Environmental Assessment:
Jackson Hole Mountain Resort
Recreation Enhancements Project – Phase 2

US Department of Agriculture – Forest Service
Bridger-Teton National Forest
Jackson Ranger District
Jackson, WY

Prepared with the assistance of:
Cirrus Ecological Solutions, LC
Logan, UT

May 2017

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1: PURPOSE AND NEED

1.1 INTRODUCTION

The Jackson Ranger District, Bridger-Teton National Forest (BTNF), has received a proposal from Jackson Hole Mountain Resort (JHMR) to implement a number of improvements at the ski area within the next 5 to 7 years. These improvements are included in JHMR's current master development plan (MDP; JHMR 2013), which was accepted by the agency in August 2014, replacing the previous 2004 MDP. BTNF authorization of these improvements is the proposed action considered in this environmental assessment (EA).

MDPs are a requirement of USDA-Forest Service (Forest Service) ski area special use permits (SUPs) and serve as a conceptual planning tool to outline the operators' vision as to how ski areas will evolve over a 10-to-15-year planning horizon. They are intended to be dynamic documents, amended or revised periodically to reflect changes in operational opportunities and constraints, skier market demands, or agency administrative requirements. Acceptance of an MDP does not authorize implementation of the plan. Decisions regarding authorization are based on review required by the National Environmental Policy Act (NEPA) addressing projects that are ripe for decision and capital investment, generally within the next 5 years.

JHMR, located on the eastern flank of the Teton Range about 12 road miles northwest of Jackson, WY (Figure 1-1), has operated for 50 years under a SUP issued by the Forest Service and administered by the BTNF. The SUP area is 2,412 acres.

The Forest Service is the lead agency in this NEPA process. The Teton County Board of Commissioners and the Town of Jackson are cooperating agencies (FSH 1909.15 11.31b).

This EA is tiered (40 CFR 1502.20) to three previous NEPA documents: the 1996 environmental impact statement (EIS) addressing revision of the 1981 MDP, the 2000 EA addressing projects not included in that EIS, and the 2015 EA addressing phase 1 of the current 2013 MDP (Forest Service 1996, Forest Service 2000, Forest Service 2015a). These three documents are incorporated by reference (40 CFR 1502.21) and are available at the Jackson Ranger District, 25 Rosencrans Lane, Jackson, WY, 83001.

This EA was prepared in compliance with the NEPA and Forest Service regulations regarding its implementation (36 CFR 220). This EA discloses the direct, indirect, and cumulative environmental impacts that would result from implementing the proposed action and alternatives, in support of an agency decision regarding JHMR's requested authorization.

1.2 ORGANIZATION OF DOCUMENT

The document is organized as follows:

- Chapter 1 – Purpose and Need: Includes background information on this EA process, summarizes the proposed action and the purpose and need for action, defines the decision to be made on the basis of this EA, identifies relevant higher level Forest Service plans, describes how the BTNF informed the public of the proposed action and how the public responded, then lists other permits and authorizations that may be necessary to implement the proposed action.
- Chapter 2 – Proposed Action and Alternatives: Outlines the alternative formulation process, describes the no-action alternative which provides the baseline for assessing the effects of the proposed action, describes the proposed action in detail, introduces design criteria and mitigation measures, discusses alternatives considered but not analyzed in depth, then summarizes and compares the environmental effects of the alternatives.

- Chapter 3 – Affected Environment and Environmental Consequences: Summarizes the disturbance type and acreage associated with the proposed improvements, identifies the cumulative actions considered in this analysis, then describes the effects of implementing the proposed action and alternatives by resource, based on the specific issues identified through public scoping and internal, interdisciplinary review.
- Chapter 4 – Consultation and Coordination: Summarizes the public involvement and agency consultation process and outcomes supporting preparation of this EA.
- Chapter 5 – List of Preparers: Identifies the BTNF and contractor personnel involved in preparation of the EA.
- Chapter 6 – References: Lists the references cited in the text of this EA.
- Appendices: More detailed information supporting the analyses presented in this EA.

Documentation of this EA process is available in the project record located at the Jackson Ranger District, 25 Rosencrans Lane, Jackson, WY, 83001.

1.3 PROPOSED ACTION

The proposed action includes the following elements (see section 2.4 for detailed description):

- Solitude #2 Covered Conveyor
- Pooh Bear Covered Conveyor
- St. John's Race Arena Handle Tow
- Amphitheatre Run
- St. John's Race Arena
- Casper Bowl Traverse
- Easy-Does-It Bypass Traverse
- Upper Après Vous Traverse
- Solitude Facility Traverse
- Ashley Ridge Traverse
- Moran Run (break-over at Deer Face)
- Solitude Run (terrain park)
- Solitude Station (Mountain Sports School facility)
- Corbet's Cabin
- Bear Flats Café
- Restroom Facility (base area)
- Snowmaking System Expansion
- Zip Line
- Wetland Mitigation Sites
- Mountain Sports School Meeting Place

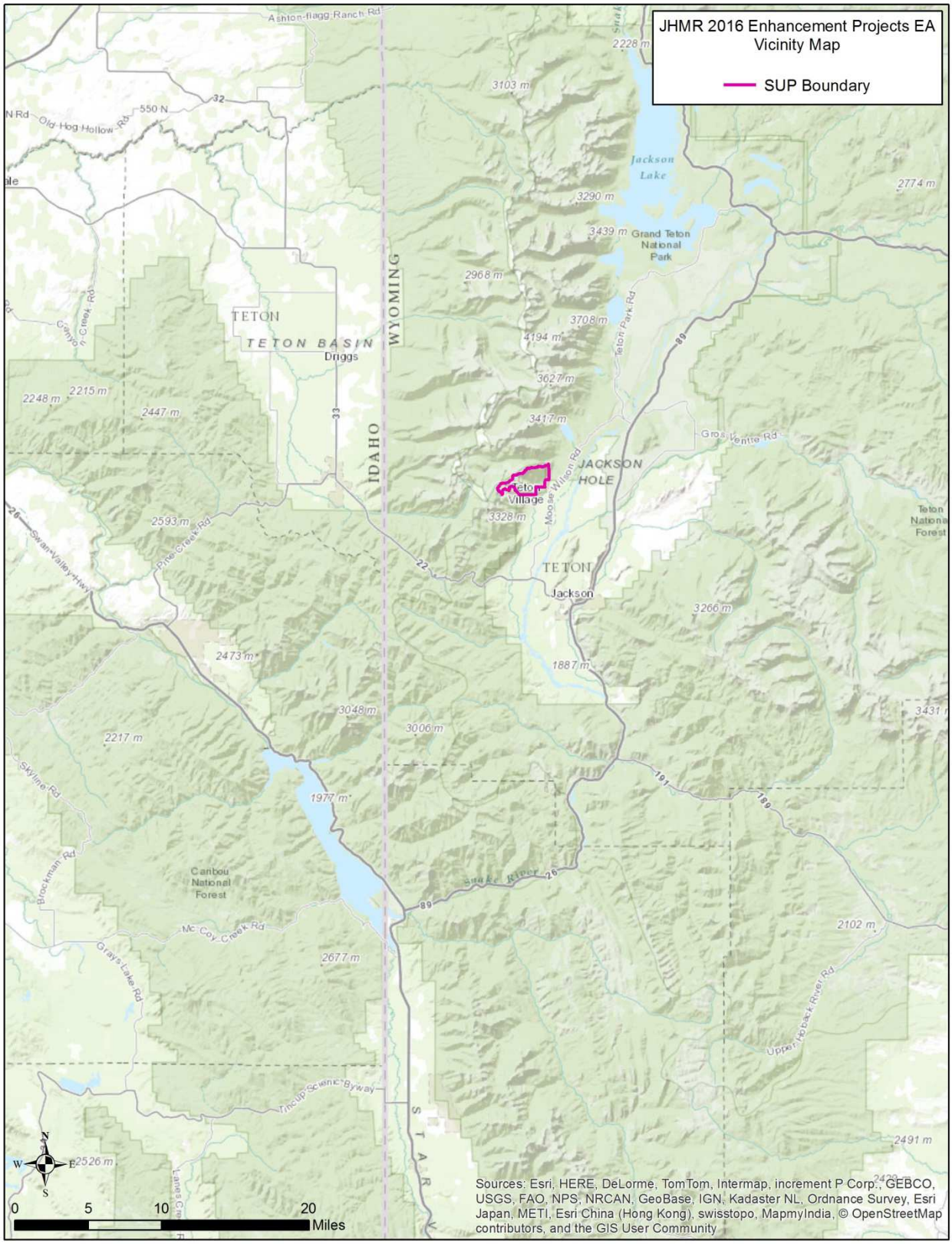

Figure 1-1. JHMR Recreation Enhancements EA vicinity map.

1.4 PURPOSE AND NEED

Facility maintenance and upgrades are a routine aspect of successful resort management. Beyond that, two emerging developments in the mountain resort industry underlie the purpose and need for the proposed action. First, extensive customer surveys conducted by JHMR and other resorts indicate that visitors are increasingly seeking a more diverse range of recreational activities, particularly for families, that includes year-round opportunities and more adventurous activities. The Forest Service response to this trend includes our 2012 introduction of *A Framework for Sustainable Recreation* (Forest Service 2010), which sets goals for providing a diverse array of recreational opportunities aimed at connecting people with the outdoors and promoting healthy lifestyles, in partnership with other public and private recreation providers.

Second, passage of the *Ski Area Recreational Opportunity Enhancement Act of 2011*(P.L. 112-46-Nov. 7, 2011) provides long-awaited direction on the types of summer activities the Forest Service should consider authorizing (e.g., zip lines, hiking/biking trails, disc golf, and ropes courses) to round out the range of opportunities provided to the public at permitted mountain resorts.

Reflecting those two developments, the purposes to be achieved through the proposed action are:

- To maintain and improve the winter sports infrastructure on NFS lands at JHMR.
- To provide new and innovative forms of year-round outdoor recreation for residents and visitors to the Jackson Hole valley, using the existing resort infrastructure as the hub.
- To capitalize on the established relationship between the BTNF and JHMR that connects visitors with the natural environment and supports the quality of life and the economy of the local community.

The needs that must be resolved in order to achieve these purposes include:

1. Continuing to develop and improve facilities and terrain for first-time and beginner skiers.
2. Improving on-mountain skier flow and circulation.
3. Reducing base area congestion.
4. Increasing snowmaking coverage to allow more reliable and earlier opening of the ski area and to maintain snow quality in high-use areas.
5. Making more runs groomable to improve terrain accessibility.
6. Improving on-mountain skier services and facilities.
7. Providing opportunities for adventurous but less skill-demanding activities for winter and summer visitors.

The detailed descriptions in section 2.4 show how each element of the proposed action helps resolve these needs.

1.5 DECISIONS TO BE MADE

In consideration of the stated purpose and need for action and this analysis of environmental effects, the responsible official, the District Ranger, Jackson Ranger District, will review the proposed action and alternatives in order to make the following decisions:

- Whether to authorize the proposed action or an alternative to it, all or in part;
- What design criteria and mitigation measures to require for the actions authorized; and

- What evaluation methods and documentation to require for monitoring project implementation and mitigation effectiveness.

Those decisions, anticipated to be documented in a decision notice/finding of no significant impact (DN/FONSI), will be subject to review and objection in accordance with the Forest Service's project-level pre-decisional administrative review process (36 CFR 218).

1.6 PLANNING GUIDANCE

1.6.1 FOREST PLAN

As indicated in the *Bridger-Teton National Forest Land and Resource Management Plan* (Forest Plan; Forest Service 1990), JHMR 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)

Two relevant Forest Plan goals for DFC 9B are:

- 2.2(a) "retain, improve, and add developed sites", and
- 2.2(b) "design facilities for all ages and abilities."

The proposed action is consistent with and implements this Forest Plan direction.

1.6.2 TETON VILLAGE MASTER PLAN

Teton Village is the community at the JHMR base. The goals of the *Teton Village Master Plan* (Design Workshop 1998), approved by Teton County in 2001, include the following:

- Maximize Teton Village's potential contribution to the quality of life and economic growth of the greater Jackson Hole community.
- Provide the best possible vacation experience to visitors to the Village both summer and winter.
- Create a recognizable identity and character for the Village during the summer.

While the proposed action involves only improvements on NFS land within the resort's SUP boundary, those improvements are consistent with, and complementary to, these Village goals.

1.7 SCOPING AND IDENTIFICATION OF ISSUES

In November 2016, the BTNF issued a public scoping notice summarizing JHMR's proposed projects (the proposed action) and inviting comments regarding the scope of the associated NEPA review. A public scoping notice was mailed to 301 agencies, organizations, and individuals on the BTNF mailing list. The notice was also posted on the BTNF website at http://www.fs.usda.gov/goto/btnf/projects and made available on CD or in hard-copy form to anyone requesting it.

In addition to meeting NEPA's scoping requirements, this exercise also met the agency's obligations regarding public notice and comment on a proposed action, per the Forest Service's project-level pre-decisional administrative review process (36 CFR 218, Subpart B).

The comment period formally began on November 28, 2016, when the BTNF's Legal Notice of Comment Period was published in the *Casper Star Tribune* (Newspaper of Record), and closed on December 29, 2016. Comment letters were received from four agencies, five organizations, and five individuals. One additional comment letter was received after the close of the comment period but was still considered in the analyses. The scoping notice and comment letters are included in the project record, as is a *Scoping Report and Response to Comment on the Proposed Action: Jackson Hole Mountain Resort Recreation Enhancements Project – Phase 2*. This report identifies commenters, comments received, and the disposition of those comments.

The proposed action and scoping results were reviewed, in conjunction with Forest Service interdisciplinary team input, to determine the environmental issues and alternatives to the proposed action (40 CFR 1508.25) to be addressed in this EA. Issue statements were formulated, organized by resource discipline, then reviewed and approved by the responsible official. They include issues to be analyzed in depth and those dropped from in-depth analysis for various reasons (e.g., because they were beyond the scope of this environmental analysis, expressed opinions rather than raising issues, involved matters covered by other laws or regulations, or were too speculative to effectively analyze). These two categories of issues as they apply to this proposed action are as follows.

1.7.1 ISSUES ANALYZED IN DEPTH

Scoping and internal, interdisciplinary review identified the following issues which will direct the EA's analysis of direct, indirect, and cumulative effects. The paragraph following each issue statement identifies the potentially affected resources and impact mechanisms.

Soil, Water, and Watershed Resources

- *How would the proposed infrastructure affect erosion, sedimentation, and water quality?*

The SUP area is characterized by steep slopes, erosive soils and, in many areas, sparse ground cover. Construction-related disturbance and subsequent use could result in increased soil erosion, sediment transport, and water quality impacts. Equipment operation and fueling could also release petroleum products and other contaminants.

- *How would the proposed septic system at Corbet's Cabin affect water quality in downstream water bodies?*

Corbet's Cabin sits on the ridgetop between Grand Teton National Park to the north and the headwaters of Fish Creek to the south. Groundwater in the area has been designated as Class 1, which imposes strict limits on the quality of water discharged into it. Elevated levels of nitrogen and phosphorous have been identified as a concern in Fish Creek.

- *How would the proposed infrastructure affect wetlands and riparian areas?*

While water resources in the SUP area are limited, they include several types of wetlands, riparian areas, and intermittent and perennial streams. Construction and subsequent use could decrease the functioning and the extent of these valuable, aquatic habitats.

Vegetation

- *How would the proposed infrastructure affect special-status (i.e., federally listed, Forest Service sensitive, Wyoming state species of concern, or Forest Service MIS) plant species?*

No federally listed plant species are known to occur at JHMR, but four Forest Service Region 4 sensitive species (including whitebark pine, a candidate for federal listing), eight Wyoming state species of concern or species of potential concern, and two BTNF MIS – some in more than one category – may occur in potentially disturbed areas. Clearing, grading, excavation, or subsequent use could affect these species.

- *How would the proposed infrastructure affect forest vegetation at the resort?*

Forest communities are among the most productive and structurally diverse vegetation types occurring at the resort, and trees would be cleared to accommodate most of the proposed lifts, buildings, and runs. This would eliminate some forest vegetation and fragment blocks of forest habitat.

Wildlife

- *How would the proposed infrastructure affect special-status (i.e., federally listed, forest sensitive, or Forest MIS) wildlife species and other species of interest or concern?*

Potential habitat for four federally listed species, 10 Forest Service Region 4 sensitive species, and eight MIS species – some in more than one category – occurs in the JHMR permit area. Other species of concern to the public or agencies are also present, such as migratory birds. These species could be affected through habitat alteration resulting from clearing, grading, excavation, or changed patterns of human activity.

Fish

- *How would the proposed infrastructure affect fish species and habitat?*

While there are no fish-bearing water bodies at JHMR, Fish Creek's headwaters are within the SUP area and reaches downstream from the resort support fish, including Forest Service Region 4 sensitive species. Impacts due to increased soil erosion, sediment transport, and nutrient loading associated with construction and operation of new facilities could indirectly impact downstream fish populations.

Scenic Resources

- *How would the proposed infrastructure affect the scenic quality of the SUP area?*

The SUP area viewscape has been affected by 50 years of ski-area development but generally retains its natural character. Additional clearing and infrastructural development could alter that character and detract from the area's scenic integrity.

1.7.2 Issues Considered but Not Analyzed in Depth

Growth-Related Effects

JHMR's 2013 MDP maintains the permitted comfortable carrying capacity (CCC) of 7,690 visitors specified in the resort's SUP. This number of visitors has carried through all planning and NEPA documents since the 1996 EIS. As a result, the effects of this number of visitors have been well studied and disclosed previously.

The actual CCC is currently 7,130 visitors per day, and the proposed action would increase this figure by 115 due to the new Pooh Bear and Solitude #2 conveyor lifts. This increase to 7,245 remains 445 below the permitted CCC of 7,690 analyzed in the 1996 EIS. Accordingly, impacts in the following areas have already been analyzed and disclosed and are not addressed in this EA:

- Air Quality
- Transportation
- Utilities
- Socio-economics
- Capacity Balance (i.e., whether key capacities such as parking, food service seating, lifts, and terrain are in balance)

To validate this approach, actual skier visits since 1996 were reviewed. While peak-day visitor numbers (e.g., Christmas—New Year's Day and President's Day weekend) have occasionally exceeded 8,000, average visitation has remained well within permitted CCC. As noted in the MDP, peak-day exceedances of CCC by up to 25 percent (up to 9,613 in this case) are anticipated by ski area planners and consistent with SUP limits. Visitor numbers are not anticipated to exceed those considered in past environmental review and planning, including the *Teton Village Master Plan.*

Cultural Resources

- *How would the proposed infrastructure affect any historic properties in the SUP area that relate to the historic integrity of the resort?*

Discussion: As a result of previous cultural resource investigations, a total of 1,027 acres have been surveyed at the Class III level at JHMR. No historic properties have been identified within the proposed action's area of potential effect, and JHMR is lacking in historic integrity due to ongoing development over the last 50 years. Consequently no effects on the historic integrity of the resort are anticipated. In a May 18, 2015, response (SHPO 2015), the Wyoming State Historic Preservation Office (SHPO) concurred with the BTNF's determination (Forest Service 2015b) that no historic properties exist at the resort, and therefore none would be affected by the proposed action. This assessment and determination included Corbet's Cabin as well as other elements of MDP Phase 2. Any proposed actions not included in the Forest Service determination (2015b) and the Class I cultural resource report (Cannon and Peart 2015) are covered under cultural resource clearance from the BTNF Forest Archaeologist (BT-17-1023). The final BTNF cultural clearance of no effect on historic properties for Phase 2 is made under the 2008 Programmatic Agreement (PA) between the Forest Service, SHPO, and the Advisory Council on Historic Preservation because of adequate previous survey and documentation. Per the PA, the BTNF consults with SHPO on an annual basis for this type of clearance.

- *How would the proposed infrastructure affect historic (prior to establishment of the ski area) and pre-historic resources?*

Discussion: A Class I cultural resources report covering the SUP area was prepared for Phase 1 and 2 of this undertaking (Cannon and Peart 2015). It concluded that previous cultural-resource investigations, including pedestrian surveys of all high-potential areas in the area of potential effect (APE), have located no historic properties at JHMR. Historic properties include historic and prehistoric sites that are eligible for, or listed on, the National Register of Historic Places (NRHP). The report did identify two previously discovered sites not eligible for listing on the NRHP. Neither of these sites is within the APE so no further analysis of these sites is necessary. JHMR is required to cease construction and report any discovery of buried cultural resources to the BTNF Forest Archaeologist. Based on these considerations, there is no need for in-depth analysis of this issue in the EA.

- *How would the proposed infrastructure affect Tribal concerns and Traditional Cultural Places (TCPs)?*

Discussion: The BTNF has consulted with representatives of area Native American Tribes, the Shoshone-Bannock, Gros Ventre, and Eastern Shoshone, in the course of previous NEPA reviews involving JHMR to ensure that no Tribal concerns were overlooked. No Tribal concerns about TCPs, sacred sites, Tribal

resource gathering areas, or prehistoric archeological sites have been identified. The Eastern Shoshone Tribal Historic Preservation Officer expressed support for any efforts to avoid, minimize, or mitigate JHMR-related adverse effects on bighorn sheep populations. Representatives of the above mentioned Tribes, as well as a representative of the Northern Arapaho Tribe, were notified of this proposed action, and no concerns have been identified. If any cultural resources, TCPs, or sacred sites are encountered at the resort, any action that could adversely affect them must cease, and the Forest Archaeologist must report the find to appropriate Tribal representatives and fulfill consultation requirements. As a result, there is no need for in-depth analysis of this issue in the EA.

Recreation

- *Is the proposed zip line an appropriate use of NFS lands at JHMR?*

Discussion: The *Ski Area Recreational Opportunity Enhancement Act of 2011* includes zip lines in the list of activities that may be authorized provided that the activity shall:

- "Encourage outdoor recreation and enjoyment of nature;
- to the extent practicable –
  - harmonize with the natural environment of the NFS land on which the activity or facility is located; and
  - be located within the developed portions of the ski area;
- be subject to such terms and conditions as the Secretary determines to be appropriate; and
- be authorized in accordance with –
  - the applicable land and resource management plan; and
  - applicable laws (including regulations)."

The proposed zip line would be an interpretive forest experience, co-located and blending with ski area infrastructure. In processing the MDP amendment that includes the zip line, we reviewed and accepted the project as consistent with the Forest Plan and applicable laws and regulations. This EA identifies any unforeseen inconsistencies, which will be considered by the responsible official in deciding whether to authorize the project.

1.8 REQUIRED PERMITS AND AUTHORIZATIONS

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, 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-level engineering review to ensure compliance with applicable codes and agency standards. Lifts also require post-construction testing and approvals.
U.S. Army Corps of Engineers (COE)	Issuance of Clean Water Act, Section 404 Permit	The COE issues permits required for the discharge of dredged or fill materials into waters of the U.S., including wetlands. Nationwide or individual permits may be involved.

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
Environmental Protection Agency (EPA)	Review and comment regarding: Clean Air Act, as amended, 42 U.S.C.A. Section 7410-762 (PL 95-604, PL 95-95) Federal Water Pollution Control Act, as amended by the Clean Water Act, 33 U.S.C.A. Section 1251-1376 (PL 92-500, PL 95-217) Safe Drinking Water Act, 452 U.S.C.A. Section 300F-300J-10 (PL 93-523) Clean Water Act, Section 404 Permit	Under NEPA, the EPA is required to review and comment on "major federal actions that have a substantial impact on the human environment." The EPA'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 EPA 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. The EPA may be involved in 404 permitting in association with the COE.
Fish and Wildlife Service (FWS)	Endangered Species Act, Section 7 Consultation Fish and Wildlife Coordination Act consultation Section 404 Permit Consultation	If impacts on federally listed species are possible, the FWS will consult with the Forest Service, review a Biological Assessment (BA), and issue a Biological Opinion. The FWS also coordinates with the Forest Service in accordance with the Fish and Wildlife Coordination Act and reviews Section 404 permit applications to avoid adverse impacts to federally listed species.
State of Wyoming		
Department of Environmental Quality (DEQ): - Water Quality Division (WQD)	Wyoming Pollutant Discharge Elimination System Permit and Stormwater Pollution Prevention Plan	The WQD 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 JHMR's plans for construction each year.
State Historic Preservation Office (SHPO)	Consultation on National Historic Preservation Act, Section 106 compliance process	The Forest Service is required to consult with SHPO on cultural resource survey, site recordation, site eligibility determination, determination of project effects, and protocols for inadvertent discovery of historic properties.
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.

