration has occurred, but vegetation alteration in the form of ski run development is a departure from the natural setting. While naturally occurring avalanche chutes are not evident in the permit boundary, the ski runs exhibit some of their characteristics in terms of line, color, and texture. The ski runs are vertical features that follow the fall line down the mountain. Their alignments and widths are variable, reflecting variation in the existing topography. Their edges have been "feathered," or cut unevenly to appear more natural. Stringers and islands of forested vegetation have been left intact to break up their pattern. As a result of natural and seeded revegetation, ski run vegetation matches fairly well in terms of color and texture with vegetation in natural openings.

Ski area infrastructure has also added elements to the landscape that are rare or infrequent in nature, particularly the straight lines associated with ski lifts, service roads, and buildings. However, the lifts are vertical features which helps them blend, and they are fine textured, few in number, and difficult to discern at distance. Service roads by necessity exhibit unnatural alignments and angles, but again they are relatively fine in texture and few in number, and their colors are natural. Few buildings have been constructed above the National Forest boundary, and those are generally screened by vegetation or, in the case of the summit buildings, by topography and distance.

In summary, while Snow King is readily identifiable visually as a ski area, it remains visually subordinate to the forested mass of Snow King and the adjacent peaks. Considering its setting and its history, the ski area is consistent with assigned VQOs and with what viewers expect to see.

Based on these considerations, the EVC of the project area landscape is Type V. Landscape changes are very noticeable and would be obvious to the average Forest visitor. Changes tend to stand out, dominating the view of the landscape, but are shaped to resemble natural patterns.

In terms of compliance with the BEIG, Snow King has few buildings of National Forest System land. As discussed in more detail in the cultural resources analysis (section 3.10), most structures outside the private base area are on the summit. They include the Panorama House (a warming hut with basic food and beverage service and a viewing deck), the top terminal of the original Summit lift (the unloading platform converted to a observation deck and the mechanical building used as a ski patrol shack), and an old, unused Civilian Conservation Corps cabin dating back to the 1930s. The only other building on National Forest System land is a small snowmaking pump house on the edge of Elk ski run built in 2014. These few structures were built over a period of more than 80 years, predating the BEIG, and they reflect no cohesive architectural style of design elements.

Finally, in regard to comprehensive plan direction on skyline protection, the buildings on the summit are too small and/or set back from the skyline as viewed from Jackson to be readily visible. While a number of communications towers are clearly visible on the Snow King ridgeline, the ski area buildings themselves do not interrupt the skyline viewshed.

3.12.2.2. Lighting

3.12.2.2.1 Background

The *Jackson/Teton County Comprehensive Plan* also includes the following direction regarding lighting and protection of dark skies: “The prominence of nature over the built environment should extend beyond daytime viewsheds. Lighting of individual developments cumulatively impacts the ability to see dark and starry night skies. Although lighting is required for public safety, especially along pedestrian corridors, non-essential lighting will be limited, and all lighting will be designed to meet dark skies best practices.” While National Forest System land does not fall under the purview of this plan, the Bridger-Teton strives to be a good neighbor and accommodate local planning goals and objectives, and protection of scenic resources is component of the comprehensive plan, including the Snow King Slope subarea.

3.12.2.2.2 Current Setting

The ski area can be a fairly active place at night, with light generated by night skiing, grooming of ski runs, and snowmaking. These are currently all winter activities, so the area is generally dark from the end of one ski season till the beginning of the next.

Night skiing has been offered on approximately 73.8 acres on the lower two-thirds of the mountain, in the Rafferty and Cougar pods. The schedule has varied, reflecting primarily the needs of the Jackson Hole Ski and Snowboard Club or other ski training organizations. Night skiing currently runs from 4–6:30 PM but has run later in the past. As discussed in section 2.4.6, a general lighting 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 in the form of glare (i.e., direct view of lighting elements) and sky glow (i.e., illumination of dust, water vapor, and other material in the sky).

Grooming has become an increasingly important aspect of ski area management because skier expectations for smooth snow surfaces and the need to “farm” snow to preserve the snowpack in good condition as long as possible. Snow King grooms all its permit area terrain, currently using two snowcats making vertical passes up and down the runs. The snowcats use headlights and spotlights to guide their work. Grooming operations generally continue through the night.

For similar reasons, snowmaking has become more important to ski areas industry wide, to maintain coverage and high-quality snow surfaces in an era of more variable natural snowfall. Snow King currently employs 30–40 snowmaking guns in a system covering about 90 acres in the Rafferty and Cougar pods and extending up Elk run. Each snowmaking gun has a light that is illuminated while it is operating, and operations generally run all night for roughly the first 60 days of the season.