CHAPTER 2: PROPOSED ACTION AND ALTERNATIVES

2.1 INTRODUCTION

This chapter outlines the alternative formulation process, describes the no-action alternative which provides the baseline for assessing the effects of the proposed action, describes the proposed action in detail, introduces design criteria and mitigation measures, discusses alternatives considered but not analyzed in depth, then summarizes and compares the environmental effects of the alternatives.

2.2 ALTERNATIVE FORMULATION

The no-action alternative is included in this analysis to provide a baseline for assessing the impacts of the proposed action and any action alternatives. In this case, no action would mean that the newly proposed Recreation Enhancements Projects were not approved. The no-action alternative is described below (section 2.3).

As indicated above (sections 1.1), JHMR's proposed 2016 Enhancement Projects are the proposed action addressed in this EA. The proposed action is described in detail below (section 2.4).

Action alternatives are different courses of action by which the purpose and need addressed by a proposed action could reasonably be achieved. For this analysis, scoping comments identified water quality concerns associated with the proposed Corbet's Cabin septic system and suggested alternative wastewater treatment options. In response to these comments, the option of a sewer line connecting to the existing base-area sewer system was added to the proposed action. With that option in place, no additional action alternatives were identified.

2.3 ALTERNATIVE 1 – NO ACTION

Under the no-action alternative, the proposed action would not be authorized. Ongoing resort operations would continue, and projects approved in the 2015 DN/FONSI addressing phase 1 of the 2013 MDP (Forest Service 2015c) would be implemented. These projects include the following:

- Sweetwater gondola cabin storage building.
- Eagle's Rest lift relocation.
- Casper restaurant remodel/expansion.
- Storage facility.
- Ashley Ridge run upgrade and realignment.
- Solitude run development.
- Washaki run grading.
- Snowmaking system expansion.
- Gazex avalanche system completion.
- Hiking and biking trail network expansion.
- Via Ferrata installation
- Zip line installation with modified alignment.

For complete descriptions of these projects see the 2015 EA (Forest Service 2015a).

2.4 ALTERNATIVE 2 – PROPOSED ACTION

The proposed action comprises the following 20 projects. Project locations are shown on Figure 2-1.

2.4.1 SOLITUDE #2 – COVERED CONVEYOR

This conveyor would be located adjacent to the Solitude #1 conveyor in the Solitude Mountain Sports School (MSS) teaching area adjacent to the mid-station of the new Sweetwater gondola. The new conveyor would be approximately 150 feet long. A buried conduit from the Sweetwater gondola mid-way station would provide power to its upper-end drive. It would provide additional capacity for MSS classes as demand increases, and it would have a capacity of 660 people per hour. The cover of the conveyor would be non-reflective and dark in color. The terrain around the conveyor would be re-contoured, and a limited number of trees would be removed.

2.4.2 POOH BEAR COVERED CONVEYOR

The Pooh Bear covered conveyor would be located one third of the way down the Pooh Bear run. The new conveyor would be approximately 400 feet long, would be centered in the trail, and would have a capacity of 660 people per hour. A buried conduit from the Sweetwater gondola mid-way station would provide power to its upper-end drive. Installing the conveyor would require some minor land re-contouring.

2.4.3 ST. JOHN'S RACE ARENA HANDLE TOW

This tow would be installed to serve skiers using the lower portion of the St. John's race arena. It would not be open to the general public. It would be approximately 700 feet long and would have a capacity of 540 people per hour. Power for the bottom-drive tow would come from the adjacent snowmaking line. Racers descending to the lower finish zone would use the lift to access the return traverse to the resort. It would only be run when race training was occurring. The lift would be installed when the race arena was constructed. The lower extension portion of the run would remain closed when racing/training was not occurring.

2.4.4 AMPHITHEATRE RUN

The majority of the Amphitheatre Run would be redeveloped, including significant rock blasting and grading, but only limited tree removal. A portion of upper Dick's Ditch would be moved to skier's left to eliminate a narrow bottleneck section in the middle of this trail and provide a more favorable width and grade. Additional snowmaking infrastructure would be installed concurrently. A portion of the summer access road near the end of the trail would be redeveloped to reduce its steepness by traversing the ski run and adding a switchback.

2.4.5 ST. JOHN'S RACE ARENA

This project would modify portions of the St. John's run to accommodate JHMR's ski racing program. A new race finish zone would be constructed at the "Y" where Buck run splits off St. John's trail. This improvement would require the removal of approximately 50 trees and some grading. In this same location, a low spot would be filled in to reduce the magnitude of the run's transition to the final steep pitch.

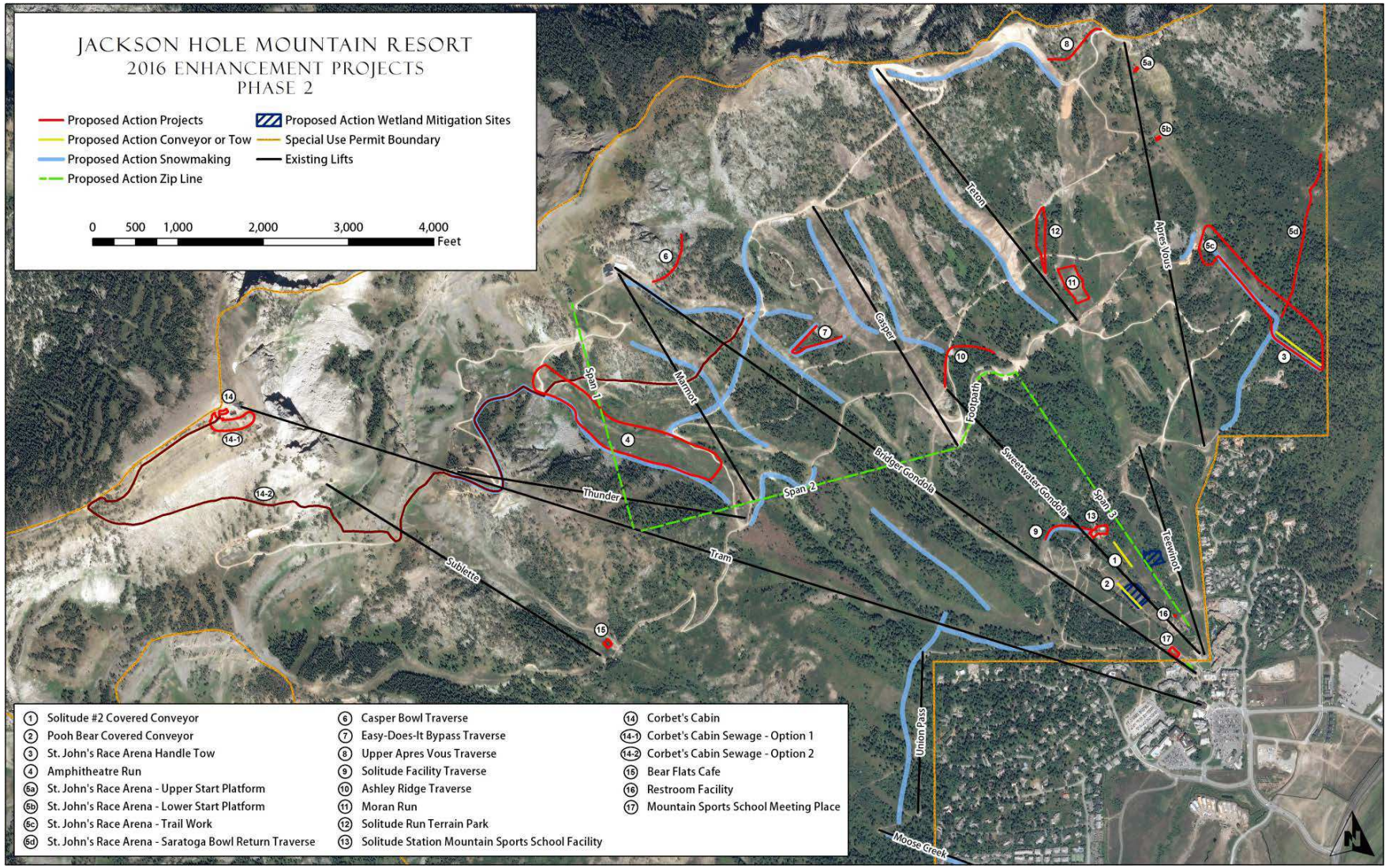

Figure 2-1. Proposed action.

The existing sharp right hand turn would be widened and re-contoured where the end of the existing trail turns into St. John's return traverse, which leads back to the Après Vous lift. This would require the removal of a few large trees and major grading. The bottom of St. John's trail would be extended downhill approximately 700 feet and a second race finish zone would be created at the end of the trail extension. The trail extension would be wide enough to accommodate the installation of the "return" handle tow.

As part of this project, the existing Saratoga Bowl return traverse would be upgraded to allow for more efficient rescues by the ski patrol. The existing narrow path through the trees makes the use of rescue toboggans very difficult. A more developed traverse with a width of 8–10 feet and an average grade of 10 percent is proposed. This project would require removal of brush and sapling trees and minor grading. To limit the amount of ground disturbance, a mini excavator would be used. All disturbed areas would be re-vegetated since this narrow traverse would not be used as a road. The traverse would also facilitate delineation of the east edge of the ski area operational boundary and improve skier safety.

2.4.6 CASPER BOWL TRAVERSE

The existing traverse would be substantially upgraded. It would still begin 100 yards down from the top of the Bridger gondola and connect to Casper Bowl. This project would require extensive rock blasting, moderate tree removal, and extensive grading. The traverse is currently rated as a difficult (black diamond) run. Following the upgrade, the traverse would provide an alternative for advanced intermediate-level skiers to access ski runs east of the Bridger gondola. It would not be used as a road, so it would be revegetated.

2.4.7 EASY-DOES-IT BYPASS TRAVERSE

A new traverse would be constructed west of the steep part of Easy-Does-It trail, at a width of 16 feet and a grade of 10 to 12 percent. This project would require the removal of a moderate amount of trees and extensive grading. It would primarily be used by ski school students the first few times they use the Easy-Does-It trail. It would not be used as a road, so it would be revegetated.

2.4.8 UPPER APRÈS VOUS TRAVERSE

This new traverse would provide a bypass for low intermediate skiers to avoid the steep slopes at the top of Après Vous Mountain. The traverse would need to be groomed, so it would be built to a width of 16 feet and would extend about 800 feet, connecting the top of the Werner trail with the end of the Crags trail. Limited tree removal and moderate grading would be required. It would provide summer vehicle access to the top of Après Vous lift, so it would not be revegetated. The existing service road would be abandoned and rehabilitated.

2.4.9 SOLITUDE FACILITY TRAVERSE

This new traverse would connect the unload area of the new Eagle's Rest lift to the mid-station of the new Sweetwater gondola and the facilities at Solitude Station. It would need to be groomed by the snow-cats, so it would be 16 feet wide. The traverse would cross a riparian area, requiring installation of a 40-foot-long culvert. It would not be used as a road, so it would be revegetated.

2.4.10 ASHLEY RIDGE TRAVERSE

This traverse would be constructed from the unload plaza of the Sweetwater gondola to the mid-portion of the Ashley Ridge run just above South Pass Traverse. It would range in width from 16 to 20 feet, and the length would be 850 feet. It would include an overpass to facilitate crossing the Togwotee Pass Traverse. This overpass would be constructed out of concrete and steel, with a moderate amount of tree removal

and extensive amounts of grading. One stream crossing would require installation of a 30-inch-diameter culvert. It would not be used as a road, so it would be revegetated.

2.4.11 MORAN RUN

The break-over at Deer Face, the steep segment near the end of the Moran Run, is difficult for low intermediates to descend. The proposal is to reduce the slope angle by 5 percent to improve the usability for both MSS classes and the skiing public. This would be accomplished by cutting the top of the face portion down and filling the bottom portion.

2.4.12 SOLITUDE RUN (TERRAIN PARK)

This trail would be constructed in phases. The existing advanced terrain park from Eagles Rest run would be relocated to the middle section of Solitude run below Togwotee Pass Traverse and end where the run merges back in with Kemmerer run. To accommodate the construction of this new terrain park, the run needs to be widened by 40 feet in places and a new overpass (bridge feature) would be installed over Solitude Traverse to reduce skier conflicts. The terrain would be graded to create "features" that are covered by manmade snow and shaped by snow cats. This terrain park would be roped off to prevent incidental access and would have only one access point at the top of the park.

2.4.13 SOLITUDE STATION: MOUNTAIN SPORTS SCHOOL FACILITY

A new MSS facility, Solitude Station, is proposed to replace the existing Solitude tent and the abandoned Solitude Cabin site. The facility would be a large single-story building with multiple entrances. Its total footprint would be approximately 11,800 square feet. There would be approximately 900 square feet of storage in the attic. This facility would be operated in both winter and summer. A dining area would provide 250 indoor seats with an additional 100 seats on an outdoor patio/deck. Restrooms would be an integral part of the facility. Sewer, water, and electrical services currently exist on the site. Access would be provided by a mid-unload/load station incorporated into the design of the new Sweetwater gondola. A heated concrete hardscape would connect the mid-station of the gondola to the new building and would meet ADA requirements. This design would allow persons in street clothing comfortable access in both summer and winter. The building would be rustic in appearance with wood timber framing and earth tone colors.

During the winter, the facility would primarily serve as a secondary MSS operations center, providing beginner through low intermediate ability-level classes. The operation would allow people who have never skied or snowboarded before a seamless first-day experience. This function would require a full-service ski rental/repair shop in the facility.

During the summer months, the facility would be used for private functions like weddings, corporate retreats, private parties, etc. It may also be used by the Kids Ranch division of the MSS. The facility may also be a hub for many outdoor activities like mountain biking, zip-lining, etc.

The site would be developed with patios and sitting areas along with a fire ring in the concrete patio and furniture to provide a somewhat secluded outdoor environment. A teepee may also be erected on site in the summertime.

2.4.14 CORBET'S CABIN

The existing Corbet's Cabin would be replaced with a completely new facility. With growing use – approximately 140,000 riders now using the Tram each summer – replacing the outdated and undersized 50-year-old facility has become a high priority. The objective is not to increase use of the facility – current use on busy days is already approaching the capacity of the Tram to deliver people to Corbet's

Cabin. The intent of the upgrade is to provide visitors with a more pleasant experience at the top of the Tram.

Prior to the proposed replacement, the existing facility would be expanded/remodeled in the near term to accommodate more guests with increased restroom capacity. A new underground water storage tank would also be added as part of the restroom expansion. Water would be supplied to the tank using the Tram, which was designed with a special removable tank to haul potable water. The total size of the proposed addition would be approximately 1,100 square feet. It would incorporate a flat roof and new siding made to match the existing exterior of the structure in an effort to maintain the same overall character. The building would be expanded to the southwest for the additional restrooms and to the southeast for the additional seating. A new deck would be added to the downhill side of the building. The interior of the existing structure would be remodeled at the same time.

Within the next 5 to 7 years, a completely new facility at the site is planned that would house a 180-seat restaurant, ski patrol operations, restrooms, a summertime interpretive center, a weather station, and storage. The building would be two stories high, with total floor area up to 6,800 square feet and a footprint of about 4,100 square feet. A full basement would be used for mechanical equipment and storage. An access walkway that met ADA requirements would be installed from the new facility to the existing tram dock. A new deck with a seating capacity of 150 would be included in the new facility. The existing building would be completely removed. A moderate amount of grading would be required to construct the new facility and outside deck.

The building would be constructed primarily of pre-cast concrete, colored to blend with the natural surroundings. Architecture and materials would be consistent with the guidelines in the Forest Service *Built Environment Image Guide for the Rocky Mountain Province*, contributing to a consistent architectural theme to the resort.

Some avalanche control explosives are currently stored at Corbet's Cabin. To replace that function, a new approximately 80 square-foot bunker would be excavated into the ridge about 300 feet southwest of the new facility, along the access road. The bunker would comply with all Bureau of Alcohol, Tobacco, Firearms, and Explosives standards applicable to such structures.

The new facility would be connected to one of two sewage systems described below. As noted above, Tram capacity limits the number of people who can visit Corbet's Cabin. Tram capacity is already being approached on busy days, so use cannot increase substantially. Since the Tram also delivers water to the facility, water use and thus wastewater generation are also limited by Tram capacity. The water tank on the Tram holds 500 gallons, and when it is in use the Tram cannot carry passengers. As a result, six water-hauling trips are generally the maximum that could be practically done in a day while maintaining the Tram's primary passenger-carrying function, resulting in 3,000 gallons of water. This is the maximum amount of wastewater that could be generated per day.

2.4.14.1 Corbet's Cabin Sewage – Option 1

Option 1 for dealing with wastewater at Corbet's Cabin is on-site treatment involving either a conventional septic system (a large septic tank and an appropriately sized leach field downslope from the existing building) or a decentralized wastewater treatment plant (e.g., aerobic digester or fixed-film treatment system). Either would be designed to meet applicable state standards for effluent discharge.

2.4.14.2 Corbet's Cabin Sewage – Option 2

Option 2 for dealing with wastewater at Corbet's Cabin is a 2.4-mile sewer line. A settling tank would be used to separate solid waste from liquids, and solids would continue to be pumped and trucked to the Teton Village wastewater treatment facility. This would occur during the snow-free season as it does now with both solid and liquid waste. Only liquid waste would be discharged via the sewer line.

The sewer line would run from the new structure down service roads, cutting a corner near the Dog Face run, then collocating in the same trench as a snowmaking line from the top of the Thunder lift to the Nez Perce Traverse, to connect in to the existing sewer line at the intersection of the Nez Perce Traverse and the Sundance run (see Figure 2-1). From there, sewage would flow to the Teton Village wastewater treatment facility.

The work would include excavation and installation of a 4-inch HDPE pipe. Excavated material would be placed alongside the trench and used to backfill once the pipe was laid. Most of the installation (2.2 miles) would be in service roads and proposed snowmaking trenches. The remainder (0.2 mile) would be in undisturbed ground. In areas where excavation occurred outside existing roads, the disturbed area would be revegetated after backfilling.

2.4.15 BEAR FLATS CAFÉ

The existing small building would be relocated or replaced with a yurt installed 50 yards north of the Sublette lift bottom terminal, in the middle of an existing island of trees. This proposed building site faces south and receives a great deal more sunshine and is more accessible to skiers than the current site. The structure would barely be visible from the valley floor but would have great views to the east.

A new deck with wind screen would be added to the front and side of the existing covered deck. A large underground water storage tank (12,000 gallons) would be installed adjacent to the relocated facility to supply water for hand washing and general cleaning. A suitably sized holding tank would be installed to handle wastewater. Wastewater would be pumped and hauled for disposal in the base-area treatment facility. Power would be supplied via a buried conduit from the bottom of Sublette lift. The existing restrooms located approximately 70 feet downhill would serve this relocated facility.

2.4.16 RESTROOM FACILITY – BASE AREA

A small restroom would be constructed near the Aerial Adventure Course and Drop Tower on the edge Antelope Flats run. This wood-constructed facility would look like many of the other mountain restrooms. Power and water would come from the maintenance facility, and sewage would tie into the main line descending from the Sweetwater mid-way station. This location is close to existing water and sewer services, so utility tie in would be simple. The restroom would be ADA compliant. Some excavating and grading would be required.

2.4.17 SNOWMAKING SYSTEM EXPANSION

With generally warmer temperatures and increased levels of business, significant snow-making coverage has become essential. Under this proposal, JHMR would install or update snow-making systems in 15 separate areas: Amphitheater, Sleeping Indian, Upper Gros Ventre, Sundog, Slalom, Upper Sundance, Amphitheater Traverse, Way Home, Kemmerer, Crag's Run, South Pass Traverse, St. John's race arena, Croakie Point, Solitude Facility Traverse, and Easy-Does-It Bypass Traverse. In some cases, this may fill gaps in the existing system. In others, it may provide coverage in isolated locations where natural snow cover is insufficient. The expansion would increase total snowmaking coverage from 216 acres to 250 acres.

The expansion would require installation of underground pipelines and electrical lines in a trench, generally on the skiers' right side of the run. The work would include excavation, temporary side casting, backfilling, and revegetation. Most construction activities would occur in locations that have been previously graded.

2.4.18 ZIP LINE

The proposed zip line would begin near the top of the Bridger gondola. It would consist of three spans with a total length of 1.9 miles. Each span would begin and end at elevated (8 to 20 feet) launch and landing terminals. A short footpath (100 feet) would connect span 1 to 2 and a slightly longer footpath (0.25 mile) would connect span 2 to 3.

Guests would purchase a ticket for the zip line at the summer ticket windows and ride the Bridger gondola to the Rendezvous Lodge, where JHMR now has sufficient restroom and food and beverage operations to accommodate additional summer visitation. Guests would be trained on the use of the zip line braking system and other key aspects of the activity before starting the tour.

The launch tower for Span 1 would be a 500-foot walk down the Lupine Way road west of the Rendezvous Lodge. Span 1 would take guests southward, from just below the Rendezvous Lodge to the top of Riverton Bowl, underneath the Tram. Span 2 would take guests from near that point eastward to a landing near the bottom of the Casper lift. From there guests would walk down the South Pass Traverse road to the top of span 3. From that point, span 3 would take guests southward to a landing just east of the existing ropes course.

Spans 1 and 2 would pass over existing ski lifts, a design which occurs at other installations and is consistent with lift industry regulations. Safety precautions would include zip line tension-monitoring systems that shut down affected lifts in the event of a loss of tension on a particular span.

2.4.19 WETLAND MITIGATION SITES

As a result of wetland impacts due to several proposed and previously approved projects, new areas for wetland mitigation are needed. Two sites for establishing new wetlands are proposed. One is a roughly 1.2-acre site on the lower portion of the Bear Flats run. The other is a 0.5-acre site on the east side of upper Antelope Flats run, adjoining an existing, natural forested/scrub wetland. Water is readily available at both sites, providing the good conditions for successful mitigation efforts.

2.4.20 MOUNTAIN SPORTS SCHOOL MEETING PLACE

With ever increasing demand for MSS programs, there is a need to expand the existing MSS meeting places in the base area. A new meeting place adjacent to Fort Wyoming and the Kids Ranch operation would be constructed to help address this need. This would require the removal of a handful of landscape trees and some grading. The project would include installation of appropriate signage.

2.5 DESIGN CRITERIA AND MITIGATION MEASURES

Design criteria are measures to avoid or reduce adverse environmental effects that are identified prior to NEPA review. This analysis incorporates a number of design criteria developed on the basis of experience at JHMR and other ski areas in the region. Reducing soil erosion and adverse effects on water quality, protecting forest and other native vegetation (particularly whitebark pine), maintaining visual quality, ensuring appropriate access to facilities, and protecting buried heritage resources are the concerns addressed by the following design criteria. They are considered to be in place in the analysis of environmental consequences discussed in Chapter 3, which identifies any additional project-specific mitigation measures. Design criteria and mitigation measures are compiled in Appendix A. The BTNF decision to authorize the proposed action, all or in part, may require specific design criteria and mitigation measures as a condition of approval.

2.6 SUMMARY AND COMPARISON OF ENVIRONMENTAL EFFECTS

Table 2-1 summarizes the effects of the no-action alternative and the proposed action for each issue addressed in this analysis. Potential impacts disclosed under the proposed action are in addition to the no-action alternative.

Table 2-1. Summary and comparison of environmental effects.

Issue	Alternative 1 – No Action	Alternative 2 – Proposed Action
Soil, Water, and Watershed Resources		
- How would the proposed infrastructure affect erosion, sedimentation, and water quality?	Would result in grading and excavation impacts on 50.3 acres. Most projects have moderate to high risk of erosion and sedimentation prior to mitigation. Application of required design criteria and BMPs would reduce risk rating to low for all projects.	Would result in grading and excavation impacts on an additional 61.9 acres under Option 1, on-site sewage treatment at Corbet's Cabin, and 63.7 acres under Option 2, off-site treatment. Most projects have moderate to high risk of erosion and sedimentation prior to mitigation. Application of required design criteria and BMPs would reduce risk rating to low for all projects.
- How would the proposed septic system at Corbet's Cabin affect water quality in downstream water bodies?	Wastewater would continue to be collected in a holding tank then pumped and trucked to the Teton Village treatment facility. No discharge to surface or subsurface water would occur. The only potential for water quality impacts would be a tank truck accident, which has never occurred.	For on-site treatment (Option 1), a conventional septic system would not meet state standards for discharge to groundwater, so a more advanced treatment system would be required. Piping liquid waste to the Teton Village facility would avoid discharge to groundwater and associated water quality issues.
- How would the proposed infrastructure affect wetlands and riparian areas?	About 0.9 acres of forested, emergent herbaceous wetlands and scrub-shrub wetlands would be permanently impacted, and less than 0.1 acre would be temporarily impacted (i.e., restored after construction). About 272 feet of perennial stream channels and 207 feet of intermittent stream channels would be permanently impacted, and 622 feet and 138 feet of intermittent and perennial stream channel, respectively, would be temporarily impacted (i.e., restored following construction). Section 404 permitting would require compensatory mitigation of any impact on jurisdictional wetlands or streams.	About 0.1 acres of forested, emergent herbaceous wetlands and scrub-shrub wetlands would be permanently impacted, and 0.1 acre would be temporarily impacted. About 312 feet of perennial stream channels and 187 feet of intermittent stream channels would be permanently impacted, with some segments culverted. Temporary stream channel impacts would include 1,820 feet and 546 feet of perennial and intermittent stream channel, respectively. Most impacts would be associated with Amphitheatre run development. Compensatory mitigation of any impact on jurisdictional wetlands or streams would be required.

Table 2-1 (cont'd). Summary and comparison of environmental effects.

Issue	Alternative 1 – No Action	Alternative 2 – Proposed Action
Vegetation		
- How would the proposed infrastructure affect special-status plant species?	Federally listed species: None present. Forest Service sensitive species: May impact rockcress draba, Payson's bladderpod, and whitebark pine but is not likely to cause a trend toward federal listing or a loss of viability. BTNF Management Indicator Species: Would remove some aspen but not affect Forest-wide population trend. Wyoming Species of Concern and Species of Potential Concern: Potential to adversely affect aromatic pussytoes, green spleenwort, milk kelloggia, and broad-leaved twayblade.	Federally listed species: None present. Forest Service sensitive species: May impact rockcress draba, Payson's bladderpod, creeping twinpod, and whitebark pine but is not likely to cause a trend toward federal listing or a loss of viability. BTNF Management Indicator Species: Would remove some aspen but not affect Forest-wide population trend. Wyoming Species of Concern and Species of Potential Concern: Potential to adversely affect aromatic pussytoes, green spleenwort, Schultz's milkvetch, milk kelloggia, broad-leaved twayblade, and large-flower triteleia.
- How would the proposed infrastructure affect forest vegetation at the resort?	About 21.8 acres of forested stands, roughly 2.5 percent of the forested area in the SUP boundary, would be removed. Most tree removal would be associated with the Washakie, Solitude, and Lower Ashley ski runs and would further fragment forested habitats at JHMR.	An additional 13.2 acres, or 1.5 percent of existing SUP forested habitat, would be removed, most associated with the St. John's Race Arena.
Wildlife		
- How would the proposed infrastructure affect special-status (i.e., federally listed, forest sensitive, or Forest MIS) wildlife species and other species of interest or concern?	Federally listed species: Minor adverse impacts on Canada lynx and grizzly bear possible. Forest Service sensitive species: May impact bighorn sheep, spotted bat, boreal owl, three-toed woodpecker, great gray owl, and northern goshawk individuals but is not likely to cause a trend toward federal listing or a loss of viability. BTNF Management Indicator Species: No measureable impact on Forest-wide population trends. Migratory birds: Minor detrimental impacts on Williamson's sapsucker and Lewis's woodpecker. Beneficial impact on black rosy-finch.	Federally listed species: Minor adverse impacts on Canada lynx, gray wolf, grizzly bear, and wolverine possible. Forest Service sensitive species: May impact bald eagle, boreal owl, three-toed woodpecker, great gray owl, and northern goshawk individuals but is not likely to cause a trend toward federal listing or a loss of viability. BTNF Management Indicator Species: No measureable impact on Forest-wide population trends. Migratory birds: Minor detrimental impacts on Williamson's sapsucker, Lewis's woodpecker, and willow flycatcher. Beneficial impact on black rosy-finch.

Table 2-1 (cont'd). Summary and comparison of environmental effects.

Issue	Alternative 1 – No Action	Alternative 2 – Proposed Action
Fish		
- How would the proposed infrastructure affect fish species and habitat?	BMPs in the form of design criteria and mitigation measures would prevent sediment from reaching Fish Creek and preclude impacts on Yellowstone cutthroat trout due to sedimentation.	The same conclusions regarding sedimentation impacts would hold. Option 1 for Corbet's Cabin wastewater could result in additional nutrients in Granite and Fish creeks if a standard septic system were used; however, a more advanced on-site system meeting state discharge standards would generate no water quality impacts or impacts on Yellowstone cutthroat trout. Option 2 would result in no impact on this species, due to wastewater being treated at the Teton Village facility.
Scenic Resources		
- How would the proposed infrastructure affect the scenic quality of the SUP area?	Completion of the Ashley Ridge run upgrade and realignment could have a notable impact on scenic resources. It will create a clearing in forest vegetation, resulting in a stark contrast in the winter. The color shift after snowmelt will soften the contrast. Clearing edges will be feathered to decrease contrast and lend a more natural appearance. The project will add incrementally to visual evidence of 50 years of ski area development. It will fit in and be consistent with the current viewscape and with viewers' expectations. This alternative will retain consistency with visual quality objectives of modification and partial retention.	Only the St. John's race arena could have a notable impact on scenic resources. It would also result in a clearing in a large, intact forest stand and stand out as a break from the natural viewscape. The mitigating factors and conclusions noted for the Ashley Ridge project under the no-action alternative would hold for this project as well.

CHAPTER 3: ENVIRONMENTAL CONSEQUENCES

3.1 INTRODUCTION

This chapter summarizes the disturbance type and acreage associated with the proposed improvements, identifies the cumulative actions considered in this analysis, then describes the effects of implementing the proposed action and alternatives by resource, based on the specific issues identified through public scoping and internal, interdisciplinary review.

3.2 DISTURBANCE TYPES AND AREAS

Table 3-1 provides basic dimensions of disturbance associated with various types of projects. These dimensions were used in calculating project-specific disturbance areas. Tables 3-2 and 3-3 show the amount of disturbance for the No-Action Alternative and both Options 1 and 2 of the Proposed Action alternative. Details on impacts to wetland vegetation are addressed separately in section 3.4. Disturbance types, from least intensive to most intensive, are as follows:

- Clearing – removal of all trees and tall shrubs using tracked or wheeled equipment. Trees and slash chipped or burned on site.
- 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, and 3-3 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-representing the extent of disturbance.

Table 3-1. Typical disturbance dimensions[1] by project type.

Project Type	Disturbance Dimensions	Disturbance Type[2]
Buildings and Other Infrastructure	Footprint size plus 50-foot construction buffer	Excavation
Conveyor Lifts, Handle Tow	25-foot width	Grading
Ski Run or Traverse, MSS meeting place.	Actual acreage + 10 feet	Grading
Utility Lines (snowmaking, power, sewer, and utility)	15-foot width	Excavation
Zip-line		
Alignment Clearing	21-foot total width (10.5-feet per line)	Clearing
Towers	50-foot diameter circle	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 the No-Action Alternative.

	Disturbance Category and Acres Disturbed[1]			
Project Name	**Clearing**	**Grading**	**Excavation**	**Project Total**
Sweetwater Gondola Cabin Storage Building	--	--	0.6	0.6
Eagle's Rest Lift	1.5	1.7	1.0	4.2
Casper Restaurant	--	--	0.9	0.9
Storage Facility	--	--	0.5	0.5
Ashley Ridge Run	--	11.8	--	11.8
Solitude Run	--	8.0	--	8.0
Washakie Run	--	7.8	--	7.8
Snowmaking System Expansion	--	--	4.3	4.3
GazEx System Expansion[2]	--	--	0.1	0.1
Hiking/Biking Trail Network	--	10.7	--	10.7
Via Ferrata	--	0.5	--	0.5
Zip-line installation	0.3	--	0.6	0.9
			Total Disturbance	50.3

[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 projects coincide, have only been counted one time. Disturbance acres have been rounded to the nearest tenth acre.

[2] A portion of the GazEx System Expansion has already been completed.

Table 3-3. Disturbance types and acres disturbed under the Proposed Action.

	Disturbance Category and Acres Disturbed[1]			
Project Name	**Clearing**	**Grading**	**Excavation**	**Project Total**
Solitude #2 – Covered Conveyor		0.2	0.0	0.3
Pooh Bear Covered Conveyor		0.2	0.2	0.5
St. John's Race Arena Handle Tow		0.4	0.8	1.2
Amphitheatre Run		18.6		18.6
St. John's Race Arena		13.2		13.2
Casper Bowl Traverse		0.5		0.5
Easy-Does-It Bypass Traverse		0.7		0.7
Upper Après Vous Traverse		0.6		0.6
Solitude Facility Traverse		0.4		0.4
Ashley Ridge Traverse		0.7		0.7
Moran Run		2.2		2.2

Table 3-3 (cont'd). Disturbance types and acres disturbed under the Proposed Action.

	Disturbance Category and Acres Disturbed[1]			
Project Name	**Clearing**	**Grading**	**Excavation**	**Project Total**
Solitude Run Terrain Park		1.6		1.6
Solitude Station: MSS Facility			1.2	1.2
Corbet's Cabin (Sewage Option 1)			2.2	2.2
Corbet's Cabin (Sewage Option 2)			4.0	4.0
Bear Flats Cafe			0.7	0.7
Restroom Facility – Base Area			0.3	0.3
Snowmaking System Expansion			12.8	12.8
Zip Line	1.0		1.4	2.5
Wetland Mitigation		1.8		1.8
MSS Meeting Place		0.3		0.3
Total Disturbance under Corbet's Sewage Option 1				61.9
Total Disturbance under Corbet's Sewage Option 2				63.7

[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 projects coincide, have only been counted one time. Disturbance acres have been rounded to the nearest tenth acre.

3.3 CUMULATIVE ACTIONS

The cumulative actions considered in this analysis are any projects listed in the BTNF Schedule Of Proposed Actions (SOPA) and Grand Teton National Park (GTNP) Planning, Environment, and Public Comment (PEPC) websites that would have temporally and spatially overlapping impacts on the same resources affected directly or indirectly by these alternatives in the past, present, or reasonably foreseeable future. Accordingly, for all resources except wildlife, the cumulative effects area consisted of the Fish Creek and Lake Creek subwatersheds (HUC 12).

There are two projects in these subwatersheds. The first is the Teton-to-Snake Fuels Management Project on the BTNF, and the second is the Moose-Wilson Corridor Comprehensive Management Plan in GTNP. For the wildlife analysis, the cumulative effects area was expanded to incorporate the home ranges of impacted special-status wildlife species. This expansion did not result in the addition of any projects; however, it did encompass more of the actions within the Moose-Wilson Corridor Comprehensive Management Plan. These two projects are briefly described below.

- The Teton-to-Snake Fuels Management Project encompasses an area beginning approximately 2 miles south of the JHMR SUP boundary and extending 22 miles to the south. The purposes of the project are to (1) reduce wildland fire threat to residential areas, (2) improve firefighter and public safety, and (3) allow BTNF managers to transition from suppressing most fires to a more natural fire regime. As scoped, the treatments would cover 0 acres (Alternative 1), 22,511 acres (Alternative 2), or 14,280 acres (Alternative 3) of the 79,056-acre project area. The project would restore and maintain fire-adapted ecosystems by reducing wildfire hazards using prescribed fire, cutting, and thinning.

- The Moose-Wilson Corridor Comprehensive Management Plan describes the future management actions to be taken on the 10,300 acre Moose-Wilson corridor. Most of the actions center on the management of the 7.1 mile Moose-Wilson road. A portion of the Moose-Wilson corridor and road are within the Lake Creek subwatershed. Actions that fall within the Lake Creek subwatershed are: (1) paving the unpaved portion of the road, (2) limiting use of the road to approximately 200 vehicles at any time, (3) reduction of the speed limit on the road, (4) parking turnouts, and (5) construction of additional facilities at the south entrance station to the corridor to accommodate queueing of vehicles. Additional actions outside of the Lake Creek subwatershed include relocation of the Death Canyon trailhead and additional parking.

3.4 SOIL, WATER, AND WATERSHED RESOURCES

3.4.1 SCOPE OF ANALYSIS

- *How would the proposed infrastructure affect erosion, sedimentation, and water quality?*

The SUP area is characterized by steep slopes, erosive soils and, in many areas, sparse ground cover. Construction-related disturbance and subsequent use could result in increased soil erosion, sediment transport, and water quality impacts. Equipment operation and fueling could also release petroleum products and other contaminants.

Indicators: A risk rating for each project based on soil type, disturbance area, intensity of disturbance, slope, presence of a runoff pathway, distance to a water body, and efficacy of proposed mitigation.

- *How would the proposed septic system at Corbet's Cabin affect nutrient water quality in downstream water bodies?*

Corbet's Cabin sits on the ridgetop between Grand Teton National Park to the north and the headwaters of Fish Creek to the south. Groundwater in the area has been designated as Class 1, which imposes strict limits on the quality of water discharged into it. Elevated levels of nitrogen and phosphorous have been identified as a concern in Fish Creek.

Indicators: Evaluation of the effectiveness of waste management options at Corbet's Cabin in treating effluent based on site characteristics and anticipated use.

- *How would the proposed infrastructure affect wetlands and riparian areas?*

While water resources in the SUP area are limited, they include several types of wetlands, riparian areas, and intermittent and perennial streams. Construction and subsequent use in and near such areas could decrease the functioning and the extent of these valuable, aquatic habitats.

Indicators: An estimate of the acreage of these habitats lying within disturbance footprints or subsequent high-use areas, and discussion of the resulting effects on wetland and riparian function and extent within the permit boundary.

3.4.2 AFFECTED ENVIRONMENT

3.4.2.1 Soil, Hydrology, and Water Quality

Soil

The potential for sedimentation to occur in the SUP area can be determined by reviewing the existing condition of soil and other watershed resources.

The 1996 EIS (sections III.C.2 and III.C.3) and 2000 EA (sections 3.2 and 3.3) described existing soil and water resources in detail, and this section summarizes and updates this information. A more recent

watershed assessment of the SUP area and surrounding National Forest System (NFS) land in the Fish Creek watershed was completed in 2009 as part of Forest planning efforts (Forest Service 2009). That report defined Fish Creek watershed health as Class I, which includes watersheds that "…exhibit high geomorphic, hydrologic, and biotic integrity relative to their natural potential condition" (FSM 2500-Chapter 2520).

A soil survey of the BTNF was completed in 1984 (SCS 1985). Figure 3-1 and Table 3-4 identify and describe all soil mapping units in the SUP area based on the 1984 survey.

Soil texture in many locations of the SUP area is skeletal, indicating a lack of well-defined soil layers and a mixture of imperfectly weathered and coarse fragments in the upper layer that generally exceeds 35 percent (Miller and Donahue, 1990). The soil profile is typically well-drained where these conditions exist.

Soil depths near the base of the SUP area extend to 5 feet or more before reaching bedrock and consist primarily of well-drained loam to gravelly loam textures (SCS 1985, Forest Service 1996 section III.C.2.a). These soils become more poorly drained with distance into Fish Creek valley areas east of the creek.

Soil at upper elevations was formed primarily from glacial till and weathered bedrock, which is reflected in high amounts of gravel and boulders at the surface. Native soil depths on mid-to-upper slopes are relatively shallow and range between 4 and 16 inches (SCS 1985, Forest Service 1996 section III.C.2.a).

Based on soil characteristics described in survey reports (Table 3-4), the inherent soil erosion hazard is high on lower slopes of the SUP area, but actual erosion potential is minimized due to low gradient slopes. Erosion potential is moderate to high on upper slopes but slight at the highest elevations due to the prevalence of cirque formations and rubble. Evidence of unstable slopes in the form of landslides and talus deposits has been identified in the SUP area and its surroundings (Case and Gilmer 1990, Love et al. 1992). Although some slow movement of soil has been noted in the form of slumping and soil creep on the steep, upper slopes of Rendezvous Mountain, loss of soil through surface erosion has not been a concern in the SUP area, particularly where vegetation cover is present (Forest Service 1996 section III.C.2.a).

Table 3-4 identifies several soil units in the SUP area that have a limited ability to support revegetation in the absence of BMPs and other actions that enhance regrowth. To offset these limitations, JHMR and the BTNF have developed effective site-rehabilitation and revegetation practices. Most notably, they routinely purchase and haul in topsoil or mix native soil with composted wood chips to create functional topsoil. This material is then spread on disturbed sites and seeded with elevation-specific seed blends developed by the BTNF or collected locally (Schreiber 2015a). With these practices in place, lower slopes are considered to have a high capacity for revegetation while upper slopes have a fair to good capacity (JHSC and Sno.engineering 1994). Overall, rehabilitation efforts have consistently been successful in establishing vegetation cover and stabilizing disturbed soil surfaces over the long term (Forest Service 1996 section III.C, Forest Service 2000 sections 3.2 and 3.3, JHSC 2015).

Hydrology

Surface hydrology in the SUP area is primarily influenced by snowmelt during the spring and, to a lesser extent, by short-duration thunderstorms in summer and late fall. Shallow groundwater is recharged by surface infiltration into coarse soils and quickly moves downslope to support flows in lower-elevation streams, springs, and wetlands (Forest Service 1996 section II.C.3.a.i, Eddy-Miller et al. 2009). The USGS has mapped perennial and intermittent stream channels in the SUP area that are tributaries to upper segments of Fish Creek, located east of Teton Village (NHD 2015). Fish Creek is classified as an intermittent stream downstream from the Village to a point approximately 4 miles downstream (Eddy-Miller et al. 2010).

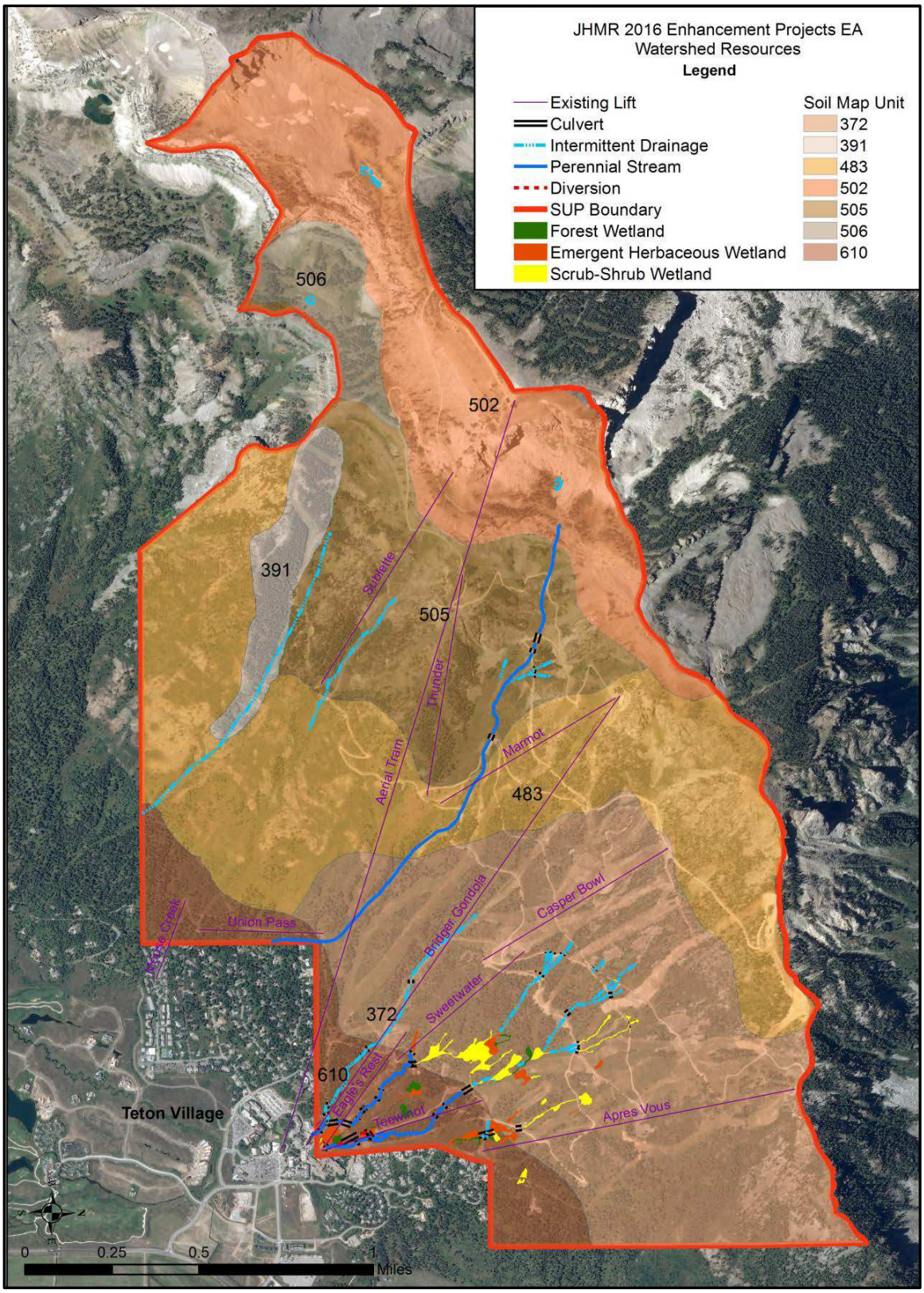

Figure 3-1. JHMR Recreation Enhancements EA watershed resources.

Table 3-4. Characteristic soil properties in the Jackson Hole Mountain Resort SUP area.

Map Unit 372: Loamy to skeletal, mixed, and well-drained soil. Surface layers are loam to very gravelly loam 6–10 inches thick. Rock fragment content in surface soil is 5–40%. This map unit covers most of the west face of Apres Vous and most mid-elevation slopes on the east half of the resort.

Erosion Hazard:	Revegetation Limitation:	Stability Rating:	Slope (%):
High	Severe	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 along a ridge east of Rock Springs Canyon on the west portion of the resort.

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

Map Unit 483: Loamy-skeletal, mixed, and well-drained soil. Surface layers are very gravelly sandy loam–extremely cobbly clay loam from 4–13 inches thick. Rock fragments in surface soils include pebbles, cobbles, and angular cobbles and comprise 20–70%. Depth to bedrock is 9–16 inches. This map unit is found on mid-upper elevation slopes including the ridge that runs to the west and south of Apres Vous Peak.

Erosion Hazard:	Revegetation Limitation:	Stability Rating:	Slope (%):
High	Very Severe	Marginally Stable	50–90

Map Unit 502: Cirque formations and rubble comprise this map unit. Majority of the unit is void of soil and vegetation. This map unit covers most high elevation slopes up to the Rendezvous Mountain ridge between the resort and Grand Teton National Park.

Erosion Hazard:	Revegetation Limitation:	Stability Rating:	Slope (%)
Low	Slight	NA	>100

Map Unit 505: Fine loamy to loamy-skeletal, mixed, and well-drained soil. Surface layers are gravelly loam-very gravelly clay loam from 7-9 inches thick. Rock fragments in surface soils include pebbles and cobbles and comprise 0-70%. Depth to bedrock is 10-15 inches in some areas. This map unit is found on mid to upper slopes and spans much of the area below map units 502 and 506.

Erosion Hazard:	Revegetation Limitation:	Stability Rating:	Slope (%):
High	Severe	Marginally Stable	40-90

Map Unit 506: Surface layers are clay loam to gravelly loam-clay loam from 5-8 inches thick. Rock fragments in surface soils range from 0-20%. This map unit is found on upper slopes of Rendezvous Mountain below map unit 502.

Erosion Hazard:	Revegetation Limitation:	Stability Rating:	Slope (%):
High	Severe	Marginally Unstable	10-50

Map Unit 610: Fine loamy to loamy-skeletal, mixed and well-drained soil. Surface layers are loam-gravelly loam from 5-10 inches thick. Rock fragments include pebbles and cobbles and comprise 0-70%. This map unit is found on relatively low-elevation slopes immediately above the resort base area.

Erosion Hazard:	Revegetation Limitation:	Stability Rating:	Slope (%):
High	Moderate	Marginally Unstable	20-60

An aquatic inventory completed in 2013 identified 21 channel segments within the SUP area, totaling approximately 19,000 feet that support a combination of intermittent and perennial flow (Pioneer 2013). In general, flows are seasonal in upper channel segments, and perennial flows occur at lower elevations in segments that receive groundwater inflow during the summer and fall seasons. Figure 3-1shows the location of all mapped channels.

The hydrologic character of stream channels in regard to intermittent or perennial flow was determined from the aquatic inventory (Pioneer 2013) and long-term observations at JHMR (Schreiber 2015a). Channels in the SUP area are predominantly small with defined bed and bank features. Intermittent channel banks are generally rocky and bordered by narrow bands of riparian vegetation. Channel segments at upper elevations have gradients that exceed 50 percent (Pioneer 2013).