Night skiing generates the most light but for the shortest period of the evening. Grooming generally occurs season-long and night-long, making it the most persistent source of light. However, it involves the smallest number of lights. Snowmaking falls somewhere between these limits. Collectively, this lighting is consistent with ski area operations anywhere and is a small fraction of the glare and sky glow generated by Jackson and surrounding communities. However, light occurring on the steep slope overlooking the town is more visually striking. Snow King's ongoing effort to upgrade the lighting technology for night skiing has notably decreased both sky glow and glare.

3.12.3 DIRECT AND INDIRECT EFFECTS

3.12.3.1 Scenic Quality

3.12.3.1.1 Alternative 1

Under the no-action scenario, Snow King's effect on scenic quality would remain as described above (section 3.12.2.1.2). Routine operations and maintenance would not alter the current viewshed, which is illustrated in Figure 3-40.

3.12.3.1.2 Alternative 2

Under this alternative, 11 new front-side ski runs, some in the eastern and western boundary adjustment areas, and modification of four existing runs would require an additional 117.8 acres of run development, 53.3 of which would be on the visible front side. The most visible changes from current conditions would be associated with the following runs: run 3 from the true summit of Snow King down to the top of Rafferty; run 8 from the summit ridge down to connect with Grizzly; runs 10, 11, 12, and 13 and modification of Belly Roll in the large forested patch between Elk and Exhibition; and modification of Bearcat. These runs would be more visible than others due to their elevation on the mountain and their alignment facing Jackson, making them highly visible. Conversely, runs such as 4, 5, and 7 would be much less visible since they are lower on the mountain and angled away from important viewpoints.

The same design and construction measures outlined above (section 3.12.2.1.2) would be employed to make new and modified runs as natural appearing as possible in terms of line, color, and texture. See Figure 3-41.

The upper section of the proposed summit access road/novice skiway (run 14), would be a less visible new element, although the profile would be more discernible in summer, crossing cleared ski runs, and year round as a break in canopy cover where it passed through forested patches. This would be an unnatural appearing, nearly horizontal line. However, obliteration of all but the top section of Elkhorn Trail (which is the existing summit access road) and an unnamed service road and user-created hiking trail on the lower front side would reduce the net number of such unnatural features in the viewshed.

Replacing the existing Summit chair with a gondola in the same alignment would increase the visual impact of the lift slightly due to the larger cabins. The lift would remain an unnatural, linear feature on the landscape but would not stand out due to its fine scale. The back side and summit carpet lifts would not be visible from Jackson.

Summer infrastructure on the front side would include the zip line from the summit to near the gondola bottom terminal, about 6.5 miles of mountain bike trails, and about 2.1 miles of new or reconstructed hiking trails. The zip line would have no intervening towers, and the cable diameter would be too small to be

visible from Jackson. Since most existing hiking and biking trails are not visible from Jackson viewpoints (see Figure 3-40), the proposed ones would likely not be discernible either, particularly following required rehabilitation of disturbed areas (section 3.4).

In terms of buildings, the existing Panorama House, unloading platform/observation deck, and ski patrol shack would be removed and replaced with the proposed multi-functional summit building. In Figure 3-40, the existing buildings are not discernible. In light of design requirements discussed in more detail below under BEIG compliance, the new summit building would not be seen during the day either. Night lighting is discussed below (section 3.12.3.2.2). The CCC cabin and observatory would be beyond the skyline, and the wedding venue – a natural-appearing excavated feature – would be obscured by vegetation and topography.

The other building proposed under this alternative is the temporary ski patrol building at the top of Cougar lift. It would be a small, pull-on structure set at the edge of the trees above the top lift terminal. That terminal is a larger structure than the building would be, and it is barely discernible from Jackson (Figure 3-41). The patrol building would not be a notable visual impact.

Obliteration of all but the top section of Elkhorn Trail and an unnamed service road and user-created hiking trail on the lower front side would contribute marginally to a more natural visual character.

Overall, in terms of complying with the assigned VQOs of modification and partial retention, this alternative would be more of the same – a quantitative change rather than a qualitative one. The area would still appear as a basic small ski area, meeting viewers' expectations in that regard. However, the new ski terrain would occupy substantially more of the viewscape, making the ski area marginally less visually subordinate to the forested mass of Snow King and the adjacent peaks.

The cultural resource analysis addresses the impact of these changes to the viewshed on Snow King's historic landscape (section 3.7).

Based on these considerations, the changes under Alternative 2 would be consistent with the Type V EVC.