Water Quality

The Wyoming Department of Environmental Quality (DEQ) has classified all groundwater in the area as Class 1 and surface waters within the Fish Creek drainage as Class 1 on the basis of their water quality (WYDEQ 2013). All surface waters located within the boundaries of GTNP (including Granite Creek) are also Class 1 waters, and "[a]ll adjacent wetlands shall have the same classification as the water to which they are adjacent" (WYDEQ 2013). Per DEQ regulations, in Class 1 surface waters:

- No further water quality degradation by point source discharges other than from dams will be allowed;
- Storm water and construction-related discharges of pollution to Class 1 waters must be controlled via permits, Section 401 certifications and/or by the application of best management practices (BMPs). Such discharges cannot degrade the quality of any Class 1 water below its existing quality and uses;
- Nonpoint source discharges of pollution to Class 1 waters or tributaries of Class 1 waters must be controlled by application of BMPs and existing water quality and uses must be maintained.

DEQ regulations for discharges to Class 1 groundwater (i.e., Underground Injection Control, or UIC, permit system) prohibit any discharge that resulted in groundwater not meeting culinary standards.

Surveys conducted on the BTNF in the early 1970s found most water bodies on the Forest in a near-pristine condition (Forest Service 1990). Monitoring activities have continued since that time, including efforts by the Forest Service, Wyoming DEQ, and other agencies concerned with water quality. A 1980 summary of past monitoring results indicated that no widespread reduction in water quality could be traced to managed resource use on the BTNF, including energy development, recreation, vegetation management, and range improvement projects (Forest Service 1990).

In regard to sediment-related water quality impacts (nutrients are discussed below), sedimentation due to natural processes in the BTNF is known to occur primarily in the form of landslide activity. This source produces sediment at relatively higher levels than erosion from road surfaces (Forest Service 1990). Recent observations indicate that Fish Creek carries only minimal loads of sediment as suspended material or along the channel bottom as bed load (Eddy-Miller et al. 2013). There are no Wyoming DEQ benthic macroinvertebrate monitoring sites in the SUP area or the Fish Creek drainage that could provide data to assess stream health per accepted state protocols (i.e., Wyoming RIVPACS and Wyoming Stream Integrity Index methodologies).

Protective buffers around stream corridors and wetland areas are defined by the BTNF as follows: 300 feet either side of perennial streams, 100 feet either side of intermittent streams and wetlands less than 1 acre, and a 300-foot buffer around wetlands greater than 1 acre. In this analysis, wetland and riparian buffers are one factor considered in assessing erosion, and sediment impacts on water quality. Direct impacts on wetlands and riparian areas are addressed as a separate issue.

3.4.2.2 Nutrient Water Quality in Downstream Water Bodies

Nutrient Sources

The potential for nutrient loading impacts on nearby surface waters in the SUP area can be determined by reviewing recent assessments of surface and ground water quality and conditions of surficial and bedrock geology that influence groundwater flow.

The Wyoming DEQ is required to evaluate water quality conditions in all waters of the state every 2 years. The most recent results are documented in *Wyoming's 2014 Integrated 305(b) and 303(d) Report* (DEQ 2016). This report includes a description of the water quality of all waters of the state for the preceding year including an assessment of support of designated uses (e.g. shellfish, fish, wildlife, and recreational activities). The report also includes a list of water bodies with threatened or impaired water quality (i.e., the 303(d) list). Fish Creek and Granite Creek are not included on this list in the 2014 report. There are no 303(d) streams immediately downstream from the SUP area either.

Recent water quality concerns in the Fish Creek watershed have focused on flow and nutrient loads in segments of Fish Creek downstream from the SUP area due to nuisance growths of algae and other aquatic plants (Eddy-Miller et al. 2009, Eddy-Miller et al. 2010, Flitner Strategies 2014). No causal relationship was established in these studies between Fish Creek water quality and the SUP area. Samples collected from Fish Creek showed highest median nutrient concentrations downstream of Teton Village. Isotopic analysis indicates that groundwater nutrient loads to Fish Creek are occurring, and that sources contributing to groundwater nutrient loads include septic/sewage, animal manure, or a combination of both (Eddy-Miller et al. 2013).

Sources of nitrogen and phosphorus were characterized for the entire Fish Creek watershed (including Granite Creek and Fish Creek) to better understand each source and define their relative contributions (Eddy-Miller et al. 2016). Several sources were identified including atmospheric deposition, lawn fertilizer, effluent from septic tanks and sewage treatment plants (including the Aspens and Teton Village sewage treatment plants), livestock waste, surface diversions from the Snake River, and explosives used for avalanche control. This assessment determined that septic tanks and sewage treatment plants contributed roughly 5 percent to the total watershed load of nitrogen and about 11 percent of the total watershed load of phosphorus. These loads are centered on developed areas and often discharge below the water table. When this occurs, there is less opportunity for nutrients to be consumed by plant uptake or adsorption to soil before nutrients reach groundwater or surface water. The potential for nutrient impacts on receiving water can vary according to septic system design and other factors such as distance to receiving water bodies and characteristics of soil and geology located around the leach field.

Geology and Nutrient Transport

The central mountains in the Teton Range consist primarily of insoluble gneiss, granite, and quartzite formations (Covington and Ransmeier, 2005). On the north and south end of the range, these formations are covered by thick sedimentary layers containing soluble limestone geology with caves and karst features. Bedrock geology that immediately underlies the shallow surface soil at Corbet's Cabin is comprised of the Darby Formation. This formation is a dolomitic siltstone and shale overlying a brittle dolomite containing sparse thin limestone beds, generally less than 300 feet thick (Covington and Ransmeier 2005). The limestone bedrock beneath this location is characterized by karst features (enlarged fractures, joints, and other underground channels), capable of rapidly transmitting large volumes of groundwater downgradient toward nearby surface waters in the Granite Creek subwatershed (Medville et.al. 1979). Contaminant discharges (e.g., nutrients) to groundwater systems within karst environments have the potential to spread rapidly throughout the subsurface environment, and cause widespread and randomly distributed impacts to both groundwater and nearby surface waters.

The relation between surface topography and sub-surface geology at Corbet's Cabin is complex. Surface runoff from this location would flow to the south and east toward Fish Creek. The near-surface geology

located beneath the site generally dips towards the west and northwest at 5–15 degrees. As a result, groundwater recharge on the east side of the ridge would be expected to flow west and northwest into the Granite Creek subwatershed, located in GTNP.

3.4.2.3 Wetland and Riparian Resources

The term "wetland" has been loosely defined by different local, state, and federal agencies. The definition used in this analysis is derived from the 1982 U.S. Army Corps of Engineers (COE) and the 1980 U.S. Environmental Protection Agency (EPA) definitions. These two agencies define wetlands as, "Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (40 CFR Part 230). These agencies further define wetlands as having three attributes: abundance of hydrophytic vegetation, hydric soils, and wetland hydrology. These factors define "jurisdictional" wetlands, those protected under the Clean Water Act.

Similarly, the term "riparian area" has various definitions. This analysis also adopts the EPA definition of riparian areas, which is, "A vegetated ecosystem along a water body through which energy, materials, and water pass. Riparian areas characteristically have a high water table and are subject to periodic flooding and influence from the adjacent water body. These systems encompass wetlands, uplands, or some combination of these two landforms. They will not in all cases have all the characteristics necessary for them to be also classified as wetlands" (EPA 2005).

Previous inventories and analyses have identified the wetland and riparian areas in the SUP area. The most recent inventory was completed in 2013 (Pioneer 2013) and focused on areas where projects included in this proposed action would be located. That inventory identified 29 wetland areas totaling approximately 18.3 acres (see Figure 3-1), including: forested (2.7 acres), emergent herbaceous (6.7 acres), and scrub-shrub (8.9 acres) types. The majority occur within drainage patterns associated with stream channels. Most are located on the lower mountain, between the base area and the South Pass Traverse, though a few are further upslope in steeper terrain.

Riparian areas are limited, characterized by narrow bands of vegetation adjacent to rocky channel banks of small, first-order streams (Pioneer 2013). As described above, soil depths are shallow, and the intermittent flows in upper channel segments provide minimal opportunity for riparian vegetation to establish near most streams.

3.4.3 DIRECT AND INDIRECT EFFECTS

3.4.3.1 Soil, Hydrology, and Water Quality

Natural erosion processes from the Rendezvous and Apres Vous mountains have contributed to soil development in the SUP area. However, prior to stabilization, erosion from areas disturbed by construction can occur at a much higher rate than natural erosion processes. Erosion, sediment transport, and amount of fine material in streams has been noted to occur at higher levels in watersheds that include ski resorts than in reference watersheds (Wemple et al. 2007, Garbrielle et al. 2009).

The method used here to assess erosion and sedimentation hazard is the connected disturbed area (CDA) approach (Forest Service 2006). It involves:

1. Measuring the size and slope of disturbances,
2. Characterizing the intensity of disturbance (clearing through excavation) as well as the erosion hazard of the affected soil types,
3. Determining the distance to the closest drainage channel or other runoff pathway (road or trail) and nearest receiving water body (stream or wetland),

4. Determining the relative pre-mitigation sedimentation potential of the project element,
5. Suggesting best management practices (BMPs) to reduce erosion and sedimentation and evaluating its effectiveness, then
6. Rating the post-mitigation erosion risk as high, medium, or low on the basis of these factors.

Generally, project elements are assigned a high pre-mitigation sedimentation-potential rating if they have two or more of the following attributes: large disturbance area (greater than 1 acre), proximity to a runoff pathway or receiving water body, and steep slopes (greater than 50 percent). Projects are assigned a moderate risk rating if they have one of these attributes and a low risk rating if they have none. Other factors, such as the shape and type of disturbance and the amount of disturbance inside stream and wetland buffers are also considered when assigning sedimentation-potential ratings.

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

Specific BMPs to reduce erosion, disconnect disturbed areas, and minimize the watershed and water quality impacts of each project are identified in the CDA analysis table for each alternative in the following sections. These measures are described in Appendix A. A more detailed discussion of these measures is available in *Volume 1: National Core BMP Technical Guide* (Forest Service 2012a).

To complete the CDA approach, the effectiveness of the assigned BMPs is evaluated, and the pre-mitigation sedimentation-potential rating is adjusted based on the evaluation. Post-mitigation risk ratings range from high to low.

The CDA approach focuses on project-specific disturbances, mostly related to erosion or sediment production and potential sediment delivery to wetlands and water bodies, but does not address the potential water quality impacts of construction equipment operation and fueling. These impacts could occur under either the proposed action or no-action scenarios, but proven BMPs addressing these potential project-wide effects are included in Appendix A's compilation of mitigation measures (see Road-7 and Road-10). These impacts are not discussed separately for the two alternatives below.

In addition to the BMPs specifically identified in the CDA analysis, JHMR must comply with a Stormwater Pollution Prevention Plan (SWPPP) that has been approved by Wyoming DEQ as a condition of JHMR's Wyoming Pollution Discharge Elimination permit. The SWPPP prescribes BMPs that minimize erosion, control sediment, and stabilize exposed soil.

Most of these SWPPP measures are also national core BMPs recommended by the Forest Service for ski area development (Forest Service 2012a) and included in the CDA tables below. As a result, they are not listed or described separately in this document. Other sections of the SWPPP address operational controls (e.g., good housekeeping measures), BMP maintenance, and construction site inspection. The SWPPP is active for a period of 5 years and amended annually to address specific activities that take place that year. The current SWPPP is set to expire this year (JHMR 2014) and it will be renewed for an additional 5 years.

Alternative 1 – No Action

Projects under the no-action alternative are described in section 2.3, and their impacts on watershed resources are reviewed in detail in the 2015 EA, section 3.4.3.1. The CDA analysis of these projects is summarized in Table 3-5.

All soil units disturbed under the no-action alternative have a high erosion hazard. Most of the proposed developments are located in soil units 505 and 372, which are found on the mid-elevation slopes of Rendezvous Mountain and the south and east faces of Apres Vous. The potential for erosion of these soil units decreases at lower elevations due to a corresponding reduction in slope. Soil units 610 and 483

comprise the remaining No Action projects. Soil unit 610 is located at the base of the SUP area on low to moderate slopes, which reduce the potential for erosion to occur. Portions of soil unit 483 are located at upper elevations and include areas where rock formations and rock fragments are prevalent at the surface, which also reduces soil erosion potential.

Projects under the no-action alternative would disturb a total of about 50.3 acres on slopes ranging from 10 to 300 percent. Projects located on the steepest slopes include the Via Ferrata climbing routes, sited on rock outcroppings with slight erosion potential. Other developments on steep slopes include the Washaki run, utility trenches for the Gazex exploders, and some hiking trail segments. Intensity of disturbance for most projects is 1 due to excavation combined with grading that would be needed to construct buildings, lift terminals and towers, and utility trenches. Disturbance acreage for individual projects ranges from 11.8 acres for the Ashley Ridge run to less than 0.1 acre for elements of the Gazex system.

Based on this analysis, projects under the no-action alternative have a moderate or high erosion and sedimentation risk rating prior to mitigation. This indicates the potential for short-term nonpoint source loads of sediment to intermittent and perennial streams in the SUP area. These impacts could take place over longer periods if revegetation did not occur and bare soil remained exposed. However, the mitigation measures identified in Table 3-5 and the SWPPP, including proper implementation of sediment control BMPs, phasing of construction over time, and successful revegetation, would effectively mitigate these potential effects. Appendix A describes these measures.

With the suggested BMPs and SWPPP requirements in place, the post-mitigation sedimentation risk ratings for all project elements would fall to low. While temporary water quality impacts could occur during and immediately following construction, no measurable long-term impacts on water quality of project-area water bodies would result from implementation of the no-action alternative. This conclusion is supported by past experience with rehabilitation efforts in the SUP area (Forest Service 1996 section III.C, Forest Service 2000 sections 3.2 and 3.3, JHSC 2015).

Alternative 2 – Proposed Action

The projects included in the proposed action are described in detail in section 2.4. Table 3-6 summarizes results of the CDA analysis for these projects. Note the disturbance for two options for treating sewage from Corbet's Cabin are shown in Table 3-6. A separate total is provided at the bottom of the table, and the impacts of each option are discussed separately.

With the exception of one, all soil units disturbed under the proposed action have a high erosion hazard. They include the same soil units described above under the no-action alternative as well as soil unit 502. This soil unit spans most of the upper elevation slopes in the SUP area up to the ridge separating the Fish Creek watershed from the Granite Creek subwatershed. Soil unit 502 is primarily comprised of rubble and has a low erosion hazard.

Projects under the proposed action would result in a total disturbance of about 61.9–63.7 acres depending on which option is selected. These projects would occur on slopes ranging from 13 to 92 percent. Several projects are located in areas with slopes exceeding 80 percent, including Amphitheatre run, Casper Bowl Traverse, Easy-Does-It-Bypass, snowmaking, and the zip line corridor. Intensity of disturbance for most projects is 1 or 2 due to excavation for buildings and utility corridors or grading activities for ski trails, respectively. Disturbance for individual projects ranges from 18.6 acres for the Amphitheatre Run to less than 0.1 acre for sewer or electrical utility lines.

The Ashley Ridge Traverse would require installation of a 30-inch culvert on about 65 feet of intermittent stream channel. The traverse would not be used as a road, and the disturbed area above the culvert would be revegetated.

Table 3-5. CDA analysis of the projects – No Action.

Project Element	Soil Unit[1]/ Erosion Hazard	Project Disturbance Area (acres)	Stream/ Wetland Buffer Disturbance (acres)[2]	Intensity of Disturbance (1-4)[3]	Max. Slope (%)	Proximity to Runoff Pathway	Pre-Mitigation Sedimentation Potential	BMPs
Sweetwater Gondola								
Gondola Building	610 / High	0.6	0.6 / 0.6	1	23	Crosses road, stream, wetland; <50 ft. to trail.	Moderate	AqEco-2, AqEco-4, Fac-2, Rec-10, Rec-12, Road-7, Veg-1, Veg-2
Eagle's Rest Triple Chair								
Grading around Upper Terminal	372 / High	1.7	1.1 / -	2	66	Crosses trail and stream.	High	Fac-2, Rec-10, Road-7, Veg-1, Veg-2
Lift corridor	610 / High	1.5	0.6 / -	3	24	Crosses road and trail; < 400 ft. to stream.	High	
Lower Terminal	610 / High	0.5	0.4 / -	1	18	Crosses trail; < 200 ft. to stream.	Moderate	
Upper Terminal	372 / High	0.5	0.1 / -	1	57	Crosses trail; < 100 ft. to stream.	High	
Casper Restaurant	372 / High	0.9	-	1	83	Adjacent to road, < 600 ft. to stream.	High	Fac-2, Rec-12
Storage Facility	610 / High	0.5	-	1	25	Crosses road, < 200 ft. to trail.	Moderate	Rec-12, Fac-2
Ashley Ridge Run	372 / High	11.8	2.8 / 5.0	2	80	Crosses road, trail, stream, and wetland.	High	Fac-2, Rec-10, Veg-2
Solitude Run	372 / High	8.0	- / 1.5	2	69	Crosses road and wetland; <200 ft. to stream.	High	Fac-2, Rec-10, Veg-2
Washakie Run	372 / High	7.8	- / 0.4	2	108	Crosses road; <800 ft. to trail; <50 ft. to wetland; <700 ft. to stream.	High	Fac-2, Rec-10, Veg-2

Table 3-5 (cont'd). CDA analysis of the projects – No Action.

Project Element	Soil Unit[1]/ Erosion Hazard	Project Disturbance Area (acres)	Stream/ Wetland Buffer Disturbance (acres)[2]	Intensity of Disturbance (1-4)[3]	Max. Slope (%)	Proximity to Runoff Pathway	Pre-Mitigation Sedimentation Potential	BMPs
Snowmaking	372 / High	4.3	0.2 / 0.7	1	74	Crosses road, trail, and wetland; <50 ft. to stream.	High	Rec-11, Fac-9, WaterUses-1
Gazex								
Gazex exploder	483 / High	<0.1	-	1	86	None.	Moderate	Rec-12, Fac-2, Fac-9
Storage shelter	483 / High	<0.1	-	1	37	None.	Low	
Trench for Gas Line	483 / High	0.1	-	1	106	None.	Moderate	
Hiking Trails	483 / High	3.8	0.4 / 0.1	2	147	Crosses road, trail, and stream; < 100 ft. to wetland.	High	Rec-4, Fac-2
Biking Trails	372 / High	6.9	1.0 / 0.2	2	83	Crosses road, trail, wetland, and stream.	High	AqEco-2, AqEco-4, Rec-4, Fac-2, Road-7
Via Ferrata	483 / High	0.5	-	4	302	<600 ft. to road, adjacent to trail.	High	Rec-12, Fac-2
Zip-Line								
Lower Tower	610 / High	0.3	0.3 / 0.3	1	11	Crosses road; <200 ft. to trail, <100 ft. to wetland, adjacent to stream (uphill).	Moderate	Rec-10, Veg-1, Veg-2, Road-7
Upper Tower	610 / High	0.3	0.3 / 0.3	1	20	Crosses trail and stream; <300 ft. to wetland.	Moderate	
Zip-Line corridor	610 / High	0.3	0.3 / 0.0	3	25	Crosses road, trail, and stream; <100 ft. to wetland.	Moderate	
Total (ac)		50.3						

[1] Dominant soil unit for a project element, other types may be present.

[2] Values indicate disturbance inside of protective buffers enclosing stream channels and wetlands.

[3] Intensity of disturbance ranges from high (1) to low (4).

Table 3-6. CDA analysis of the projects – Proposed Action.

Project Element	Soil unit[1] / Erosion Hazard	Project Disturbance Area (acres)	Stream/ Wetland Buffer Disturbance (acres)[2]	Intensity of Disturbance (1-4)[3]	Max. Slope (%)	Proximity to Runoff Pathway	Pre-Mitigation Sedimentation Potential)	BMPs
Amphitheatre Run	505/High	18.6	9.2 / -	2	84	Crosses road and stream.	High	Rec-10, Veg-2, Plan-2, Road-2, Road-3
Ashley Ridge Traverse	372/High	0.7	0.3 / -	2	76	Crosses road and stream.	High	Rec-10, Veg-2, Plan-2, Road-7
Bear Flats Café								
Café and surrounding area	505/High	0.6	-	1	30	Crosses road and stream.	Moderate	Rec-12, Fac-2, Fac-3, Fac-5, Fac-9, Rec-10.
Electrical conduit to café	505/High	0.1	-	1	29	< 100 ft. to road; >1,000 ft. to stream.	Low - Moderate	
Casper Bowl Traverse	483/High	0.5	-	2	85	Crosses trail; >1,000 ft. to road and stream.	High	Rec-10, Veg-2, Plan-2
Corbet's Cabin								
Cabin and surrounding area	502/Low	0.6	-	1	48	Crosses road; <100 ft. to trail; >1,000 ft. to stream.	Moderate	Rec-12, Fac-2, Fac-3, Fac-4, Fac-5, Fac-10 Rec-10
On-site treatment (Sewage Option 1)	502/Low	1.6	-	1	53	Crosses road, trail; >1,000 ft. to stream.	High	
Off-site treatment (Sewage Option 2)	502/Low	3.4	0.2 / -	1	73	Crosses road, trail, and stream.	High	Fac-9, Road-7
Easy-Does-It Bypass Traverse	372/High	0.7	-	2	82	Crosses trail; <200 ft. to road; <400 ft. to stream.	High	Rec-10, Veg-2, Plan-2
Moran Run	372/High	2.2	- / 1.0	2	64	Crosses wetland; <200 ft. to road.	High	Rec-10, Veg-2, Plan-2
MSS Meeting Place	610/High	0.3	0.3 / 0.3	2	21	Road, trail, stream crossing.	High	Rec-10, Veg-2, Plan-2

Table 3-6 (cont'd). CDA analysis of the projects – Proposed Action.

Project Element	Soil unit / Erosion Hazard	Project Disturbance Area (acres)	Stream/ Wetland Buffer Disturbance (acres)[2]	Intensity of Disturbance (1-4)[3]	Max. Slope (%)	Proximity to Runoff Pathway	Pre-Mitigation Sedimentation Potential)	BMPs
Pooh Bear Conveyor								
Covered Pooh Bear conveyor	610/High	0.2	0.2 / -	2	15	Trail crossing; <500 ft. to road and stream.	Moderate	Rec-10, Veg-2, Plan-2, Fac-9
Electrical conduit to PB conveyor	610/High	0.2	0.2 / 0.1	1	22	Crosses road, trail, and stream.	Moderate	
Restroom Facility								
Restroom and surrounding area	610/High	0.1	0.1 / 0.1	1	19	Road and trail crossing; <100 ft. to stream.	Moderate	Rec-12, Fac-2, Fac-3, Fac-4, Fac-5, Fac-9
Electrical conduit to restroom	610/High	0.1	0.1 / 0.1	1	31	Crosses stream; < 50 ft. to trail and road.	Moderate	
Sewer line to restroom	610/High	<0.1	<0.1 / <0.1	1	18	< 50 ft. to road, trail, and stream.	Low-Moderate	
Water line to restroom	610/High	0.1	0.1 / 0.1	1	19	Crosses trail and stream; adjacent to road.	Moderate	
Snowmaking	372/High	12.8	0.6 / 0.3	1	88	Crosses road, trail, and stream.	High	Rec-11, Fac-9, WaterUses-1
Solitude #2 Conveyor								
Covered Solitude conveyor	610/High	0.2	0.2 / 0.1	2	22	Crosses trail; <200 ft. to stream, < 900 ft. to road.	Moderate	Rec-10, Veg-2, Plan-2, Fac-9
Electrical conduit to S2 conveyor	610/High	<0.1	<0.1 / <0.1	1	13	Crosses trail; < 100 ft. to stream and wetland.	Moderate	
Solitude Facility Traverse	372/High	0.4	0.2 / 0.3	2	76	Crosses trail and wetland; < 50 ft. to road; < 100 ft. to stream.	High	Rec-10, Veg-2, Plan-2, Road-7
Solitude Run Terrain Park	372/High	1.6	- / 0.7	2	64	Crosses road and wetland; <600 ft. to stream.	High	Rec-10, Veg-2, Plan-2

Table 3-6 (cont'd). CDA analysis of the projects – Proposed Action.

Project Element	Soil unit / Erosion Hazard	Project Disturbance Area (acres)	Stream/ Wetland Buffer Disturbance (acres)[2]	Intensity of Disturbance (1-4)[3]	Max. Slope (%)	Proximity to Runoff Pathway	Pre-Mitigation Sedimentation Potential)	BMPs
Solitude Station	610/High	1.2	1.2 / 1.2	1	20	Crosses road, trail, stream, and wetland.	High	Rec-12, Fac-2, Fac-3, Fac-4, Fac-5
St. John's								
Saratoga Bowl Traverse	372/High	0.6	-	2	76	< 200 ft. to trail.	Moderate	Rec-10, Veg-2, Road-7
St. John's trail	372/High	12.4	-	2	68	Crosses trail; <700 ft. to road.	High	
St. John's Lower Start Platform	372/High	0.1	-	2	42	> 1,000 ft. to road, trail, or stream.	Low	
St. John's Upper Start Platform	372/High	0.1	-	2	42	<700 ft. to road.	Moderate	
St. John's Tow								
Tow line corridor and surrounding area	610/High	0.4	-	2	35	Crosses trail.	Moderate	Rec-10, Veg-2, Plan-2 , Fac-9
Electrical conduit to tow line	610/High	0.8	- / 0.1	1	35	Crosses trail; <100 ft. to wetland, <900 ft. to stream.	Moderate	
Upper Apres Vous Traverse	372/High	0.6	-	2	76	Adjacent to road.	High	Rec-10, Veg-2, Plan-2 , Road-6
Wetland Mitigation	610/High	1.8	1.5 / 0.6	2	20	Crosses trail; adjacent to stream; <200 ft. to road.	High	

Table 3-6 (cont'd). CDA analysis of the projects – Proposed Action.

Project Element	Soil unit / Erosion Hazard	Project Disturbance Area (acres)	Stream/ Wetland Buffer Disturbance (acres)[2]	Intensity of Disturbance (1-4)[3]	Max. Slope (%)	Proximity to Runoff Pathway	Pre-Mitigation Sedimen-tation Potential)	BMPs
Zip Line								
Zip line corridor	610/High	1.0	0.4 / 0.2	3	92	Crosses trail; adjacent to road; <100 ft. to stream; <200 ft. to wetland.	High	Rec-10, Veg-1, Veg-2, Road-7
Zip line terminals	505/High	1.4	0.2 / 0.2	1	76	Crosses trail and wetland; adjacent to road; <100 ft. to stream channel.	High	
Total Disturbance – Option 1 (ac)		61.9						
Total Disturbance – Option 2 (ac)		63.7						

[1] Dominant soil unit for a project element, other types may be present.

[2] Values indicate disturbance inside of protective buffers enclosing stream channels and wetlands.

[3] Intensity of disturbance ranges from high (1) to low (4).

The Amphitheatre run project would reroute 312 feet of perennial channel and 122 feet of intermittent channel a maximum distance of 18 feet to the north, and eventually reconnect to the existing perennial channel below. The new channel would be excavated with a similar gradient (25–30 percent) and cross-section as the original channel, lined with geo-textile fabric and covered by native cobbles, boulders, and gravel. Channel banks would eventually be planted with native riparian vegetation where suitable conditions of soil and water are found. Some material would be initially transported from this segment as water is turned into the new stream channel. This would occur during late summer when base flow occurs and potential for transport is low. The geotextile material would prevent erosion of fine sediment from the new channel bed and banks. No permanent stream crossing would occur as a result of this project.

More details on stream channel impacts are described below in section 3.4.3.2. Table 3-6 includes BMPs that address permanent stream crossings. These BMPs would minimize the risk of sedimentation and ensure stream crossings maintain channel stability and function in segments located above and below each crossing.

Most elements of the proposed action have a moderate or high erosion and sedimentation risk rating prior to mitigation. The risk rating for the several narrow, linear projects is varied due to the distance from streams or roads (e.g., trails and some segments of the snowmaking pipeline).

Table 3-6 identifies BMPs that would minimize or reduce the potential for erosion and sedimentation. These BMPs are described in Appendix A. Pollution control measures that JHMR is required to comply with in the SWPPP, enforced by Wyoming DEQ, would provide additional assurance that potential sedimentation impacts were effectively mitigated.

With the suggested BMPs and SWPPP requirements in place, the erosion and sedimentation risk ratings for all project elements under the proposed action would fall to low. While temporary water quality impacts would occur during and immediately following construction on some projects, no measurable long-term impacts on water quality of project-area water bodies would result from implementation of the proposed action alternative. This conclusion is supported by past experience with rehabilitation efforts in the SUP area (Forest Service 1996 section III.C, Forest Service 2000 sections 3.2. and 3.3, JHSC 2015).

3.4.3.2 Nutrient Water Quality in Downstream Water Bodies

Nutrient impacts on Fish Creek and Granite Creek are the focus of this analysis. These two water bodies are classified as Class 1 streams and, as such, must not degrade from their existing high levels of water quality (WYDEQ 2001, WYDEQ 2013). Nutrient transport to receiving water bodies can occur above ground during surface runoff and below ground as part of groundwater flow. Surface topography in the permit area contributes flow to Fish Creek in the form of runoff and stream flow in perennial and intermittent stream channels. In general, shallow groundwater flow from the permit area follows the slope of surface topography and provides recharge to aquifers in Teton Valley, Wyoming which then discharge to Fish Creek. However, as described above (section 3.4.2.2), geologic layers near Corbet's Cabin dip to the northwest and convey groundwater flow into the Granite Creek drainage.

Nutrients can be lost during transport through chemical interactions, plant uptake, and adsorption to sediment particles that settle from suspension. Subsequently, the distance and time of transport between nutrient sources and receiving water bodies can decrease nutrient levels.

Alternative 1 – No Action

Under the no-action alternative, expansion/replacement of the Corbet's Cabin facility would not occur, and wastewater management resources would remain unchanged. All wastewater would continue to be collected in a 1,500-gallon holding tank and pumped and trucked to the Teton Village wastewater treatment facility during the summer when roads are dry. There would be no surface or subsurface wastewater discharges. The only potential for nutrient-loading impacts to nearby water resources would be if the tank truck carrying pumped waste from the holding tank at Corbet's Cabin to the wastewater

treatment facility had an accident coming down the mountain and waste was spilled from the tank. Potential water quality impacts would be greatest where the road crosses stream channels or locations near these crossings that are devoid of vegetation and sloped toward stream channels. Factors that would influence the magnitude of potential impacts include distance to receiving water bodies and conditions that would promote surface runoff (e.g. wet weather, surface slope, bare surfaces, etc.).

The practice of transporting wastewater between restroom facilities at JHMR and the Teton Village wastewater treatment facility occurs during dry conditions when travel on unpaved roads is safe. The tanker truck that hauls wastewater carries about 800-1,000 gallons and services several facilities at the resort. JHMR has never had a wastewater spill associated with this activity.

Alternative 2 – Proposed Action

The proposed action would expand then replace Corbet's Cabin and replace the existing wastewater treatment system using one of two options. Option 1 is on-site treatment of wastewater with either a conventional septic system as originally proposed (i.e., traditional concrete septic tank and associated leach field with no supplemental treatment technologies) or a more elaborate decentralized wastewater treatment plant (e.g., aerobic digesters and fixed film treatment systems) designed to maximize nutrient removal from on-site wastewater discharges. Option 2 is piping wastewater to the existing Teton Village wastewater treatment facility.

In regard to Option 1, percolation tests have been performed at the proposed septic system location and drainage characteristics are favorable in regard to wastewater disposal – i.e., moving waste out of the leach field and away from the site. However, characteristics of soil and geology at site pose constraints to wastewater treatment – i.e., removing nutrients and other pollutants from liquid waste. These opportunities and constraints are discussed below. Ultimately, a Wyoming DEQ permit for any new wastewater system would be required prior to installation, and to obtain the permit the system would need to meet state requirements for both disposal and treatment.

As shown in Table 3-6, installation of a new on-site septic system would disturb a total of 1.6 acres, including the tank, leach field, and connectors. A new underground water storage tank would also be added as part of the restroom expansion to the proposed building. Water would be supplied to the tank using the existing Tram and removable tank system that currently supply potable water.

Conventional septic systems can contribute nutrients and coliform to both surface water and ground water. However, nutrient loading caused by these systems is difficult to quantify because of transformations that occur as effluent leaves the leach field and interacts with soil layers. Under optimal conditions, nutrients are consumed or adsorbed as effluent passes through unsaturated soil before reaching the water table. The rate at which nutrients are removed is dependent upon soil type and temperatures that are conducive to chemical adsorption to soil particles or bacterial consumption. Soils with a mixture of sand, silt, and clay sized particles are considered to have an optimal ability to both treat and dispose of septic effluent.

Biological activity is critical in treating wastewater. Decreased temperatures reduce biological activity by 50 percent for every drop in temperature of 18°F until biological activity stops at about 35°F (Washington State Department of Health 1992). These conditions are not a concern in most settings because of incoming heat from sewage, biological activity, and the surrounding soil.

If conditions are less than optimal, septic effluent with high levels of nutrients can degrade water quality in surface and groundwater. Soils are shallow at the Corbet's Cabin site, and local geology is characterized by karst features that are capable of rapidly transmitting large volumes of groundwater over long distances. For the purposes of this analysis, it is assumed that septic effluent would follow the slope and dip of shallow bedrock geology (including limestone beds) and migrate to the west and north into the Granite Creek subwatershed. Low winter temperatures at the site could limit treatment effectiveness.

In short, based on estimates of septic system outflow (i.e., roughly 3,000 gallons per day based on Tram's water hauling capacity; see section 2.4.14), effluent nutrient concentrations, local characteristics of soil, geology and temperature, and uncertainty on how these characteristics will effect treatment, installation of a conventional septic system at Corbet's Cabin could add nutrients and other pollutants to Granite Creek and ultimately Fish Creek.

The National Parks Omnibus Management Act of 1998 (16 USC 5901 et seq.) underscores NEPA and is fundamental to NPS park management decisions. Both acts provide direction for articulating and connecting resource management decisions to analysis of impacts, using appropriate technical and scientific information. Both also recognize that such data may not be readily available and provide options for resource impact assessment should this be the case. The National Parks Omnibus Management Act directs the NPS to obtain scientific and technical information for analysis. The NPS Handbook for Director's Order 12 states, "If such information cannot be obtained due to excessive cost or technical impossibility, the proposed alternative should be modified to eliminate the action causing the unknown or uncertain impact or other alternative may be selected" (NPS 2011).

Potential water quality impacts of a septic system at Corbet's Cabin could be eliminated through the installation of a more advanced, decentralized on-site wastewater treatment plant that includes chemical and physical treatment. Options for treatment could include aerobic digesters, heated systems, and media filters to name a few. Such systems have been effective in situations such as those found at Corbet's Cabin (AWWA 2000, EPA 2007, Rodel 2016), however costs associated with installation, operation, and maintenance of these systems is significantly higher than those of conventional septic systems. Due to local characteristics of soil and geology and the potential to degrade water quality in Class 1 groundwater and receiving water bodies, any on-site treatment method would need to provide evidence that wastewater effluent would not impact Granite Creek or Fish Creek. An on-site treatment system meeting Wyoming DEQ (i.e., a Class 1 UIC Permit allowing no groundwater degradation below culinary standards) and all other regulatory requirements could certainly be designed. Cost would be the main constraint.

The mitigation measures identified for sanitation facilities (Appendix A, Mitigation Measures, Fac-4) would be a condition of authorizing any on-site treatment system.

Under Option 2, all liquid sewage and wastewater generated at Corbet's Cabin would be transported off site via a 4-inch HDPE pipe (solids would continue to be trucked to the Teton Village wastewater treatment facility). The pipe would extend 2.4 miles and would be buried primarily (2.2 miles) in existing road corridors or proposed snowmaking trenches. The proposed sewer line alignment crosses three stream channels at existing road crossings where the channel is in a culvert. The sewer line would pass beneath the culvert.

The disturbance impacts associated with installing the sewer line are addressed in section 3.4.3.1. The line would connect to the existing sewer line at the intersection of the Nez Perce Traverse and the Sundance run and flow to the treatment facility. The existing treatment facility supports this option and confirms that the treatment facility has the capacity to treat this wastewater (TVWSD 2016).

JHMR has operated similar sewer lines to the Village treatment facility from Casper Restaurant since 1986 and from Rendezvous Lodge since 2005. The lines are inspected annually, and no leaks have been detected. A recent internal, video inspection of the Casper line showed no evidence of deterioration or leaks (Schreiber 2017.) The mitigation measures identified for pipelines (Appendix A, Mitigation Measures, Fac-9) would be a condition of authorizing Option 2.

In summary, a conventional septic system under Option 1 would likely result in some level of nutrient loading and water quality degradation to Granite Creek, a Class 1 water body and tributary to Fish Creek. Alternative methods of on-site treatment could eliminate water quality impacts but would be costly. Option 2 would transport all sewage off-site to the existing wastewater treatment plant with minimal resource impact, and would not contribute nutrients to surface or groundwater. Since all wastewater from

Corbet's Cabin currently goes to the treatment plant, and wastewater production from Corbet's Cabin would not increase significantly (see section 2.4.14), Option 2 does not vary substantially from the existing situation.

3.4.3.3 Wetland and Riparian Resources

Prior to initiating any project that would affect waters of the U.S., including wetlands and stream channels, JHMR would be required to secure any permitting required under Section 404 of the Clean Water Act. As part of that process, the COE would require a plan detailing how JHMR would mitigate impacts. Options include impact avoidance, impact reduction, impact mitigation (i.e., establishment, re-establishment, enhancement, rehabilitation, or preservation of Waters of the U.S.), purchase of mitigation credits from an existing mitigation bank, or participation in an in-lieu fee program (Johnson 2008). The COE would also require that wetland areas which are temporarily impacted by project construction be returned to pre-construction condition.

Alternative 1 – No Action

Potential impacts of projects included in the no-action alternative on wetlands and stream channels under the no-action alternative are reviewed in detail in the 2015 EA, section 3.4.3.2. They include disturbance of about 0.9 acre of wetlands and approximately 1,200 feet of stream channel (Table 3-7). Impacts on wetlands and stream channels under the no-action alternative would occur on both a permanent and temporary basis.

Table 3-7. Acres of wetlands and feet of stream channel directly affected by the no-action alternative.

Disturbance Type	Forested Wetland (acres)	Emergent Herbaceous Wetland (acres)	Scrub-Shrub Wetlands (acres)	Total (acres)	Intermittent Stream Channel (feet)	Perennial Stream Channel (feet)	Total (feet)
Permanent Impacts							
Grading	<0.1	0.2	0.5	0.7	207	67	274
Excavation	<0.1	<0.1	0.1	0.2	--	205	205
Total	<0.1	0.3	0.6	0.9	207	272	479
Temporary Impacts							
Grading	--	<0.1	--	<0.1	622	--	622
Excavation	--	--	--	--	--	79	79
Total	--	<0.1	--	<0.1	622	79	701

Grading and excavation activities under the no-action alternative would remove vegetation and disturb the ground surface, and some projects could disturb subsurface hydrology and deposit dredged or fill material in wetland and riparian areas. Grading and excavation would likely convert some wetland or riparian areas into uplands. The grading projects would directly, permanently impact less than 0.1 acre of forested wetlands, 0.2 acres of emergent herbaceous wetland, and 0.5 acres of scrub-shrub wetland (total 0.7 acres). Grading projects would temporarily disturb less than 0.1 acres of emergent herbaceous wetlands that occur in buffer areas around project sites.

The excavation projects would directly, permanently impact less than 0.1 acres of forested wetland, less than 0.1 acres of emergent herbaceous wetland, and about 0.1 acres of scrub-shrub wetlands. No temporary impacts would result from excavation projects under the no-action alternative.

Under the no-action alternative, the Ashley Ridge Run project has the highest potential impact on wetlands, accounting for slightly over 0.5 acre of impact of all types. However, most of this would occur at the bottom end of the project, where JHMR proposes to fill the channel and adjacent low-lying area with snow rather than filling or grading it. The rest of the impact area is midway down the run, where grading may impact the extreme margins of adjacent wetlands. No indirect disturbance due to subsequent use of adjacent areas is expected.

Wetland impacts resulting from development of several proposed and previously approved projects (primarily the Sweetwater gondola) have triggered Section 404 permitting and compensatory mitigation to offset the impact. That permit was issued in March 2016. Impacts associated with creating these wetland mitigation areas are discussed below under the proposed action.

Permanent impacts on stream channels under the no-action alternative include 207 feet of intermittent stream channel and 272 feet of perennial stream channel. Temporary stream channel impacts would include 622 feet and 79 feet of intermittent and perennial stream channel, respectively.

Impacts on wetlands and stream channels under the no-action alternative would be minimized by BMPs listed in Table 3-5 that maintain proper function of wetlands and channel stability. With the suggested mitigation, no substantial impacts on wetlands and riparian areas would result under the no-action alternative. This conclusion is supported by past experience with rehabilitation efforts in the SUP area (Forest Service 1996 section III.C, Forest Service 2000 sections 3.2 and 3.3, JHSC 2015)

Any impact on jurisdictional wetlands would be subject to permitting under Section 404 of the Clean Water Act, as discussed above, which would entail offsetting mitigation. Impacts on intermittent drainage channels would be slightly more extensive, but these channels are intermittent, rocky, and support little or no riparian habitat. Following site rehabilitation efforts, no adverse impact on their functioning is expected. This conclusion summarizes the findings of the 2015 EA (Forest Service 2015a).

Alternative 2 – Proposed Action

Potential impacts on wetlands and stream channels under the proposed action alternative include disturbance of less than 0.3 acre of wetlands and approximately 2,900 feet of stream channel (Table 3-8). Both temporary and permanent impacts on wetlands and stream channels would occur under the proposed action.

Similar to the no-action alternative, grading and excavation would remove vegetation and disturb the ground surface, and some projects could disturb subsurface hydrology and deposit dredged or fill material in wetland and riparian areas. Grading and excavation would likely convert some wetland or riparian areas into uplands. Grading projects would directly, permanently impact less than 0.1 acre of emergent herbaceous wetland and less than 0.1 acre of scrub-shrub wetlands (total 0.1 acres). Temporary impacts from grading projects would impact less than 0.1 acre of emergent herbaceous wetland and less than 0.1 acre of scrub-shrub wetlands (total 0.1 acres). Temporary impacts would occur on wetlands located in buffer areas surrounding project footprints.

Excavation projects would permanently and directly impact less than 0.1 acre in each of forested, emergent herbaceous, and scrub-shrub wetlands. Additional impacts from excavation would occur on a temporary basis on 0.1 acre of forested wetland and less than 0.1 acre of scrub-shrub wetland that exist in buffer areas around project sites.

Table 3-8. Acres of wetlands and feet of stream channel directly affected by the proposed action.

Disturbance Type	Forested Wetland (acres)	Emergent Herbaceous Wetland (acres)	Scrub-Shrub Wetlands (acres)	Total (acres)	Intermittent Stream Channel (feet)	Perennial Stream Channel (feet)	Total (feet)
Permanent							
Grading	--	<0.1	<0.1	0.1	187	312	499
Excavation	<0.1	<0.1	<0.1	0.1	--	--	--
Total	<0.1	<0.1	0.1	0.1	187	312	499
Temporary							
Grading	--	<0.1	<0.1	<0.1	367	1,554	1,921
Excavation	0.1	--	<0.1	0.1	179	266	445
Total	0.1	<0.1	0.1	0.1	546	1,820	2,366

On an individual basis, the impacts on wetlands under the proposed action would be minor, with each less than 0.1 acre. Permanent impacts would be primarily associated with excavating trenches across wetland areas during installation of power lines for the restroom facility and St. John's race arena handle tow, as well as snowmaking lines. No indirect disturbance due to subsequent use of adjacent areas is expected. As discussed above, prior to initiating any project that would affect waters of the U.S., including wetlands and stream channels, JHMR would be required to secure any permitting required under Section 404 of the Clean Water Act. Temporary impacts on wetlands would be minor and restored following project completion. The wetland impacts associated with the Solitude Facility Traverse were covered in the March 2016 permit that also covered the Sweetwater gondola.

The proposed action would include two wetland mitigation projects. One project site is about 1.2 acres on the lower portion of the Bear Flats run and the other is a 0.5 acre site on the east side of Upper Antelope Flats run, adjacent to an existing natural scrub wetland. Water is available at each site to support growth of new wetland vegetation and help ensure long-term success.

Permanent stream channel impacts under the proposed action include 312 feet of perennial channel and 187 feet of intermittent channel. The majority of permanent impacts would occur from relocating stream channel segments during development of Amphitheatre run. This project would move 312 feet of perennial stream channel and 122 feet of intermittent channel a maximum of 18 feet to the north, near the trail boundary. The 404 permitting for this activity has already been initiated. The new stream channels would be created to match existing segments in regard to pattern and profile. Diversion from the old channel to new channel segments would occur during the fall season when flows were lowest. The bed and banks of the stream would be stabilized with native materials, and channel banks would be revegetated with riparian vegetation in areas where sufficient water and soil exist. These methods have proven successful with other efforts in the SUP area (Forest Service 1996 section III.C, Forest Service 2000 sections 3.2 and 3.3). The proposed Ashley Ridge Traverse would also include permanent stream impacts and place 65 feet of intermittent stream channel in a 30-inch diameter culvert.

Temporary impacts on stream channels include stream segments that would pass through disturbance buffers surrounding excavation for the Bear Flats Café and Solitude Station, and graded areas for the MSS meeting place, Moran Run, Solitude Station, and Solitude Terrain Park. Other temporary impacts would occur at stream crossings when power or snowmaking lines would be placed below stream

channels. The majority of temporary disturbance (1,800 feet) on perennial and intermittent stream channels would occur as part of grading areas in the Amphitheatre run. No grading projects (including Amphitheatre run) would impact streams.

Impacts on wetlands and stream channels under the proposed action would be minimized by BMPs listed in Table 3-6 (described in Appendix A) that maintain proper function of wetlands and channel stability. With the suggested mitigation, no substantial impacts on wetlands and riparian areas would result under the proposed action. This conclusion is supported by past experience with rehabilitation efforts in the SUP area (Forest Service 1996 section III.C, Forest Service 2000 sections 3.2 and 3.3, JHSC 2015)

3.4.4 CUMULATIVE EFFECTS

As discussed in section 3.3, the cumulative actions considered in this analysis are any projects listed in the BTNF SOPA that would have temporally and spatially overlapping impact on the same resources affected directly or indirectly by these alternatives – generally those occurring within the Fish Creek watershed – in the past, present, or reasonably foreseeable future. Two projects meet these requirements including the Teton-to-Snake Fuels Management Project and the Moose-Wilson Corridor Comprehensive Management Plan.

Scoping documents for the Teton-to-Snake Fuels Management Project indicate that 23 design features will be employed to decrease impacts on watershed resources, including wetland and riparian areas. Those design features include identifying water bodies and wetlands, excluding heavy equipment and mechanical treatments in and around them, establishing non-ignition areas adjacent to them, and rehabilitating all temporary roads, landings, and skid trails used as part of fuel reduction activities.

Reducing fuel loads in the Teton-to-Snake Fuels Management Project area will reduce the risk of catastrophic wildland fires and the associated negative impacts on soil stability, sediment delivery to water bodies, and water quality that accompany catastrophic fires. As a result, the Teton-to-Snake Fuels Management Project is anticipated to have a long-term beneficial cumulative effect on watershed resources including stream channels, water quality, wetlands, and riparian areas.

In regard to the Moose-Wilson Corridor Comprehensive Management Plan, the road is maintained in a way that does not contribute surface runoff to Lake Creek or other water bodies, and the location of the road does not impact riparian or wetland resources. The road does provide access to trailhead areas near the mouth of the Granite Creek subwatershed. Recreational use of trails in that area for hiking and horseback riding is monitored by park staff, and normal use does not affect water quality, riparian, and wetland resources. By design, the management plan will prohibit impairment of park resources and maintain them at the existing high level of quality. As a result, implementing the Moose-Wilson Corridor Comprehensive Management Plan is anticipated to have a beneficial cumulative effect on watershed resources including stream channels, water quality, wetlands, and riparian areas.

The issue of potential nutrient loading requires further discussion, since Fish Creek has identified issues in this regard. This analysis identifies potential nutrient loading to Granite Creek and hence Fish Creek associated with the conventional septic system treatment option for Corbet's Cabin wastewater. This addition of nutrients could be continuous, as long as the Corbet's facility was in operation. As noted above, this would be inconsistent with the anti-degradation designation of these two streams.

The recent USGS study of nutrient loading in Fish Creek (USGS 2016) characterized sources of nitrogen and phosphorus in the Fish Creek watershed (Eddy Miller 2016). This assessment determined that septic tanks and sewage treatment plants contributed roughly 5 percent to the total watershed load of nitrogen and about 11 percent of the total watershed load of phosphorus. While relatively minor, these loads primarily occur in developed areas of the Fish Creek watershed including Teton Village as well as other areas in the watershed. Highest nutrient concentrations in Fish Creek were observed near Teton Village in comparison to other downstream monitoring sites. Flow from Granite Creek enters Lake Creek which

then flows into Fish Creek about 4 miles downstream from Teton Village. Previous monitoring in Fish Creek near this point of confluence indicates good water quality without the elevated nutrient concentrations observed at upstream locations. As a result, water quality in Granite Creek would not affect segments of Fish Creek that currently maintain elevated nutrient levels.