Compliance with the BEIG would become a consideration under this alternative. As described in Chapter 2's description of the proposed summit building and Cougar ski patrol building (section 2.4.5), both would be built in compliance with the BEIG's guidelines for the Rocky Mountain Province. Those guidelines are summarized as, "include overscaled building elements, such as oversized doors and windows, heavy timber structures, and boulders incorporated into the building base…" to "help humans relate to the overpowering scale of the landscape," and "make the scale, color, and texture of materials correspond to the setting." Any given developed site should reflect a consistent architectural theme. As discussed in section 2.4.5, these buildings have not yet been designed, but pre-construction engineering review of final plans by the Bridger-Teton would ensure compliance with these guidelines. Compliance, in turn, would ensure that the buildings blended with the natural setting and shared and established architectural theme.

The last issue is the proposed summit building's compliance with *Jackson/Teton County Comprehensive Plan* (Town of Jackson and Teton County 2012) direction regarding construction on skylines, though as noted above compliance is not required on National Forest System land. That direction is, "Development along butte tops and ridgelines will be avoided or minimized so that key skyline viewsheds retain a natural appearance uninterrupted by built forms." As discussed in section 2.4.5.1, the building would be a single-story and set back from the ridgeline. It would comply with plan direction that the roof line be broken up to include multiple levels rather than forming a single, unnatural straight line. As noted above (section 3.12.2.1.2), the Snow King ridgeline is already punctuated by a number of visible communication towers. Based on these considerations, coupled with the fact that the building would be nearly 2 miles in slope distance from viewpoint on the north end of Jackson used in our visual simulations, the summit building would comply with comprehensive plan direction regarding skyline construction.

3.12.3.1.3 Alternative 3

The main new element with potential visual effects under this alternative would be the thinning or glading of about 190 acres, mostly on the visible front side of Snow King. These treatments would be similar in terms of what was done on the ground, with both involving removal of dead, unhealthy, poorly formed, or overly crowded trees, resulting in a spacing of 10 to 18 feet between trees. Dead and down material would also be removed. In many areas, this would not entail the removal of many trees.

In terms of visual impact, thinning and glading have been going on at Snow King for a number of years, with the objective of reducing fuel loads at the wildland/urban interface and improving skiing. However, given the variability in cover and texture of the forest canopy on Snow King Mountain, the thinned areas are not visually discernible. As a result, the impact of this activity on scenic quality is projected to be negligible.

This alternative includes several other changes relative to Alternative 2 with potential minor visual impacts (Figure 3-42). The Cougar lift would be removed, making the Slow Trail and Fast Trail access road/novice skiways unnecessary. These features would be obliterated. These changes would reduce the human-created visual clutter on the front side of Snow King.

Alignments of the Summit gondola, zip line, and summit hiking trail would be altered, but these changes would have negligible effects on visual impacts. The Cougar ski patrol building would no longer be necessary and would not be built.

Based on these considerations, Alternative 3 would be consistent with the VQOs of modification and partial retention and with Type V EVC. This alternative would be the same as Alternative 2 in terms of compliance with BEIG guidelines and skyline construction direction.

3.12.3.1.4 Alternative 4

The primary change under this alternative would be reconfiguration of front-side ski runs. To protect the historic landscape, several proposed runs in the central part of the ski area would be eliminated (runs 8 and 10–12). Run 3 along the upper, eastern edge of the current permit area, and runs 1, 2, and 15 in the east and west boundary adjustment areas, would be added to offset the resulting loss in trail capacity in balance with the new gondola. Total new terrain would be 133.6 acres.

New runs would be constructed using the same design and construction measures outlined above (section 3.12.2.1.2) to make them as natural appearing as possible in terms of line, color, and texture. See Figure 3-43. The acreage of increased ski terrain would be somewhat higher than Alternative 3, but terrain development would be shifted from the central part of the ski area to the east and west boundary expansion areas. These areas are less visible from most perspectives in Jackson, but they are previously unaffected visually by ski area activities.

The other change from the previous alternatives is in the design of the front-side mountain bike trail system. The length of trails would be reduced by roughly a third, and the bulk of trails would be shifted down slope and to the east into the eastern boundary adjustment area and the Rafferty pod. As noted above (section 3.12.3.1.2), bike trails are not generally visible, so this change is likely negligible in terms of scenic impact. However, the trails would generally be in a more heavily forested area, lower on the mountain, and on a less direct exposure to Jackson viewpoints.

Based on these considerations, the same conclusions regarding compliance with assigned VQOs, Type V EVC, BEIG guidelines, and skyline construction direction would hold for this alternative as for Alternative 3.

Figure 3-40. View from turnout on US Highway 26 entering Jackson from the north under Alternative 1 (actual current condition).

Figure 3-41. View from turnout on US Highway 26 entering Jackson from the north under Alternative 2 (simulation).

Figure 3-42. View from turnout on US Highway 26 entering Jackson from the north under Alternative 3 (simulation).