3.5 VEGETATION

3.5.1 SCOPE OF ANALYSIS

- *How would the proposed infrastructure affect special-status (i.e., federally listed, Forest Service sensitive, Wyoming state species of concern or potential concern, or Forest Service MIS) plant species?*

No federally listed plant species are known to occur at JHMR, but four Forest Service Region 4 sensitive species (including whitebark pine, a candidate for federal listing), eight Wyoming state species of concern or species of potential concern, and two BTNF MIS – some in more than one category – may occur in potentially disturbed areas. Clearing, grading, excavation, or subsequent use could affect these species.

Indicators: Species-specific determinations of the potential individual- and population-level impacts, based primarily on past surveys and published information on the species' distribution and population status.

- *How would the proposed infrastructure affect forest vegetation at the resort?*

Forest communities are among the most productive and structurally diverse vegetation types occurring at the resort, and trees would be cleared to accommodate most of the proposed lifts, buildings, and runs. This would eliminate some forest vegetation and fragment blocks of forest habitat.

Indicators: Assessment of the amount of forest vegetation removed and qualitative description of the resulting fragmentation.

3.5.2 AFFECTED ENVIRONMENT

3.5.2.1 Special-Status Plant Species

The ski area and the BTNF developed a vegetation management plan in 1997 that provided specific instruction on rare plant inventories that were to be conducted within the SUP area. The inventories had actually begun the previous year and have continued since, resulting in annual inventory reports. The inventories focus on federally listed threatened and endangered species, Region 4 sensitive species, and Wyoming state plant species of special concern (JHSC and Forest Service 1997). As of 2016, a total of 460 vascular plant species had been documented in the SUP area (Delmatier 2017). The ski area-wide inventories have been used to support past NEPA analyses.

In 2015 and 2016, plant inventories focused primarily on areas affected by projects described in the 2013 MDP, including the proposed action projects. The disturbance footprint of all proposed action projects have been, or will be, surveyed before ground disturbances begin (Appendix A, no. 9). Survey results will be used to minimize the potential for adverse effects on special-status plant species, especially as small adjustments are made to project alignments either because of design constraints or presence of those species.

A total of 11 plant species were selected for detailed analysis because they are known to occur within the JHMR SUP area (Delmatier 2017). Those 11 species are listed in Table 3-9. Proposed activities are considered to have no impact on special-status plant species without potential habitat in the SUP area. A full list of special-status plant species considered is provided in Appendix B.

Table 3-9. List of special-status plant species with known occurrences in the JHMR SUP area.

Species Name	Habitat Description	Status and Rank	Known Occurrences in the SUP Area	Habitat Present in SUP Area
Aromatic pussytoes (*Antennaria aromatica*)	Crevices on sparsely vegetated ridgelines and summits at and above the timberline on limestone-derived soils at 4,500 to 10,800 feet in elevation (Fertig 2000a).	Wyoming Species of Potential Concern	Yes	Yes
Green spleenwort (*Asplenium trichomanes-ramosum*)	Crevices on north-facing limestone outcroppings in spruce/subalpine fir forests at elevations between 5,800 and 9,900 feet (Fertig 2000b).	Wyoming Species of Concern	Yes	Yes
Shultz's milkvetch (*Astragalus shultziorum, Astragalus molybdenus*)	Distribution centered in Wyoming in the Teton, Salt, and Wind River ranges. Found primarily in subalpine forb communities on shallow, rocky, calcareous soils at elevations of 8,800 to 11,500 feet (Heidel and Fertig 2008a).	MIS, Wyoming Species of Potential Concern	Yes	Yes
Rockcress draba (*Draba apiculata*, *Draba globosa, Draba densifolia* var. *apiculata*)	Moist, gravelly alpine meadows and talus slopes, often on limestone-derived soils, at elevations between 8,100 and 12,400 feet (Handley and Fertig 2008).	R4 Sensitive, Wyoming Species of Concern	Yes	Yes
Milk kelloggia (*Kelloggia galioides*)	Woods and open slopes at elevations between 7,100 and 8,200 feet (Markow and Fertig 2008).	Wyoming Species of Concern	Yes	Yes
Payson's bladderpod (*Lesquerella paysonii*)	Endemic to the carbonate mountain ranges of west-central Wyoming, eastern Idaho, and southwestern Montana. Found on rocky, sparsely vegetated slopes, often calcareous substrates, at elevations between 5,500 and 10,600 feet (Heidel 2008a).	R4 Sensitive, Wyoming Species of Potential Concern	Yes	Yes
Broad-leaved twayblade (*Listera convallarioides*)	Margins of waterbodies and other moist areas in coniferous or aspen/alder forests at elevations between 6,400 and 9,000 feet (Markow and Fertig 2000).	Wyoming Species of Concern	Yes	Yes

Table 3-9 (cont'd). List of special-status plant species with known occurrences in the JHMR SUP area.

Species Name	Habitat Description	Status and Rank	Known Occurrences in the SUP Area	Habitat Present in SUP Area
Creeping twinpod (*Physaria integrifolia*)[1]	Barren, rocky, calcareous hills and slopes at 6,500 to 8,600 feet elevation (Fertig, Refsdal, and Whipple 1994).	R4 Sensitive	Yes	Yes
Whitebark pine (*Pinus albicaulis*)	In pure stands near the treeline and in mixed stands in subalpine forests from under 8,000 to over 10,000 feet in Wyoming (Arno and Hoff 1990).	Candidate, R4 Sensitive	Yes	Yes
Quaking aspen (*Populus tremuloides*)	Found throughout the BTNF. It occurs in pure stands, or mixed with subalpine fir, lodgepole pine, Douglas-fir, whitebark pine, or Engelmann spruce. In lower elevations, it forms a mosaic with shrublands (NatureServe 2017).	MIS	Yes	Yes
Large-flower triteleia (*Triteleia grandiflora*)	Grasslands or sagebrush and pinyon-juniper woodlands to pine-forest slopes and hills (NatureServe 2017).	Wyoming Species of Concern	Yes	Yes

[1]Forest Service Region 4 Sensitive Species list includes *Physaria integrifolia* var. *monticola*, which is no longer considered a valid taxon by Rocky Mountain Herbarium, WYNDD, JHMR, or the BTNF.

In addition to completing rare plant inventories, JHMR has pro-actively taken steps to minimize the impact of resort activities on rare plants and native plant communities. Those steps include avoiding disturbance of areas with known concentrations of rare plants, designing disturbances to avoid impacts on rare plants and native plant communities when possible, conducting on-site research comparing rehabilitation practices, salvaging and importing topsoil and organic matter to improve soils and create appropriate seed beds, collecting and planting native seeds, transplanting rare plants from areas prior to disturbances, protecting rehabilitated sites, and providing signage and other interpretive materials to educate the public regarding rare plants. JHMR has also adhered to the design criteria listed in Appendix A of this EA on past projects.

Aromatic Pussytoes

Aromatic pussytoes is regionally endemic to southwest Montana and northwest Wyoming, and is known from the Absaroka, Beartooth, Bighorn, Gros Ventre, Wind River, Wyoming, and Salt River ranges. As of 2000, there were 27 known occurrences in Wyoming. Threats to this species are considered minimal due to the ruggedness and inaccessibility of its alpine habitat. Trend data are lacking, but there appears to be little evidence of a decline in either numbers or range (Fertig 2000a).

Aromatic pussytoes occur in crevices on sparsely vegetated ridgelines and summits at and above the timberline on limestone-derived soils at 4,500 to 10,800 feet in elevation (Fertig 2000a). This habitat

corresponds to the subalpine and alpine tundra community described in the 2000 EA, of which there were approximately 169 acres in the SUP area. Aromatic pussytoes has been observed in the SUP area, with seven confirmed and two potential observations recorded on the ridge of Rendezvous Mountain between the west side of Cody Bowl and the Tram upper terminal (Delmatier 2017). Since the original Tram was built 50 years ago, the summit area of Rendezvous Mountain has supported dispersed hiking along the ridgeline and concentrated hiking along the service road that accesses the Tram terminal during the growing season. A new population of aromatic pussytoes was discovered on the ridgeline between JHMR and Grand Teton National Park in the cliff area above the Casper Bowl lift during pre-construction surveys in 2016. (Delmatier 2017). The population is near a hiking trail and Via Ferrata route that was approved in 2015, but has not yet been constructed.

Green Spleenwort

Green spleenwort is a small-statured, perennial fern widely distributed in North America, from Alaska to Newfoundland and south to California, Colorado, Wyoming, South Dakota, Michigan and New England. There are nine extant and two historical green spleenwort occurrences in Wyoming. Those occurrences are in the Bighorn, Medicine Bow, Gros Ventre, and Teton ranges in Carbon, Sheridan, Sublette, Teton, and Washakie counties. Threats to green spleenwort include trampling, over-collection, and logging (Fertig 2000b).

Green spleenwort habitat includes crevices on north-facing limestone outcroppings in spruce/subalpine fir forests at elevations between 5,800 and 9,900 feet (Fertig 2000b). Approximately 168 acres of rock outcrop habitat were previously identified in the SUP area, where green spleenwort has been observed growing in limestone rock crevices on a cliff face in an outcropping between Cody Bowl and Rock Springs Bowl (Delmatier 2014). Although the Cody Bowl and Rock Springs Bowl areas experience dispersed hiking during the growing season, this species is likely protected because of its location.

Shultz's Milkvetch

Shultz's milkvetch, also known as Leadville milkvetch (*A. molybdenus*), has been removed from the R4 sensitive species list but remains a MIS. A regional endemic, 26 occurrences of Shultz's milkvetch have been found in the Teton, Salt River and Wind River ranges of Wyoming, and it has recently been found in Idaho. Trend data are lacking but most populations appear to be stable. Sheep grazing has been identified as a potential threat at some sites, but most populations are at high elevations and in physically protected sites that receive little use or impacts (Heidel and Fertig 2008a).

Shultz's milkvetch occurs primarily in subalpine forb communities on shallow, rocky, calcareous soils at elevations of 8,800 to 11,500 feet (Heidel and Fertig 2008a). Subalpine and alpine tundra were estimated to cover approximately 169 acres of the SUP area in 2000. Shultz's milkvetch is known to occur along the east edge of Cody Bowl and on Rendezvous Mountain, west of the upper Tram terminal. Previous inventories have estimated that there are more than 1,000 individual plants growing in those areas (Delmatier 2014). These areas are used for both dispersed and concentrated hiking along existing roads and trails.

Rockcress Draba

Rockcress draba, previously known as *Draba densifolia* var. *apiculata,* is a regional endemic of Idaho, Montana, Colorado, Utah and Wyoming. In Wyoming there are 22 extant occurrences, known from the Absaroka, Teton, Wind River, Beartooth, Medicine Bow, Gros Ventre, and Salt River ranges and the Overthrust Belt (Handley and Fertig 2008). Handley and Fertig (2008) state that rockcress draba is protected from human threats by its inaccessible habitat. However, Ladyman (2004) indicates that invasive weeds are a threat.

Rockcress draba is found in moist, gravelly alpine meadows and talus slopes, often on limestone-derived soils at elevations between 8,100 and 12,400 feet (Handley and Fertig 2008). Rock outcrop, tall forb, and talus slopes were previously estimated to cover a total of approximately 407 acres of the SUP area. To

date, rockcress draba is known to occur in alpine rock outcrop and talus slopes in the Cody Bowl area, on the ridge of Rendezvous Mountain east of the upper Tram terminal, in Tensleep Bowl, and in the Headwall area. Because invasive weeds are rare in these alpine areas, they are unlikely to pose a threat to rockcress draba. However, these areas support dispersed and concentrated hiking during the growing season.

Milk Kelloggia

Milk kelloggia is a perennial herb distributed from Washington to California and inland to Idaho, Wyoming, Utah, and Arizona. However, as of 2008, it was only known from six extant populations and two historical records in Wyoming. There are no known threats to milk kelloggia, though it is anticipated that expanding recreation at JHMR may constitute a threat (Markow and Fertig 2008).

Milk kelloggia occurs beneath dense canopies of coniferous forests and on granite outcrops in mixed conifer forests at elevations between 7,100 and 8,200 feet (Markow and Fertig 2008). There are approximately 893 acres of coniferous and mixed coniferous forests within the SUP area, and roughly one-third of that is within the elevation band occupied by milk kelloggia. At JHMR, milk kelloggia has been observed at two locations in the Crags area, two locations near the Cheyenne Gully ski run, and one location approximately 80 feet east of the existing Sweetwater gondola alignment (Delmatier 2014, Delmatier 2015a).

Payson's Bladderpod

Payson's bladderpod is regionally endemic to west central Wyoming, eastern Idaho, and southwestern Montana. It is found in the mountain ranges of Lincoln, Sublette, and Teton counties in Wyoming, and there were 41 extant occurrences in the Salt River and Wyoming ranges at the time of the latest surveys. (Heidel 2012). Threats to Payson's bladderpod include impacts from hiking and off-road vehicles, ski development, grazing, and mining (Fertig and Heidel 2008).

Payson's bladderpod grows in open and sparsely vegetated areas and is typically associated with sagebrush grasslands at elevations between 5,500 and 10,600 feet (Heidel 2008a). While Payson's bladderpod occupies sparsely vegetated areas, it is unclear if the species is disturbance adapted. Recent surveys have shown that it occupies areas that are naturally low in vegetative cover, such as talus slopes, but also grows in pipeline corridors and on exposed ridge-tops which have been recently bladed (Heidel 2012). Though there are no sagebrush grasslands at JHMR, there are an estimated 206 acres of talus slope and subalpine and alpine plant communities in the SUP area. Payson's bladderpod is known to occur on the east side of Cody Bowl and on the ridge of Rendezvous Mountain to the south of the upper Tram terminal, with a single occurrence recorded on the ridgeline above the Bridger Restaurant (Delmatier 2017). These areas have supported dispersed and trail hiking during past growing seasons.

Broad-leaved Twayblade

Broad-leaved twayblade is a perennial orchid widely distributed across western North America. It is known from four extant occurrences and two historical records from the Teton, Medicine Bow, Laramie, and Bighorn ranges in Albany, Converse, Sheridan, and Teton counties in Wyoming (Markow and Fertig 2000). It is considered globally secure, but the status has been classified as critically imperiled in Wyoming by Markow and Fertig in 2000 and as imperiled by the WYNDD in 2012. The WYNDD has assigned broad-leaved twayblade a peripheral, or low conservation priority, status. This species has also been assigned a high intrinsic vulnerability (WYNDD 2012), meaning that a loss of individuals or populations may have a larger impact on the species as a whole. Threats to broad-leaved twayblade are loss of moist forest habitat (i.e., logging), over-collection, and recreation (Markow and Fertig 2000).

Broad-leaved twayblade is found in riparian and other moist, shaded areas in coniferous, aspen, or alder forests at elevations between 6,400 and 9,000 feet. Those habitat requirements are most likely to occur in the willow/mixed brush community described in the 2000 EA, of which there was approximately 35 acres in the SUP area. It has been observed at the lower elevations at JHMR, in the small riparian area adjacent

to the Beaver Tooth ski run and in a forest stand to the northwest between the South Pass and Togwotee Pass traverses (Delmatier 2014, WYNDD 2012).

Creeping Twinpod

Only the *monticola* variety of creeping twinpod is listed as a Region 4 sensitive species. Creeping twinpod is not tracked by WYNDD because of questions of taxonomy. The *Flora of North America* treatment of *Physaria* (eFloras 2017) includes the species *integrifolia* but clarifies that the variety *monticola* is not valid taxon. The treatment states that the key characteristic of variety *monticola* is simply a result of plasticity in the growth form resulting from edaphic (soil and climate) conditions rather than evolutionary novelty. The variety is, however, listed as sensitive in Region 4 and as such still has an analysis requirement. As a result of the lack of monitoring of this species, little is known about the threats, but they are likely to be similar to those of other species that occupy rocky and barren habitats, which include competitive exclusion by invasive species.

Creeping twinpod has been observed in the SUP area. However, since variety *monticola* is no longer a recognized taxon, and since *Physaria integrifolia* is not a special-status species, creeping twinpod will not be discussed further in this analysis.

Whitebark Pine

Whitebark pine is a subalpine species common to western mountain ranges and is considered a keystone species of high-elevation western ecosystems. It is under pressure from a number of threats, including: white pine blister rust, outbreaks of mountain pine beetle, fire suppression that has allowed for increased interspecific competition, severe wildfire, and climate change which influences mountain beetle outbreak cycles. Blister rust has been an especially severe threat in some areas of the species' range. However, some trees appear to be naturally resistant to the blister rust and able to withstand mountain beetle attacks. These trees are referred to as "plus" trees. In recent years, the mountain-pine-beetle epidemic has subsided, and trees with a genetic resistance to blister rust have a higher probability of survival (FWS 2016).

Whitebark pine grows in pure and mixed stands at high elevations throughout the SUP area. A multi-agency GIS vegetation layer identified approximately 537 acres of whitebark pine forest in the SUP area, including 162 acres of whitebark pine-dominated stands and 375 acres of whitebark pine mixed with other conifers. The estimation of acres of whitebark pine stands is based on aerial image interpretation and geologic and gradient modeling, which is known to slightly overestimate whitebark pine presence in the Teton Range (Bockino 2012). A comparison of the vegetation layer to recent aerial imagery of JHMR supports Bockino's over-estimation observation and suggests that rock outcroppings at JHMR may be inaccurately included in areas identified as whitebark pine stands (Figure 3-2).

While conducting vegetation surveys near the proposed Upper Wide Open run, Delmatier (2014) observed mortality rates of 70 percent at elevations above 8,670 feet and 50 percent at lower elevations. The cause of mortality is likely to be a combination of blister rust and mountain pine beetle.

Four plus trees have been identified within the SUP area, and JHMR and BTNF have planted over 1,000 seedlings from those plus trees in the SUP area as an effort to maintain the whitebark pine population at JHMR.

Quaking Aspen

Quaking aspen is a widely-distributed deciduous tree species that occurs across much of North America. It can be found growing in varying conditions and on a wide range of soil types at elevations between 4,600 and 10,500 feet. Quaking aspen is often found growing on north- or east-facing mountain slopes and canyons, or near streams and other surface water. Since it is a shade-intolerant species, aspen often decrease as evergreen trees increase in an area.

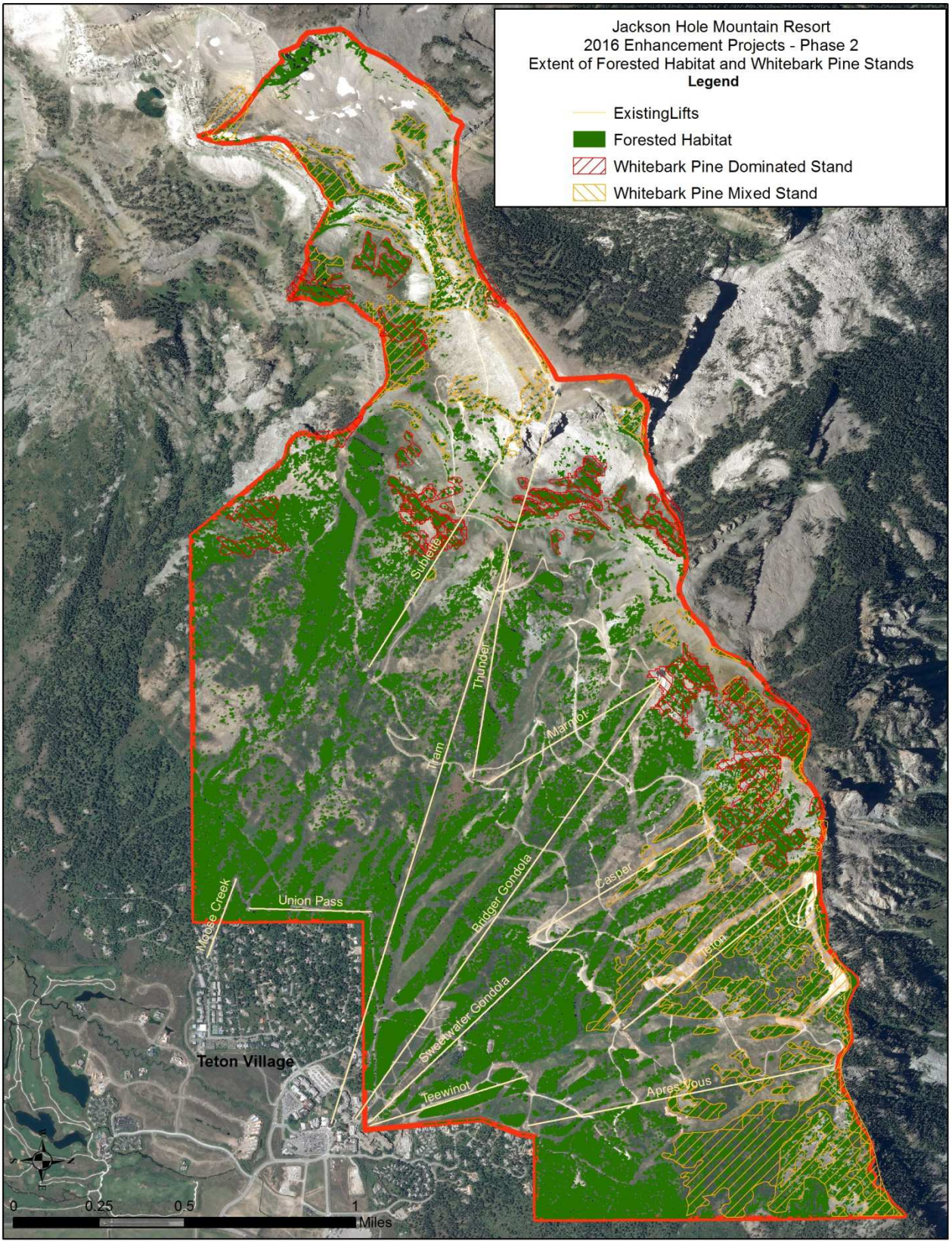

Figure 3-2. Forested habitat and whitebark pine stands at JHMR.

Most of the quaking aspen on the BTNF was established after the area was burned between 1840 and 1890 (Gruell and Loope 1974, Loope and Gruell 1973), the result of which is the current condition of mature stands with very little age and size class diversity. Late-seral aspen is being replaced by conifers throughout the species' range. Because aspen is intolerant of shade, many well-stocked even-aged stands have virtually no aspen regeneration beneath them. The major cause of this decline is greatly reduced fire frequency. Quaking aspen flourished in the West when these lands burned periodically (Bartos 2007). Aspen exists within the SUP area and is most common near the base area. There were an estimated 226 acres of mixed conifer/aspen forest within the JHMR SUP area in 2000 (Forest Service 2000).

Large-flower Triteleia

Large-flower triteleia is a widely distributed species, ranging from southern British Columbia to northern California and westward to Montana, Wyoming, Utah, and Colorado (NatureServe 2017). It can be found in sagebrush, oak-maple, aspen, and Douglas-fir communities at elevations between 4,590 and 9,350 feet (Welsh et al. 2015). In Wyoming, large-flowered triteleia is known from Fremont, Lincoln, and Teton counties.

The majority of the SUP area is located within the elevation band inhabited by this species. However, Douglas-fir and aspen communities are most common at the middle- and lower-elevation portion of the SUP area. Large-flower triteleia has only been observed in the SUP area at three locations. Two of the occurrences are on steep rocky roadsides passing through open shrub communities near the base of Teton lift along South Pass Traverse, but surveys conducted in the spring of 2015 did not detect any large-flower triteleia in that area (Delmatier 2015b). The third occurrence was observed in 2016 and is located near the Teewinot Gully ski run and the South Pass Traverse (Delmatier 2017).

3.5.2.2 Forest Vegetation

The distribution of forest stands at JHMR has been influenced by variations in growing conditions (i.e., elevation, temperature, precipitation, and soil productivity) and disturbances such as avalanches, disease, and previous development associated with operating JHMR. The creation of lift alignments, ski runs, trails, and other infrastructure has created a series of linear forest stands. While some small tree islands exist within cleared areas, they are typically removed to provide safe and efficient winch-grooming conditions on steep runs and to provide settings appropriate for beginner- and intermediate-level skiers. Operations at JHMR are also likely to have increased the extent of forest stands. For example, avalanche control results in smaller, more frequent avalanches than occurred in the past. The smaller avalanches have allowed forest stands to regenerate in areas where they had been eliminated by large avalanches. The combination of natural processes and previous management has fragmented the forest stands.

Forest stands have also been impacted by glading treatments. Glading includes the removal of select trees to open up areas that are naturally too densely forested for most skiers to navigate comfortably. Glading affects the overstory layer of vegetation directly by removing select trees and changing the structure of a stand. Decreasing the overstory canopy cover also has the potential to affect the understory layer and may increase shrub and herbaceous-species cover.