Figure 3-43. View from turnout on US Highway 26 entering Jackson from the north under Alternative 4 (simulation).

3.12.3.2 Lighting

3.12.3.2.1 Alternative 1

Under the no-action scenario, the night-lighting situation would remain as described above (3.12.2.2) in terms of lighting for night skiing, operation of grooming equipment, and snowmaking.

3.12.3.2.2 Alternative 2

Under Alternative 2, the area illuminated for night skiing would increase by 27.3 acres, or 37 percent. 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, Lift B and C terrain, and the proposed summit access road/novice skiway. The hours night skiing was offered could be extended to as late as 9 PM. The lighting equipment would incorporate modern technology to provide more uniform and effective lighting to the snow surface while generating less glare and sky glow. This technology includes energy efficient magnetic induction lights and downcast reflectors.

In regard to grooming, Alternative 2 would add 117.8 acres of new ski runs, 53.3 of which would be on the visible front side. Snow King projects that the same two snowcats currently used for grooming would sufficient to cover the additional terrain, though intensity of grooming might decrease somewhat. As a result, the light generated by grooming would not change.

As to snowmaking, this alternative would add 147.7 acres of new snowmaking system coverage, 82.6 acres of which would be on the front side. Snow King projects that this might increase the number of lighted snowmaking guns by 20, most of which could be operating on the front side depending on conditions. That would be a 50 to 67 percent increase over the current operation.

Alternative 2 would introduce a new light source as well, the summit building described in section 2.4.5.1. In addition to its daytime functions, this building would include a restaurant open during the evening, and it would be a venue for evening events. As discussed above (section 3.12.3.1.2), the building would be a low structure, set back from the ridgeline and at least a mile distant from viewpoints in Jackson. It would also be LEED-certified for energy efficiency and would employ dark sky designs and operating practices such as minimal exterior lighting, appropriate bulbs and downcast reflectors, no exterior lights on after operating hours, and non-reflective glass (section 2.4.5.1). Black-out curtains and downcast red lighting of walkways between building and the gondola have also been proposed by Snow King for any activities at the facility after 10 PM.

Hours of operation would likely vary, with a normal restaurant closing time of 10 PM and most special events over by midnight. Once operations ended, lighting would be extinguished.

Overall, the changes in lighting associated with night skiing, grooming, and snowmaking would be quantitative rather than qualitative, commensurate with growth and development in the community. The summit building would be a new light source, but the stated design and operating parameters would minimize its visual impact. All in all, this alternative would comply with the town and county's comprehensive plan direction to limit lighting to what is required for public safety, especially along pedestrian corridors, limiting non-essential lighting, and designing lighting to meet dark skies best practices.

3.12.3.2.3 Alternative 3

None of the changes incorporated into Alternative 3 would alter the lighting impacts identified under Alternative 2 above.

3.12.3.2.4 Alternative 4

None of the changes incorporated into Alternative 4 would substantially alter the lighting impacts identified under Alternative 3 above. The altered ski run configuration would result in less grooming and snowmaking

concentrated in the central portion of Snow King's front side, and more dispersion of these activities into the east and west boundary adjustment areas.

3.12.4 CUMULATIVE EFFECTS

Of the cumulative actions identified in section 3.1.2, two have the potential to effect scenic resources in a cumulative way, overlapping the direct and indirect effects of the alternatives considered here. The 2015 Rafferty replacement and trail development added to the cleared openings on the forested front side of Snow King Mountain. This contributed cumulatively to the extent of clearly ski-area generated visual impacts. The Rafferty development is included as appropriate in the affected environment description (section 3.12.2.1.2), ensuring that its cumulative impact is considered in the analysis.

The other project is the ongoing Lower Elk Lighting project, which will complete the effort begun in 2015 to reduce light pollution in the sky with energy efficient magnetic induction lights that are also less impactful on wildlife. It includes additional 80 lights and 15 poles, replacing existing lighting on lower Elk. By reducing existing glare and sky glow, it would have a positive cumulative effect.

3.12.5 DESIGN CRITERIA

1. Design and build permanent structures in compliance with the Forest Service's *Built Environment Image Guide* (https://www.fs.fed.us/recreation/programs/beig/), ensuring that architectural style, building materials, size, and color are consistent and meet the adopted scenery objectives. Confirm compliance through Forest Service engineering review prior to construction.
2. Feather the edges of cleared ski runs to appear more like natural openings in forest cover, flowing with the topography and blending with the natural vegetation.
3. Acid dip or otherwise treat lift towers to reduce reflectivity and visual impact.
4. Consider pertinent Teton County and Town of Jackson development regulations regarding dark sky maintenance and ridgeline construction, as appropriate.
5. Obliterate all roads and trails identified for obliteration that lie below the upper leg of the proposed summit access road/novice skiway within 1 year following completion of the proposed summit access road/novice skiway.
6. Obliterate the first segment of Elkhorn Trail above the upper leg of the proposed summit access road/novice skiway within 1 year following completion of Lift D.

3.13 OTHER DISCLOSURES

3.13.1 HEALTHY FOREST RESTORATION ACT

This action would implement a land management plan and is not authorized under the Healthy Forest Restoration Act. As a result, it is subject to subparts A and B of the Project-level Predecisional Administrative Review Process (36 CFR 218).

3.13.2 SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

NEPA requires that an EIS considers "the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity" (40 CFR 1502.16). This includes using all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and to fulfill the social, economic, and other requirements of present and future generations of Americans (NEPA, Section 101).

Snow King's permit allocates the National Forest System lands occupied by the ski area to provision of recreation opportunities through the term of the permit. This land use has some inherent impacts. This analysis identifies several adverse environmental effects, but few have important implications for the long-term productivity of the site. Surface and subsurface water systems would not be notably affected (see section 3.4.3.1). Changes in soil loss and fertility would be minimal (see section 3.4.3.2). Vegetation changes would be reversible through succession. The question here is whether this land use justifies any loss in long-term productivity of the resources involved.

Through issuance of ski area permits, the Forest Service helps provide outdoor recreation for a high number of visitors on a relatively small proportion of our National Forest System lands. The Bridger-Teton is no exception. The ski areas on the Bridger-Teton account for the majority of the total visitor use on the Forest while accounting for only a small fraction of the Forest's area.

In short, the potential impacts of this proposal on the long-term productivity of the ski area are minimal, especially in relation to the value of the short-term use. No important distinction among the alternatives can be drawn.

3.13.3 UNAVOIDABLE ADVERSE EFFECTS

This analysis identifies a number of adverse effects which are either minor or would be avoided through implementation of design criteria. This discussion focuses on more substantial adverse effects that would not be fully avoided by design criteria. By resource, these are as follows:

Climate Change (section 3.2) – No unavoidable adverse effects.

Air Quality (section 3.3) – No unavoidable adverse effects.

Water, Soils, and Watershed (section 3.4) – No unavoidable adverse effects.

Vegetation (section 3.5) – No unavoidable adverse effects.

Wildlife (section 3.6) – No unavoidable adverse effects.

Cultural (section 3.7) – All action-alternatives would have unavoidable adverse effects on resources that are contributing to the historic landscape at Snow King. Section 106 consultation (section 3.7.5) will determine if and how these impacts would be minimized.

Land Use (section 3.8) – No unavoidable adverse effects.

Noise (section 3.9) – Under Alternative 2 there would be unavoidable impacts due to the summer recreation-related noise on the western side of the ski area.

Recreation (section 3.10) – Increased mountain bike use on existing cross-country trails under Alternative 2 could increase user conflicts, trail damage, and resource impacts in the Cache Creek/Game Creek trail system.

Safety (section 3.11) – No unavoidable adverse effects.

Scenery (section 3.12) – No unavoidable adverse effects.

3.13.4 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Irreversible commitment of a resource means that, once committed to a given use, the resource is lost to other uses. In general, this term applies to non-renewable resources (e.g., minerals, geologic features, or historic sites) or to resources which are renewable only over a very long period of time (e.g., soil fertility or perhaps old-growth forests). Most of the impacts identified in this analysis do not fall in this category. If the decision were made to terminate the resort's permit, the site could be reclaimed, and most resource functions could be returned to their previous levels. However, there may be some exceptions:

- Soil productivity at some of the larger grading or excavation areas, such as the teaching center terrain and the access road/novice skiway, would likely not return to previous levels for a long time, if ever.
- Succession to pre-disturbance vegetation types would also be a slow process, particularly for older forest stands.
- Restoration of impacts associated with the historic landscape would be either not possible, as with removed structures such as the panorama house, or would be a very slow process, as with trees growing into cut runs to restore the historic run pattern.

Irretrievable commitments of resources involve lost use or productivity of resources. Any lost use or production resulting from this proposal's commitment of resources to recreation development would fall in this category. This could include the timber production lost to maintenance of open ski runs, access roads, and trails. However, ski areas are not typically managed for sustainable timber production.

While this proposal involves both irreversible and irretrievable commitments of resources, most of the commitments were made decades ago when the ski area was developed, and they are likely to continue. The incremental impact of this proposal would be minimal, and no important distinctions can be made among the alternatives in this regard.

3.13.5 Incomplete and Unavailable Information

No information necessary to appropriate analysis and disclosure of the environmental effects of the alternatives was incomplete or unavailable.