Stands have closer canopies and greater tree cover on north-facing slopes. The forest stands within the SUP area consist of conifer/aspen at the lower- and mid-mountain elevations, and conifer stands at the higher elevations. The dominant conifer trees at the lower elevations are lodgepole pine (*Pinus contorta*) and Douglas-fir (*Pseudotsuga menziesii*), and these trees are intermixed with aspen. Lodgepole pine is most common near the Teewinot and Apres Vous lifts and, aspen tend to comprise a greater percentage of the stands near riparian areas and wetlands (Forest Service 2000). At higher elevations, stand dominance transitions to limber pine (*Pinus flexilis*), subalpine fir (*Abies lasiocarpa*), and whitebark pine. The 2000 EA identified a total of 1,007 acres of conifer and conifer/aspen forests in the SUP area (Forest Service 2000).

A remotely sensed dataset (LIDAR) from 2008 was used to estimate of the extent of forest stands in the SUP area (see Figure 3- 2). That dataset was adjusted to account for areas that are no longer forested as a result of previously approved projects completed since 2008 (e.g., Sweetwater gondola, Teton lift, Solitude conveyor, Upper Wide Open run, Grizzly Glade). Following those adjustments, forest stands are now estimated to occupy approximately 885 acres of the SUP area.

3.5.3 DIRECT AND INDIRECT EFFECTS

As described in section 3.2 the disturbance types associated with projects addressed in this EA have been categorized as clearing, grading, or excavation. Clearing projects would involve the removal of all trees and large shrubs in order to create open corridors that would accommodate lift alignments or zip-lines. The forested communities in cleared corridors would be converted to low-statured shrub or herbaceous communities. This treatment may also increase shrub and herbaceous-species cover. Clearing projects may result in minor, temporary ground disturbances as cut vegetation is removed from those corridors but would not include major, permanent ground disturbances.

Projects requiring grading would clear away existing vegetation and recontour the ground surface. The recontouring would include depositing or removing soil and fill material to create a smooth and contoured ground surface. Grading is used most often to construct ski runs or to level areas around other infrastructure. The result may be a permanent conversion from a forested to a low-statured shrub or herbaceous vegetation community. As part of their rehabilitation efforts, and to improve revegetation success, JHMR often either stockpiles or imports topsoil for use on disturbed areas.

Excavation projects would also clear away existing vegetation, as well as top soil and subsurface soil or rock in order to adequately accommodate infrastructure. Excavation would most often be associated with installation of snowmaking and other utilities, footings and foundations for buildings, and zip-line terminals. Vegetation communities disturbed by excavation (other than snowmaking and utility lines) would be permanently converted to a developed condition within the project footprint, though buffer areas around excavations may be rehabilitated following the disturbance. When excavation is used to construct hiking and biking trails, the use of small equipment and hand tools would allow for strategic avoidance of special-status plants or trees greater than 3 inches in diameter.

3.5.3.1 Alternative 1 – No Action

Special-Status Species

Under the no-action alternative, JHMR would continue to operate within the SUP boundary as permitted. Ground-disturbing activities associated with previously approved projects or routine operations and maintenance would still be authorized, including those approved in the 2015 DN/FONSI. Projects under the no-action alternative are described in section 2.3 and their impacts on vegetation resources are summarized below and reviewed in detail in the 2015 EA (Forest Service 2015a).

The no-action alternative would have no effect on Shultz's milkvetch, or large-flower triteleia. However, since elements of the no-action alternative are located in potential habitat for, or near known locations of, aromatic pussytoes (including the population discovered in 2016 near approved, but not yet constructed hiking trail and Via Ferrata segments), green spleenwort, rockcress draba, milk kelloggia, Payson's bladderpod, and broad-leaved twayblade, it may impact individuals but is not likely to cause a trend to federal listing or loss of viability. The no-action alternative would also directly affect whitebark pine, and aspen, but is not likely to cause a trend to federal listing or loss of viability for whitebark pine or to affect forest-wide aspen trends. Design criteria listed in Appendix A would limit the potential impact on these species.

Forest Vegetation

The effect of the no-action alternative on forest vegetation would be the reduction of 21.8 acres of forested stands, or about 2.5 percent of the forested area in the SUP boundary (Table 3-10). The removal of forested vegetation, especially for the proposed ski runs, would further fragment forested habitats at JHMR. The projects that would most notably contribute to fragmentation are the Washakie, Solitude, and Lower Ashley runs.

Table 3-10. Amount of forest vegetation affected by clearing, grading, and excavation associated with the No-Action Alternative and Proposed Action.

Disturbance Type	No Action (acres)	Proposed Action, Corbet's Cabin Sewage Option 1 (acres)	Proposed Action, Corbet's Cabin Sewage Option 2 (acres)
Clearing	0.2	0.5	0.5
Grading	18.3	10.8	10.8
Excavation	3.3	1.9	1.9
Total	21.8	13.2	13.2

3.5.3.2 Alternative 2 - Proposed Action

Special-Status Species

Under the proposed action, there would only be one project, the zip-line, which would involve clearing. Approximately 0.2 acres of mixed conifer/aspen forest would be removed from near the upper terminal of Span 3 and in a portion of the Span 3 alignment, potentially affecting aspen. Approximately 0.3 acres of conifer forest and 0.3 acres of willow habitat would also be removed for zip-line. The removed habitat is potential suitable habitat for broad-leaved twayblade, milk kelloggia and large-flower triteleia. The clearing near the upper terminal of Span 3 would also be approximately 90 feet upslope from a population of broad-leaved twayblade. Aside from aspen, no other special-status species occur in areas that would be cleared.

The grading projects associated with the proposed action overlap with potential, unoccupied, suitable habitat for milk kelloggia, large-flower triteleia, broad-leaved twayblade, green spleenwort, rockcress draba, Payson's bladderpod, whitebark pine, and aspen, and known, occupied, habitat of aspen and whitebark pine. Other grading projects occur in areas that have previously been disturbed or are not considered habitat for special-status species. Under the proposed action, grading for the Pooh Bear and Solitude #2 conveyors, St. John's Race Arena handle tow, St. John's Race Arena, both the Solitude Facility and Saratoga Bowl Traverses, wetland mitigation site, and the MSS meeting place projects would remove approximately 6.7 acres of mixed conifer/aspen forest. Grading for the Casper Bowl Traverse would affect occupied whitebark pine habitat, and remove 10 trees with a diameter greater than 4 inches and four trees with a diameter less than 4 inches. Grading for the St. John's Race Arena, Solitude run terrain park projects would occur in mixed conifer stands, but surveys revealed that the affected areas do not include whitebark pine. No other special-status plants are known to occur in areas that will be subject to grading disturbances.

The excavation projects associated with the proposed action overlap potential suitable habitat for all of the special status species carried into detailed analysis, though only one species (i.e., aspen) was observed in its potential habitat. Excavation associated with installing power for the Pooh Bear and Solitude #2 conveyors and St. John's Race Arena handle tow, the restroom facility and associated utilities, Solitude Station MSS facility, zip-line terminals, and the snowmaking system expansion would remove approximately 2.5 acres of mixed conifer/aspen forest. And some excavation for the Corbet's Cabin

sewage line under Option 2 would occur in areas which have been designated as whitebark pine stands and mixed conifer stands with a whitebark pine component, the excavation would largely be confined to the prism of an existing service road. The segment of the sewer line alignment that would not be constructed in the existing road was not included in the rare plant surveys completed in 2016, but would be subject to preconstruction surveys to confirm that the excavation would avoid impacting whitebark pine trees. Excavation for Corbet's Cabin and either the septic tank and leach field (Option 1), or the portion of the sewer line not installed within the existing service road (Option 2), would be constructed in potential aromatic pussytoes, Schultz's milkvetch, rockcress draba, and Payson's bladderpod habitat. As described above in section 3.5.2.1, prior surveys have found these four species growing in the vicinity of Corbet's Cabin and the ridgeline of Rendezvous Mountain. However, pedestrian surveys completed in 2016 confirmed that the habitat impacted by Corbet's Cabin under either Option 1 or 2 is not occupied. As a result, the excavation projects are not likely to directly affect aromatic pussytoes, rockcress draba, or Payson's bladderpod. No other special-status plant species are known to occur in areas that will be excavated.

Considering the disturbances described above and their location relative to known special-status plants or potential habitat, the proposed action would have no direct effect on aromatic pussytoes, green spleenwort, Shultz's milkvetch, rockcress draba, milk kelloggia, Payson's bladderpod, broad-leaved twayblade, or large-flower triteleia. The proposed action would have a direct effect on aspen and whitebark pine but is not likely to cause a trend to federal listing or loss of viability for whitebark pine or to affect Forest-wide aspen trends. Since elements of the proposed action are located in potential suitable habitat for all of the special-status species carried into detailed analysis, it may result in indirect effects on individuals but is not likely to cause a trend to federal listing or loss of viability. Design criteria listed in Appendix A would limit the potential impact on these species.

Forest Vegetation

The clearing, grading, and excavation associated with the proposed action would remove approximately 13.2 acres or 1.5 percent of existing forested habitat within the JHMR SUP boundary. The amount removed would be equal if either Options 1 or 2 of the Corbet's Cabin project were selected (Table 3-10). In either option, grading disturbances associated with the St. John's Race Arena account for the majority of forested habitat that would be removed. The removal of forested vegetation, especially for the proposed ski runs, would further fragment forested habitats at JHMR.

Grading for the St. John's Race Arena would also remove approximately 12 old Douglas-fir trees. Three of the trees are located upslope of the Saratoga Bowl Traverse and would need to be removed in order to improve sight lines were the two runs intersect and provide a safe radius for skiers turning onto the traverse. The nine remaining old-growth trees are located downslope of the Saratoga Bowl Traverse near the center of the last 600 feet of the race arena. These trees would be removed to eliminate a safety hazard posed by having a bottleneck in that segment of the race arena.

3.5.4 CUMULATIVE EFFECTS

As discussed in section 3.3, the cumulative actions considered in this analysis are any projects listed in the BTNF SOPA and GTNP PEPC that would have temporally and spatially overlapping impacts on the same resources affected directly or indirectly by these alternatives. Only the Teton-to-Snake Fuels Management and Moose-Wilson Corridor Comprehensive Management Plan projects meet the spatial and temporal overlap requirements. A brief summary of both projects is provided above in section 3.3.

Reducing fuel loads in the Teton-to-Snake Fuels Management project area will reduce the risk of catastrophic wildland fires and the associated negative impacts on rare or sensitive plant species, and on establishment of noxious weeds, that accompany catastrophic fires. Furthermore, the project will employ design features to decrease impacts on sensitive plant species, such as not igniting fires in sparse or alpine vegetation and not piling fuels on the ridgelines. As a result, the Teton-to-Snake Fuels Management

project is anticipated to have a long-term beneficial impact on special-status vegetation and forested habitats. The cumulative effect of the Teton-to-Snake Fuels Management Project and the proposed action would not be detrimental to any special-status plant species or forested habitats.

Implementing the Moose-Wilson Corridor Comprehensive Management Plan will not result in a substantial loss or alteration of vegetation communities or a major change in the abundance and distribution of native plant species. Paving the unpaved segment of the road and reducing vehicle parking in non-designated areas will have a beneficial effect on native vegetation. The localized adverse impacts will be offset by the long-term beneficial effects and will result in no impairment of vegetation. The cumulative effect of the Moose-Wilson Corridor Comprehensive Management Plan and the proposed action would not be detrimental to any special-status plants species or forested habitats.

3.6 WILDLIFE AND FISH

3.6.1 SCOPE OF ANALYSIS

- *How would the proposed infrastructure affect special-status (i.e., federally listed, forest sensitive, or Forest MIS) wildlife species and other species of interest or concern?*

Potential habitat for four federally listed species, 10 Forest Service Region 4 sensitive species, and eight MIS species – some in more than one category – occurs in the JHMR permit area. Other species of concern to the public or agencies are also present, such as migratory birds. These species could be affected through habitat alteration resulting from clearing, grading, excavation, or changed patterns of human activity.

Indicators: Species-specific determinations of the potential individual- and population-level impacts, based primarily on past surveys, surveys completed for this analysis, published information on the species' habitat distribution and population status, and efficacy of proposed mitigation.

- *How would the proposed infrastructure affect fish species and habitat?*

While there are no fish-bearing water bodies at JHMR, Fish Creek's headwaters are within the SUP area, and reaches downstream from the resort support fish, including Forest Service Region 4 sensitive species. Increased soil erosion, sediment transport, and nutrient loading associated with construction and operation of new facilities could indirectly impact downstream fish populations.

Indicators: Evaluation of any water quality impacts identified in Soil, Water, and Watershed section, specifically the efficacy of design criteria, construction BMPs, and other mitigation in preventing water quality impacts on Fish Creek.

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 BTNF (Forest Service 2015d). Sixteen of these species have habitat in the SUP area and are discussed in detail below. The remaining species have no habitat in the SUP area, would not be affected by the alternatives, and are not discussed further.

Table 3-11. Special-status species (threatened, endangered, sensitive, and management indicator species) on the Jackson Ranger District and their status in the SUP area.

Species Name	Habitat Description	Status	Known Occurrences in the Project Area	Habitat Present in Project Area
Mammals				
American marten (*Martes americana*)	Dense, old growth forests. Requires tree cavities for resting and denning.[1]	MIS	Yes	Yes
Bighorn sheep (*Ovis Canadensis*)	Rugged terrain and areas near rugged terrain with grasses and forbs.[1]	R4 Sensitive, MIS	Yes	Yes
Canada lynx (*Lynx canadensis*)	Coniferous or mixed forests, thick undergrowth for hunting, old growth with deadfall for denning and resting.[2]	Threatened	No	Yes
Rocky Mountain Elk (*Cervus elaphus*)	Habitat generalist occupying a wide range of habitats.	MIS	Yes	Yes
Gray Wolf (*Canis lupus*)	Variable. Any area supporting sufficient prey, offering denning and rendezvous sites with minimal exposure to humans.	Experimental Non-essential	No	Yes
Grizzly bear (*Ursus arctos horribillis*)	Diverse habitats that provide relative solitude, ungulate prey and carrion, herbaceous vegetation and mast crops such as whitebark pine.	Threatened, MIS	Yes	Yes
Spotted bat (*Euderma maculatum*)	Associated with cliffs and a variety of habitats, including openings in high-elevation conifer and aspen communities.[1]	R4 Sensitive	No	No
Fisher (*Martes pennant*)	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]	R4 Sensitive	No	No
Moose (*Alces alces*)	Associated with aquatic, riparian, and densely forested areas.[1]	MIS	Yes	Yes
Mule deer (*Odocoileus hemionus*)	Habitat generalist occupying a wide range of habitats.	MIS	Yes	Yes

Table 3-11 (cont'd). Special-status species (threatened, endangered, sensitive, and management indicator species) on the BTNF and their status in the SUP area.

Species Name	Habitat Description	Status	Known Occurrences in the Project Area	Habitat Present in Project Area
Pronghorn (*Antilocarpra americana*	Open, low-elevation, flat or gently rolling habitats.	MIS	No	No
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]	R4 Sensitive	No	No
Wolverine (*Gulo gulo*)	Wide ranging species that uses a variety of montane habitats.[1]	Proposed Threatened	No	Yes
Birds				
Bald eagle (*Haliaeetus leucocephalus*)	Roosts in large trees. Generally nests in mature, old-growth trees within 2 kilometers of water.[3]	R4 Sensitive, MIS	Yes	Yes
Brewer's sparrow (*Spizella breweri*)	Associated with sagebrush shrublands. Requires areas of tall, dense sagebrush for nesting.[3]	MIS	Yes (eBird location at the base area)	No
Boreal owl (*Aegolius funereus*)	High-elevation spruce/fir or mixed forests. Requires cavities for nesting. Cavities generally found in older trees and snags.[3]	R4 Sensitive	No	Yes
Greater sage-grouse (C*entrocercus urophasianus*)	Sagebrush obligate. Requires expansive areas dominated by sagebrush of varying densities and age classes.[3] Portions of SUP area within 5-mile airport lek buffer, but no actual habitat.	R4 Sensitive	No	No
Trumpeter swan (*Cygnus buccinators*)	Freshwater ponds, lakes, or marshes with abundant aquatic vegetation.[3]	R4 Sensitive	No	No
Peregrine falcon (*Falco peregrinus anatum*)	Habitat varies widely. Nesting habitat most commonly associated with cliffs.[3]	R4 Sensitive, MIS	Yes	Yes
Common loon (*Gavia immer*)	Large water bodies with islands and fish.[3]	R4 Sensitive	No	No
Harlequin duck (*Histrionicus histrionicus*)	Large, fast-flowing rivers with forested banks for nesting.[3]	R4 Sensitive	No	No

Table 3-11 (cont'd). Special-status species (threatened, endangered, sensitive, and management indicator species) on the BTNF and their status in the SUP 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.[3]	R4 Sensitive	No	No
Three-toed woodpecker (*Picoides dorsalis*)	Coniferous or mixed forests, generally with abundant beetle-killed snags.[3]	R4 Sensitive	Yes	Yes
Great gray owl (*Strix nebulosi*)	Mixed lodgepole pine, Douglas fir, or aspen forests. Commonly nests in large broken-toped snags.[3]	R4 Sensitive	No	Yes
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 SUP area.[3]	R4 Sensitive	Yes	Yes
Whooping crane (*Grus americana*)	Experimental population extirpated in Wyoming.	MIS	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.[3]	Threatened	No	No
Amphibians				
Columbia spotted frog (*Rana luteiventris*)	Requires perennial, slow-moving, or standing water, generally with emergent vegetation.[1]	R4 Sensitive	No	No
Boreal chorus frog (*Pseudacris maculata*)	Requires perennial, slow-moving, or standing water, generally with emergent vegetation.[1]	MIS	No	No
Boreal toad (*Anaxyrus boreas*)	Requires perennial, slow-moving, or standing water, generally with emergent vegetation.[1]	R4 Sensitive, MIS	No	No
Fish				
Yellowstone cutthroat trout (*Oncorhynchus clarkii bouvieri*)	Cold-water perennial streams or lakes and ponds with suitable substrate for spawning and sufficient food source.[1]	R4 Sensitive, MIS	No	Yes (Downstream)

[1] Natureserve 2015. http://explorer.natureserve.org/index.htm

[2] Forest Service 2007.

[3] 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 (ESA), is administrated by the U.S. Fish and Wildlife Service (FWS) and the National Marine Fisheries Service (NMFS). 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 is documented in a Biological Assessment (BA), and the findings from the BA prepared for this proposed action are summarized here (Cirrus 2017).

Canada Lynx

The Canada lynx was listed as threatened in the contiguous U.S. under the ESA in March 2000 (FWS 2000). Critical habitat for Canada lynx, none of which occurs within the SUP area, was designated September 2014 (FWS 2014).). Lynx occur throughout the boreal forests of Alaska and Canada, and can also be found in 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. 2000). Lynx denning habitat is characterized by the presence of large woody debris and usually consists of older successional or mature stands (Ruediger et al. 2000).

Snowshoe hares are the primary prey of lynx. Red squirrels are an important alternate prey species, particularly 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. 2000).

Lynx density is highly dependent on prey abundance. Their primary prey, the snowshoe hare, is found throughout the BTNF in suitable habitat. In the SUP area, suitable habitat for snowshoe hares is found in the small dense coniferous tree stands located in the Moran Face, Crags, and Solitude Cabin areas, as well as in the more extensive conifer stands in the lower Cheyenne Bowl. Snowshoe hares were detected by tracks and fecal pellets in these areas in 2002 surveys. However, there was much more snowshoe hare sign in the lower Cheyenne Bowl area, and it was more consistent between survey sessions. This is to be expected given the high level of fragmentation and minimal understory in the remaining areas (Pioneer 2002).

Threats to Canada lynx include habitat loss, alteration, and fragmentation; competition from other predators, such as coyotes, mountain lions, or bobcats; and trapping. Recreational activity in lynx habitat is also a concern. Roads, trails, and snow compaction may facilitate access of competitors and predators into lynx habitat (Ruediger et al. 2000).

Since the creation of JHMR in 1965, recreational improvements occurred similar to those described for the proposed action. New ski runs were cut through potential lynx habitat, most recently as part of the ski run installation associated with the new Teton lift.

The Fall Creek North Lynx Analysis Unit (LAU) covers 75,383 acres and contains 53,630 acres of mapped lynx habitat based on the most recent lynx habitat mapping effort. There are two lynx habitat mapping efforts that have been undertaken by the Forest Service that will be used in this analysis. The first coincided with the 2007 Northern Rockies Lynx Management Direction and is presented because it was the mapping used to guide that document. The second was undertaken specifically for the BTNF in 2015 using updated imagery with higher resolution than the 2007 mapping. This mapping is presented because it represents the most up-to-date lynx habitat mapping, including recent wildfire, prescribed fires, and vegetation management activities by the Bridger-Teton National Forest. Potential lynx habitat exists on the resort as identified in each of these mapping efforts with the 2015 mapping identifying substantially more lynx habitat at JHMR than the 2007 mapping. The entire area is within the Fall Creek North LAU.

There are no records of lynx occurrences on or near JHMR (WNHD 2015). No surveys for lynx have occurred specifically at the resort; however, surveys have been completed on other areas of the BTNF

with positive results (Holden 2004). Surveys for lynx have occurred throughout prime habitat on the BTNF from 2014 to the present. These surveys have produced no sightings of lynx or lynx sign. The last documented record of lynx on the BTNF occurred in 2010 on the Grey's River Ranger District. According to the Canada Lynx Conservation Agreement between the Forest Service and the FWS (FWS 2006), all mapped lynx habitat on the BTNF must be considered "occupied" because lynx have been found on the Forest.

Gray Wolf

On September 23, 2014, the Federal District Court for the District of Columbia vacated the delisting of wolves in Wyoming under the ESA. Therefore, wolves are again listed as a nonessential experimental population in all of Wyoming. Take of wolves may be authorized only by the nonessential experimental population (10j) rules or by permits issued under section 10 of the ESA. All of Wyoming except the Wind River Indian Reservation and National Parks (threatened status) again operates under the 1994 nonessential experimental population rule. During March 2017, the U.S. District Court of Appeals for the District of Columbia overturned the September 2014, ruling of the District Court. This ruling, pending appeal, may leave Wyoming with authority to manage wolves as a trophy animal under its wolf management plan.

Gray wolves were originally classified as endangered in 1967 under the Endangered Species Preservation Act of 1966. In 1973, the northern Rocky Mountain wolf subspecies was listed as endangered under the ESA of 1973. The FWS began reintroducing the gray wolf into Yellowstone National Park in 1994, and classified this population as "nonessential experimental wolves," according to section 10 (j) of the ESA.

Gray wolves occupy a wide variety of habitat types given sufficient prey. Wolves tolerate only low levels of human activity, although they may inhabit areas with limited human development (NatureServe 2015). No wolf sightings have been recorded at or near JHMR (WNHD 2015), and JHMR is not within the range of any known wolf pack (WGFD et al. 2014); however, no surveys specifically for wolves have been conducted at the resort. It is likely that high levels of year-round human activity in and around the resort deter use of the SUP area by wolves.

Grizzly Bear

The grizzly bear was listed as threatened in the lower 48 States in July of 1975 (FWS 1975). 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 and that support animal prey and provide herbaceous vegetation or mast crops such as berries or nuts.

The SUP area is within the Demographic Monitoring Area (DMA) for the Greater Yellowstone Ecosystem bear population. Recent research by the IGBST indicates that the trend of female grizzly bears with cubs of the year was upward for the period between 1983 and 2001 and stable from 2002 to 2015 (IGBST 2016). While this does not conclusively demonstrate that the population has increased over that period, it is suggestive of a stable population trend for grizzly bears in the DMA. Since no BTNF-specific information for this MIS is available, for the purposes of this analysis we will treat the upward trend on the DMA as indicative of the trend on the BTNF.

Grizzly bears are now well documented in the Snake River corridor down-slope of the JHMR, and occasionally occur south of Highway 22, south of the SUP area. There are a handful of Wyoming Natural Heritage database records for grizzly bears in and around the SUP area, all of which are from 2009 and 2010 (ICST 2007, WNHD 2015). No surveys for grizzly bears have been conducted specifically at JHMR. Given the historic sightings in the area, 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).

North American Wolverine

As a result of litigation and a court decision issued on April 4, 2016, the current status of the North American wolverine is proposed threatened. At this time, no critical habitat for wolverines has been designated or proposed. The primary indicator of wolverine habitat is deep, persistent, reliable spring snow cover (Copeland et al. 2010). This species' requirement for cold, snowy conditions means that, in the southern portion of the species' range where ambient temperatures are warmest (like Wyoming), wolverines occur principally at high (> 8,000 feet) elevations (Murphy et al. 2011, Inman et al. 2012).