3.13.6 Energy Requirements and Conservation

Implementation of any action alternative would increase the ski area's energy demands in the short-term due to the need for construction vehicles and machinery. In the longer term, the additional ski lifts and buildings would consume energy, but the increase would be offset by removal of less efficient, older facilities with modern, high-efficiency technology. Energy use and conservation would be similar under all action alternatives.

3.13.7 Pollinators

A Presidential Memorandum was signed June 20, 2014, establishing the Pollinator Heath Task Force (PHTF), calling for the creation of a national pollinator health strategy, and directing federal land management agencies to review any new or renewing land management contracts and grants for the opportunity to include requirements for enhancing pollinator habitat (Obama 2014). The resulting 2015 *National Strategy to Promote the Health of Honey Bees and Other Pollinators* discusses Forest Service efforts to, among other things, restore pollinator habitat through prescribed fire and silvicultural thinning of forested stands and educate the public about pollinators (PHTF 2015).

Pollinators inhabiting the area likely include birds, bats, and other insects. This diverse group pollinates a wide number of plant species. The proposed action and all action alternatives would decrease tree cover in forested stands on proposed ski runs, lift alignments, and in gladed or thinned areas. Those treatments would likely increase plant species diversity, especially in densely forested areas, and likely benefit pollinator species.

Climate change could temper this positive conclusion. Recent research on climate change effects on western lands managed by the Forest Service and the National Park Service indicates several relevant conclusions (Halofsky et al 2018). First, in alpine ecosystems forbs are important for bees and other pollinators. Second, changes in the winter climate can expose alpine and subalpine plants and seeds to frost damage, disease

outbreaks, and habitat fragmentation, and can result in plant phenology that is out of sequence with pollinators. Third, these effects may favor generalist pollinators over alpine specialist pollinators.

3.14 CONSISTENCE WITH LAWS, REGULATIONS, POLICIES, AND PROCEDURES

3.14.1 ENDANGERED SPECIES ACT

The analysis of potential impacts on federally listed wildlife species is documented in section 3.6. There are no federally listed plants in the area. A Biological Assessment (BA) will be prepared for this analysis to document compliance with the ESA once a preferred alternative has been identified. The BA will be submitted to the FWS, initiating consultation under Section 7 of the Endangered Species Act. All consultation with the FWS will be completed before a Record of Decision is signed for this project.

3.14.2 CLEAN WATER ACT

The objective of the Clean Water Act is to restore and maintain the chemical, physical, and biological integrity of all waters of the US in order to protect their beneficial uses – in this case, those assigned by the Wyoming Department of Environmental Quality (WDEQ). Beneficial uses reflect resources or activities that would be directly affected by a change in water quality or quantity.

As discussed in the water, soils, and watershed resources analysis (section 3.4), the project area includes no live water and has no surface hydrologic connectivity with waters outside the project area, except stormwater runoff collected on East Snow King Avenue. These factors limit the scope of potential impacts on water quality. The design criteria for the water, soils, and watershed resource (section 3.4.5) include many BMPs, including those described in *Ski Area BMPs: Guidelines for Planning, Erosion Control, and Reclamation* (Forest Service 2001a). These design criteria would eliminate the potential for substantial water quality impacts associated with any alternative (see section 3.4.3.3).

3.14.3 AMERICANS WITH DISABILITIES ACT

In accordance with Forest Service regulations, compliance with the accessibility guidelines of the Americans with Disabilities Act of 1990 (ADA) and Uniform Federal Accessibility Standards (UFAS) of Section 504 of the Rehabilitation Act of 1973 apply to the design of structures proposed as part of this project. The ADA applies because Snow King operates as a "public accommodation," that is, it is a business open to the public. Section 504 applies because the ski area operates under a special-use permit authorized by a federal agency, the Forest Service. Implementation guidelines for Section 504 that apply to recreation special-use permit holders are located in 7 CFR 15b.

UFAS and ADA accessibility guidelines were combined in November 8, 2005, and are now known as the Architectural Barriers Act Accessibility Standard (ABAAS). The ABAAS replaces the former guidelines as the current standard for federal agencies, including the Forest Service. These guidelines are included in the *Accessibility Guidebook for Ski Areas Operating on Public Lands – 2012 Update* (Forest Service 2012b). Design criterion 1 in section 3.10.5 directs that design and construction of new structures will comply with this document. Bridger-Teton engineering review of construction plans prior to notification to proceed will ensure compliance with ABAAS.

3.14.4 EXECUTIVE ORDER 11644 - USE OF OFF-ROAD VEHICLES ON PUBLIC LANDS

Public use of off-road vehicles is not authorized within Snow King's permit area. Only the ski area may use such vehicles in conducting authorized activities. None of the alternatives would alter this.

3.14.5 Executive Orders 11988 and 11990 - Protection of Floodplains and Wetlands

As discussed in the issues considered but not carried into detailed analysis section (section 1.7.2.1), there are no wetlands in the project area and thus no potential for direct effects. The analysis in this section states that there are also no surface waters and thus no floodplains subject to direct effects. The lack of surface hydrologic connectivity effectively eliminates the potential for indirect impacts on these resources.

3.14.6 Executive Order 13186 - Protection of Migratory Birds

This order and the protection it affords to migratory birds is discussed in the wildlife analysis (section 3.6.2.3). That analysis concludes that potential impacts on migratory birds would be eliminated by the addition of design criterion 1 in section 3.6.5, which requires trees to be cut outside of the nesting season unless they are specifically determined to be free of nesting birds. A small fraction of available habitat for forest nesting species would be lost under either alternative, but populations would not be impacted given the large amount of habitat in the area.

3.14.7 Executive Order 12898 - Environmental Justice

None of the alternatives would have a disproportionately high or adverse effect on minority or low-income populations. Some scoping commenters were concerned that potential ticket price increases would be beyond the means of lower-income people. However, no ticket price increase has been proposed at this time. Ticket pricing is determined by the permittee's business model and is generally not subject to Forest Service authority. Snow King currently works with organizations such as Coombs Outdoors to provide access to skiing for lower income kids. This partnership is expected to continue under any alternative. Beyond that, no adverse effects on minority or low-income populations have been identified.

3.14.8 USDA Civil Rights Policy

None of the alternatives would result in any civil rights impacts on Forest Service employees, visitors to Snow King, or the general public. All would be free from reprisal or discrimination based on race, color, national origin, sex, religion, age, disability, sexual orientation, marital or familial status, political beliefs, parental status, receipt of public assistance, or protected genetic information.

3.14.9 Prime Farmland, Rangeland, and Forest Land

None of the alternatives include any use of prime farmland or rangelands, and the term "prime forest land" does not apply to National Forest System lands. Under these alternatives, National Forest System lands would be managed with sensitivity to the effects on adjacent lands.

CHAPTER 4: CONSULTATION AND COORDINATION

4.1 PUBLIC SCOPING

On August 3, 2018, the Bridger-Teton issued a public scoping notice summarizing Snow King's proposed improvements project and inviting comments regarding the scope of the associated NEPA review. The projects included in the proposed action are included in Snow King's current master development plan, accepted by the Bridger-Teton.

Information regarding the scoping period and available materials for review was sent to the agencies, organizations, and individuals on the Bridger-Teton mailing list. The scoping notice was posted on the Bridger-Teton website at https://www.fs.usda.gov/project/?project=54201 and made available on CD or in hard-copy form to anyone requesting it.

The scoping period formally began on August 3, 2018, when a Notice of Intent to Prepare an Environmental Impact Statement was published in the Federal Register (Vol. 83, No. 150, pp. 38117-38118). The scoping period was scheduled to close 30 days later on September 2, 2018. A correction to the project website address and extension of the scoping comment period to September 13, 2018, was published in the Federal Register on August 14, 2018 (Vol. 83, No. 157, pp. 40215-40216). A news release was circulated August 14, 2018, notifying the public of the comment period extension. On September 14, 2018, notice of a second extension of the scoping period was published in the Federal Register (Vol. 83, No. 179, p. 46701), allowing submittal of comments until October 4, 2018.

Comment letters were received from 10 agencies, 11 organizations, and 419 individuals. The scoping notice, comment letters, and scoping report are included in the project record.

4.2 NOTICE AND COMMENT ON THE DRAFT EIS

In accordance with agency regulations (36 CFR 215.6), the Bridger-Teton published a legal notice describing an opportunity to comment on the Draft EIS in the *Casper Star-Tribune* on January 31, 2020. The notice was also emailed to subscribers on the BTNF mailing list and posted on the Bridger-Teton website. Hard copies of the notice were made available by the Forest Service to those requesting a copy. A Notice of Availability of the Draft EIS was also published in the Federal Register on January 31, 2020, initiating a 45-day comment period, as stipulated in the agency's notice and comment regulations. On March 13, 2020, an amended notice was published in the Federal Register extending the comment period another 2 weeks, to March 31, 2020. This comment period also met pertinent public involvement requirements of the National Historic Preservation Act (36 CFR 800.6[a][4]).

Comments were received from 9 agencies, 33 organizations, and 388 individuals. A report was prepared, listing the comments received and providing Bridger-Teton responses to substantive comments considered by the Responsible Official. The response-to-comments document is included as Appendix A. The legal notice, comments, and other documentation are included in the project record.

4.3 OTHER CONSULTATION

4.3.1 ENDANGERED SPECIES ACT SECTION 7

As discussed in section 3.6.2.1, Snow King lies within a Lynx Analysis Unit. As a result, this project could potentially affect the federally listed (endangered) Canada lynx. As a result, the Bridger-Teton is consulting with the US Fish and Wildlife Service in accordance with Section 7 of the Endangered Species Act.

Consultation will begin when we submit the biological assessment (BA) currently being prepared and will conclude when the Fish and Wildlife Service responds to the BA. This will occur within a stipulated 135-day timeframe. Based on analysis in the Final EIS (section 3.6.3.4.1), and in the BA itself, we anticipate that the Fish and Wildlife Service will concur with the findings of the BA. The Final ROD will reflect the actual Fish and Wildlife Service determination and any additional mitigation requirements it may stipulate.

4.3.2 NATIONAL HISTORIC PRESERVATION ACT SECTION 106

As discussed in section 3.7.2.1, part of Snow King was previously identified as eligible for listing on the National Register of Historic Places as an historic landscape, and our analysis indicated that this project would adversely affect that landscape (section 3.7.3.1). The Wyoming SHPO reviewed the analysis, concurred with the adverse effect finding, and agreed to initiate consultation under Section 106 of the National Historic Preservation Act to develop a memorandum of agreement (MOA) stipulating how the adverse effects would be mitigated. The Advisory Council on Historic Preservation opted to participate, and the Teton County Historic Preservation Board, the Jackson Hole Historical Society and Museum, and Snow King were invited to participate as consulting parties.

The consulting group met three times during winter and spring of 2020 to develop the MOA. It includes stipulations in four broad categories to mitigate adverse effects. These stipulations are included as cultural resources design criteria in section 3.7.5 and may be required as conditions of authorization in the Responsible Official's decision. When signed, the MOA will be posted on the project website and included in the project record.

4.3.3 TRIBAL CONSULTATION

As discussed in section 3.7.2.1, the Jackson Hole area, including Snow King, has been used by Native Americans for roughly 12,000 years. As a result, the project has the potential to affect Traditional Cultural Places or other Native American tribal resources. Therefore, the Bridger-Teton initiated consultation with the following tribes in September 2019, in accordance with Executive Order 13175: Crow, Eastern Shoshone, Gros Ventre and Assiniboine, Northern Arapaho, and Shoshone-Bannock. No tribal concerns have been identified.

CHAPTER 5: LIST OF PREPARERS

Name	Position	Contribution
Forest Service Team		
Mary Moore	District Ranger	Project oversight.
Janine Prout	ID Team Leader	Initial project management.
Sean McGinness	ID Team Leader/Mountain Resorts Coordinator	Subsequent project management and climate change/snow quantity, air quality, safety, and noise review and oversight.
Anita DeLong	Environmental Coordinator	Project NEPA Lead.
Kelly Owens	Forest Hydrologist	Water and watershed resources review and oversight.
Dave Marr	Forest Soil Scientist	Soils review and oversight.
Martina Keil	Forest Botanist, North Zone Range and Invasive Species Manager	Vegetation and land use review and oversight.
Jason Wilmot	Wildlife Biologist, Jackson and Blackrock Ranger Districts	Wildlife resources review and oversight.
J.P. Schubert	Forest Archaeologist/Heritage Program Manager	Cultural resources review and oversight.
Linda Merigliano	Recreation/Wilderness Program Coordinator	Recreation review and oversight.
Paul Valcarce	Forest Landscape Architect	Scenery review and oversight.
Cirrus Ecological Solutions, LC Team		
Neal Artz	Project Manager	Project management, NEPA oversight, QA/QC review, and preparation of scenery and recreation analyses.
Matt Westover	Assistant Project Manager/Wildlife Biologist	Project management and preparation of wildlife, safety, and noise analyses.
Tim Royer and Stephanie Trapp	Botanist and Wetland Specialist	Preparation of vegetation and climate change/snow quantity analyses.
Justin Barker	Environmental Analyst	Preparation of air quality analysis.
Eric Duffin	Hydrologist	Preparation of water, soils, and watershed analysis.

Name	Position	Contribution
Scott Evans	Range Scientist	Preparation of land use analysis.
Jose Pacheco	Environmental Technician	GIS and cartography.
Judy Seamons	Document Production Specialist	Document production and preparation of the project record.
Cannon Heritage Consultants, Inc.		
Ken Cannon	Archeologist	Completion of cultural resources survey and report and cultural resource analysis.
Tatanka Historical Associates, Inc.		
Ron Sladek	Historian and Historic Preservation Consultant	Completion of historical landscape survey and report.

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