There have been no confirmed sightings of wolverines at JHMR. 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 SUP area.

3.6.2.2 Forest Service Sensitive Species

The population trend and viability of sensitive species is a Forest Service management concern. They are managed under the authority of the National Forest Management Act (PL 94-588; NFMA) and are administratively designated by the Regional Forester (FSM 2670). Table 3-11 shows which sensitive wildlife species and associated habitats occur in the SUP area.

Bighorn Sheep

Bighorn sheep are a widely distributed species, ranging from the northern Rockies south to the Baja peninsula. The subspecies present in the vicinity of the resort is the Rocky Mountain bighorn. Rocky Mountain bighorn are found in and around rugged areas they use as escape terrain. In these areas 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).

The bighorn sheep population around JHMR is a part of the Targhee herd unit (WGFD 2015*a*). The unit extends northward from Highway 22 (Teton Pass) to the northern extent of the Teton Range. It includes southerly and northerly subpopulations with little demographic or genetic connectivity. It is estimated that there were 125 bighorn sheep in this population in 2015. The population objective is 125, which is also the approximate size of the 2013 and 2014 population.

Surveys conducted March 29 and 30, 2015, yielded observations of bighorn sheep within 2 miles, and their tracks within 1 mile, of the JHMR permit area (WGFD 2015*b*). The permit area was not surveyed as part of this effort. GPS data collected in 2008 and 2009 indicate that JHMR is not within currently-utilized summer or winter ranges for the Targhee herd (Courtemanch 2014). The resort does provide suitable bighorn habitat, but current human activity in the summer and winter virtually eliminates use of this habitat.

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 SUP area. Several records for this species exist in the WNHD and additional records exist on eBird (WNHD 2015, eBird 2017). No surveys for this species were conducted in the SUP area.

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 1993). They also often occur in other conifer and mixed-conifer aspen forests that support inclusions of mature subalpine fir stands, and may forage in forest openings. In western Wyoming, subalpine fir 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 1993).

No WNHD records exist for boreal owls within 2 miles of the SUP area (WNHD 2015). There is one recorded sighting on eBird approximately 1 mile northeast in GTNP (eBird 2017). Recent surveys conducted for the Teton-to-Snake Fuels Reduction Project suggest that breeding boreal owls are common on the BTNF during some years.

Surveys for this species were conducted in the SUP area in 2016 and 2017, using recorded calls from 26 calling stations in potential habitat subject to disturbance under the proposed action. The taped calls were audible for over 0.5 miles from calling stations, ensuring complete coverage of potentially disturbed habitat. Two boreal owls were detected in the vicinity of the St. John's race arena during surveys in 2016 but were not detected during surveys in 2017. The area where the two owls were detected represents good quality habitat for this species. Boreal owls could also utilize other portions of the SUP area as some marginal quality habitat is present.

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 2015, eBird 2017). Surveys for peregrine falcon nests were conducted in suitable nesting habitat in cliff areas in 2015. Surveys involved scanning the cliff faces, using a spotting scope, for indicative whitewash from fecal deposits. No peregrine nests were detected, although suitable habitat is present.

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 WNHD records for three-toed woodpeckers exist within 2 miles of the SUP area (WNHD 2015). However, there are several records in the vicinity of the SUP area on eBird, most of which occur in GTNP (eBird 2017). There are many beetle killed trees at JHMR and many snags are present. Some snags are cut down for skier safety but the density remains high. However, when compared with GTNP, the snag density at JHMR is lower. No surveys have been conducted for this species in the SUP area.

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 (Bull and Duncan 1993).

Records for this species exist in both the WNHD and on eBird (WNHD 2015, eBird 2017). None of these records are in the SUP area, but there are several in the vicinity. Surveys for this species were conducted in the project area in 2016 and 2017, using recorded calls from 26 calling stations in potential habitat subject to disturbance under the proposed action. The taped calls were audible for over 0.5 miles from calling stations, ensuring complete coverage of potentially disturbed habitat. Although no great gray owls were detected during these surveys, this species may use the project area. Some habitat is present, though generally poor quality due to low tree density.

Northern Goshawk

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). Although the habitat-use and foraging preferences of goshawks are poorly understood for North American populations, they generally forage in diverse habitats ranging from open-sage steppes to dense forests, including riparian areas (Squires and Reynolds 1997). Average goshawk home range sizes during nesting are 1,400–8,600 acres in N. America, depending on sex and habitat characteristics (Squires and Reynolds 1997).

This species has been documented at JHMR, including records from eBird and the WNHD (WNHD 2015, eBird 2017). Surveys for this species were conducted in the SUP area in 2016 and 2017. Morning surveys were conducted at 16 sites between 6:30 AM to 8:30 AM. The surveys consisted of an individual observer or highly sensitive wildlife recording device (Wildlife Acoustics SM3BAT) at each site. Observers listened for goshawk calls, and recordings were scanned for calls using Wildlife Acoustics SongScope software. This survey protocol is considered to be extremely effective in detecting nesting goshawks if they are present (Woodbridge and Hargis 2006). No goshawks were detected. Goshawks may still use habitats at JHMR, as has been documented previously; however, based on the surveys completed for this analysis, there are no goshawks currently nesting in the area of potential disturbance.

Yellowstone Cutthroat Trout

Yellowstone cutthroat trout are found in rivers, creeks, beaver ponds, and large lakes. Cold water between 40 and 60 degrees Fahrenheit is preferred although some populations occur in geothermally heated streams with higher temperatures. Fluvial populations, such as those found downstream from the SUP area, spawn in low gradient streams with gravelly bottoms and water depth of 3.5 – 12 inches. (NatureServe 2017).

Yellowstone cutthroat trout are found in Fish Creek which is the receiving water body for all runoff within the SUP area. Fish Creek is known to have nutrient loading concerns. See section 3.4.2.2 for a discussion of Fish Creek water quality.

3.6.2.3 Forest Service Management Indicator Species (MIS)

NFMA implementing regulations (36 CFR 219.19) and Forest Service Manual (FSM) 2600 guidance require that forest plans identify select vertebrates and/or invertebrates as management indicator species (MIS), and that these species be monitored “in order to assess the effects of management activities on their populations and the populations of other species with similar habitat needs which they may represent” (FSM 2620.5).

American Marten

This species is an ecological MIS for old growth habitats on the BTNF. Marten inhabit late-successional, old growth, and mixed-age stands of conifers, especially those with complex physical structure at ground level. They eat a variety of foods such as small mammals, rodents, berries, eggs, and fish (Clark et al.

1987). The marten is broadly distributed—its range extends from the southern Sierras and northern New Mexico to northern Alaska, Canada and to Newfoundland Island. Within the lower 48 states, its distribution is limited to mountain ranges that provide habitat (Clark et al. 1987).

This species has been documented at JHMR (WNHD 2015); Recent (2014-present) meso-carnivore surveys on the BTNF suggest that this species is very common; however, no trend data is available.

Bighorn Sheep

Bighorn sheep are an economic MIS on the BTNF. See the Sensitive Species section above for a discussion of bighorn sheep habitat and life history attributes.

Rocky Mountain Elk

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 JHMR is a part of the Jackson herd. It is estimated that there are 11,200 elk in this population. The population objective is 11,000 individuals. This population is meeting objectives and has remained fairly stable in the last 6 years. (WGFD 2015*a*)

Grizzly Bear

See preceding discussion of the grizzly bear as a federally listed species.

Moose

Moose use a variety of habitats from dense coniferous or quaking aspen forests to mixed-mountain shrublands, open meadows, and riparian areas. During the summer months, they are associated with coniferous forests, often with standing water, where they seek relief from warm temperatures. Moose typically move to lower elevation and use willow-dominated riparian areas in the winter

Moose occur at lower elevations in the SUP area on a yearlong basis. The moose population around JHMR is a part is of the Sublette herd. It is estimated that there are 999 moose in this population. The population objective is 1,500 individuals. This population is below objectives and has been fluctuating slightly in the last 6 years. (WGFD 2015*a*)

Mule Deer

Mule deer are 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 snow pack is deep.

Mule deer occur at lower elevation in the SUP area on a yearlong basis. The population around JHMR is a part is of the Sublette herd (WGFD 2015*a*). It is estimated that there are 28,976 mule deer in this population. The population objective is 32,000. This population is below objectives but has been increasing for 5 of the last 6 years.

Bald Eagle

See discussion of the bald eagle as a sensitive species.

There is no information on population or trend on the BTNF for this MIS. However, Breeding Bird Survey data from the USGS indicates that the overall trend for Wyoming is up for the period of 1968 to 2013 as well as for the period of 2003 to 2013 (USGS 2017).

Peregrine Falcon

See discussion of the peregrine falcon as a sensitive species.

There is no information on population or trend on the BTNF for this MIS. However, Breeding Bird Survey data from the USGS indicates that the overall trend for Wyoming is up for the period of 1968 to 2013 as well as for the period of 2003 to 2013 (USGS 2017).

Yellowstone Cutthroat Trout

See discussion of the Yellowstone cutthroat trout as a sensitive species. No Forest-wide population trend data is available for this species.

3.6.2.4 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, an MOU between the Forest Service and the FWS to promote the conservation of migratory birds was signed (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 FWS, Division of Migratory Bird Management (FWS 2008). The current list is available at http://www.fws.gov/migratorybirds. The SUP area is located within the Northern Rockies Bird Conservation Region (BCR 10).

There are a total of 22 FWS birds of conservation concern for BCR 10. Three of these species are also Forest Service sensitive species, one is a threatened species under the ESA, and one is a BTNF MIS. The ESA-listed and Forest Service sensitive species are discussed above, and the MIS is included in Table 3-11 since there is no habitat on the SUP area to warrant discussion as an MIS. The remaining 18 species are described in Table 3-12 below.

Table 3-12. FWS Region 10 Birds of Conservation Concern, their habitat, and their presence in the SUP 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	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	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.	Yes	Yes
Upland sandpiper	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

Table 3-12 (cont'd). FWS Region 10 Birds of Conservation Concern, their habitat, and their presence in the SUP area.

Species Name	Habitat Description	Known Occurrences in the Project Area	Habitat Present in Project Area
Long-billed curlew	Sagebrush-grasslands, meadow grasslands, irrigated meadows. Nests on the ground near water. Feeds on insects, aquatic invertebrates.	No	No
Yellow-billed cuckoo	See Table 3-11.	No	No
Flammulated owl	See sensitive species section.	No	No
Black swift	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	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.	Yes	Yes
Lewis's woodpecker	Ponderosa pine savannah, pine-juniper, other coniferous forests, aspen, cottonwood-riparian, below 8,500 feet. Nests in cavities in dead or live trees or poles. Feeds on insects, nuts, and berries.	No	Yes
Williamson's sapsucker	Coniferous forests, especially those that have burned. Also aspen. Nests in cavities in aspen, pine, or fir. Feeds on insects, tree sap.	Yes	Yes
White-headed woodpecker	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
Olive-sided flycatcher	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.	Yes	Yes
Willow flycatcher	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	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	Basin-prairie and mountain-foothills shrublands. Nest is concealed in or beneath a sagebrush shrub. Feeds on insects, some fruit.	No	No

Table 3-12 (cont'd). FWS Region 10 Birds of Conservation Concern, their habitat, and their presence in the SUP area.

Species Name	Habitat Description	Known Occurrences in the Project Area	Habitat Present in Project Area
Brewer's sparrow	See Table 3-11.	Yes (eBird location at base area)	No
Sagebrush sparrow (formerly sage sparrow)	Basin-prairie and mountain-foothills shrublands. Usually nests in or under sagebrush. Feeds on insects, seeds.	No	No
McCown's longspur	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	Alpine grasslands, alpine moss-lichen-forb, barren ground, fallow agricultural areas. A variety of habitats during the winter. Nests on the ground or on cliffs. Feeds on seeds, insects.	Yes	Yes
Cassin's finch	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.	Yes	Yes

3.6.3 DIRECT AND INDIRECT EFFECTS

3.6.3.1 Alternative 1 – No Action Alternative

Projects included in the no-action alternative were addressed in the 2015 EA. They were subsequently authorized but not yet completed. The impacts of this alternative are summarized in Table 3-13 below. For details and impacts on migratory birds, see the 2015 EA.

Table 3-13. Special-status species (threatened, endangered, sensitive, and management indicator species) on the BTNF and impacts associated with the no action alternative.

Species Name	Impacts
Mammals	
American marten	No impact on populations Forest-wide.
Bighorn sheep	May impact individuals but not likely to cause a trend toward federal listing or loss of viability. Unlikely to measurably impact populations Forest-wide.
Canada lynx	May impact this species, but this alternative is consistent with the Northern Rockies Direction and its amendment to the Forest Plan. No critical habitat would be affected.

Table 3-13 (cont'd). Special-status species (threatened, endangered, sensitive, and management indicator species) on the BTNF and impacts associated with the no action alternative.

Species Name	Impacts
Rocky Mountain Elk	Unlikely that this alternative would measurably impact elk population trends Forest-wide.
Gray Wolf	No impact.
Grizzly bear	May impact this species, but this alternative is consistent with the Forest Plan goal of contributing to the recovery of the species. No impact on population trends Forest-wide.
Spotted bat	May impact individuals but not likely to cause a trend toward federal listing or loss of viability.
Fisher	No impact.
Moose	No impact on populations Forest-wide.
Mule deer	Unlikely that this alternative would measurably impact mule deer population trends Forest-wide.
Pronghorn	No impact.
Townsend's western big-eared bat	No impact.
Wolverine	No impact.
Birds	
Bald eagle	No impact. No impact on population trends Forest-wide.
Brewer's sparrow	No impact on population trends Forest-wide.
Boreal owl	May impact individuals but not likely to cause a trend toward federal listing or loss of viability.
Greater sage-grouse	No impact.
Trumpeter swan	No impact.
Peregrine falcon	No impact. No impact on population trends Forest-wide.
Common loon	No impact.
Harlequin duck	No impact.
Flammulated owl	No impact.
Three-toed woodpecker	May impact individuals but not likely to cause a trend toward federal listing or loss of viability.
Great gray owl	May impact individuals but not likely to cause a trend toward federal listing or loss of viability.
Northern goshawk	May impact individuals but not likely to cause a trend toward federal listing or loss of viability.
Whooping crane	No impact on population trends Forest-wide.
Yellow-billed cuckoo	No impact.

Table 3-13 (cont'd). Special-status species (threatened, endangered, sensitive, and management indicator species) on the BTNF and impacts associated with the no action alternative.

Species Name	Impacts
Amphibians	
Columbia spotted frog	No impact.
Boreal chorus frog	No impact. No impact on population trends Forest-wide.
Boreal toad	No impact. No impact on population trends Forest-wide.
Fish	
Yellowstone cutthroat trout	No impact. No impact on population trends Forest-wide.

3.6.3.2 Alternative 2 – Proposed Action

Threatened and Endangered Species

Canada Lynx

The Northern Rockies Lynx Management Direction provides guidance for management of lynx habitat on NFS lands (Forest Service 2007). Objectives, standards, and guidelines are identified to address the risks posed to lynx habitat. These objectives, standards, and guidelines are intended to protect key linkages, provide for lynx movement, and maintain the lynx habitat. The guidance that applies to ski area improvements include human use projects and habitat linkage. Applicable objectives, standards, and guidelines are included below. This management direction does not specifically address the impacts of human disturbance on lynx. This potential impact is addressed separately following the discussion of objectives, standards, and guidelines from the Northern Rockies Lynx Management Direction.

Habitat Linkage and Movement

- Objective ALL O1: Maintain or restore lynx habitat connectivity in and between LAU's 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** (emphasis added).
- Objective HU O3: Concentrate activities in existing developed areas, rather than developing new areas in lynx habitat.
- Guideline HU G3: Recreation development and operations should be planned in ways that both **provide for lynx movement** (emphasis added) and maintain the effectiveness of lynx habitat.

The regional habitat connectivity (e.g. at the LAU scale) for lynx would not be impacted by the proposed action as no barriers to lynx travel would be created, and the SUP area does not fall within a linkage area. Habitat in the SUP area is currently highly fragmented, both naturally and as a result of past ski area development and operations (see BA Figures 2 and 3; Cirrus 2017). The SUP area is also surrounded on all sides by unsuitable or naturally fragmented habitat. A lynx that chose to move through the SUP area would have no more difficulty doing so before implementation of these projects than after.

Habitat Quality and Effectiveness

- Objective HU O2: Manage recreational activities to maintain lynx **habitat** (emphasis added) and connectivity.
- 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 G3: Recreation development and operations should be planned in ways that both provide for lynx movement and **maintain the effectiveness of lynx habitat** (emphasis added).
- 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.

The proposed action would impact 4.8 acres or 17.8 acres of forested mapped lynx habitat using the 2007 and 2015 mapping, respectively (see BA Figures 2 and 3; Cirrus 2017). An additional 1.3 acres (2007) or 9.2 acres (2015) of non-forested mapped lynx habitat would be impacted temporarily by installation of buried snowmaking and utility lines. Non-forested areas within mapped lynx habitat occur due to the resolution at which lynx habitat was mapped, or disturbance that occurred after the habitat mapping effort was undertaken. The 4.8 acres of 2007 forested mapped lynx habitat represent 2.4 percent of the mapped lynx habitat within the JHMR SUP boundary and less than 0.1 percent of lynx habitat in the LAU. The 17.8 acres of 2015 forested mapped lynx habitat represent 1.0 percent of the mapped lynx habitat within the JHMR SUP boundary and less than 0.1 percent of lynx habitat in the LAU. Given the small spatial effect of the project on habitat within the ski area, effects pertaining to G1, G2, and G3 are insignificant. The only lifts associated with this project are conveyors and a handle tow. Each of these lifts are located in previously cleared areas or areas that would be cleared as a result of this project and comply with G10 as they would not affect lynx security habitat.

- 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 proposed action would increase the extent of snow compaction, specifically in the area of the St. John's Race Arena. The new run is adjacent to the existing St. John's ski run and local access roads to residences that are plowed during the winter, so access for lynx competitors or predators already exists in the general area. However, the terrain on the lower portion of the St. John's Race Arena currently receives very little skier use. Thus, the project would result in snow compaction in a 4.5 acre area that is currently minimally compacted by skier use. However, due to the lack of old-growth characteristics and highly fragmented nature of the lynx habitat in the area, the St. John's Race Arena would likely have a negative but insignificant effect on snow compaction at the ski area scale.

Human Activity

The proposed action has the potential to directly affect individual lynx due to project construction and skier activity by disturbing their feeding, breeding, or sheltering activities. However, in order for that to occur, there would have to be lynx present in the area. Based on current and historic information, lynx presence in the SUP area is highly unlikely.

The proposed action is consistent with the Northern Rockies Lynx Management Direction objectives, standards, and guidelines that pertain to this project. This determination is based on the insignificant spatial effects of the project and the poor quality of lynx habitat at the ski area. Thus, the proposed action

may impact the Canada lynx but is consistent with the Northern Rockies Direction and its amendment to the Forest Plan. No critical habitat would be affected.

Gray Wolf

The proposed action would have no direct or indirect effects on wolves. The resort does provide habitat for prey species and could be used by wolves. However, high levels of human activity year-round discourage wolf use of the area.

Wolves do not regularly occupy the SUP area, and no known wolf dens or rendezvous sites occur there. Prey species could be temporarily displaced during project implementation, but this should not negatively affect gray wolves because this predator is wide ranging and has areas adjacent to JHMR readily available to hunt.

For these reasons, our determination for gray wolves is that the proposed action would have no impact on the gray wolf and is therefore consistent with Forest Plan goal of achieving recovery of endangered species. Wolves are currently meeting recovery targets in Wyoming and would continue to do so with implementation of this alternative.

Grizzly Bear

The SUP area is located in occupied grizzly bear range and in biologically suitable habitat identified by the FWS. However, the SUP area is not in the Yellowstone Ecosystem Grizzly Bear Recovery area. The area falls under Management Situation #5 where grizzly bears are expected to be uncommon and federal land management is unlikely to affect the species' recovery. No conflicts with grizzly bears are likely to occur because BTNF food storage regulations (in effect March 1 to December 1) would be enforced during construction and subsequent recreational use during the spring-fall (March 1 to December 1) period. Human activity generally keeps this species at a safe distance, should bears be present during project implementation. This displacement due to construction would be short-term and would not measurably affect the fitness of individuals.

Only minimal grizzly bear habitat (less than 1 acre) would be lost as a result of the proposed action, specifically areas where structures would be built (i.e., buildings and zip line terminals.). Ungulates that serve as prey and a source of carrion would continue to occur in the SUP area.

For these reasons, it is our determination that the proposed action is consistent with the Forest Plan goal of contributing to the recovery of grizzly bears. This alternative is consistent with the standards for grizzly bear-human management and grizzly bear-habitat management in the Forest Plan. JHMR is not in the grizzly bear recovery zone or in management situations 1, 2 or 3.

North American Wolverine

While the resort could provide marginal quality habitat for wolverines, the proposed projects would have no impact on the quality of habitat at the resort due to the high variability of habitat wolverines use. Only a minimal amount of wolverine habitat (less than 1 acre) would be lost as a result of the proposed action, specifically areas where structures would be built (i.e., buildings and zip line terminals). Should any wolverines be in the area during construction, they would likely be displaced, but abundant habitat is present on adjacent, pristine NFS and GTNP land. This displacement would be short-term and would not likely impact the fitness of any individuals displaced in a measureable way. Also, the level of winter recreation activity at the resort, relative to the already high recreational use, would not change substantially as a result of this action. Summer recreation would likely increase due to the proposed zip line but zip line riders passing overhead would be unlikely to impact wolverines.

Forest Service Sensitive Species

Bighorn Sheep

Relative to the no-action alternative, the proposed action would have no impact on bighorn sheep due to the high level of summer and winter human activity associated with both alternatives. This existing high level of human activity is likely what currently limits the use of the otherwise suitable habitat at JHMR by bighorn sheep (Courtemanch 2014). Should a bighorn sheep choose to move through the area, the proposed action would not limit its ability to do so. Backcountry skiing would continue to have impacts on wintering bighorn sheep and their distribution, but this alternative would not measurably affect levels of backcountry use.

Bald Eagle

There would be a slight loss of potential roosting habitat due to trail development related to the St. John's race arena and zip line. Bald eagles may sporadically enter this 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 or surrounding area, and any loss of roosting habitat would be negligible. Therefore, it is our determination that the proposed action may impact individuals but is not likely to cause a trend toward federal listing or loss of viability.

Boreal Owl

One of the boreal owls detected in 2016 was in the vicinity of trees that would be cut for the St. John's race arena. The trees in that area meet the criteria for nesting habitat based on their high density and the size of the patch. Additional boreal owl habitat exists in the disturbance areas for the zip line and traverses. The total amount of nesting habitat (dense subalpine fir or other conifer patches) disturbed by these ski runs would be approximately 9.1 acres, split among 15 patches. Other than the patch in the St. John's area, these patches represent poor quality boreal owl nesting habitat due to their small size, low density, and lack of maturity and old growth characteristics.

The removal of trees associated with the proposed action would contribute to habitat fragmentation for this species. However, approximately 68 acres of much higher quality (in terms of density and patch size) habitat exists elsewhere on the resort, and surrounding NFS lands provide hundreds of acres of quality habitat. The substantial amount of nesting habitat elsewhere does not preclude the possibility that an individual could choose to nest in the patches that would be removed by the proposed action.

Given the minimal intensity and minimal spatial extent of impacts on nesting habitat for boreal owls in the SUP area, our determination is that the proposed action may impact individuals but is not likely to cause a trend toward federal listing or loss of viability.

Peregrine Falcon

No peregrine falcon activity was detected during surveys in 2015, and individuals have been documented only sporadically foraging in the SUP area. Given the wide variety of habitats peregrine falcons use for foraging, no foraging habitat would be lost. The proposed action would 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 the proposed action. Snag removals would be associated with the St. John's Race Arena, zip line, and traverses. Snags are already periodically removed throughout the resort for skier safety but snag density at the resort remains high. Given the general absence of three-toed woodpeckers in the SUP area, the large amount of habitat at JHMR, and the large amount of suitable habitat in areas adjacent to the SUP area, it is our determination that the proposed action may impact individuals but is not likely to cause a trend toward federal listing or loss of viability.

Great Gray Owl

While no great gray owls were detected during surveys conducted for this project, some patches of nesting habitat exist in the disturbance areas for the St. John's race arena, zip line, and traverses. The total amount of nesting habitat (patches of trees with dense canopy) disturbed by these projects would be approximately 7.8 acres, split among 12 patches. Other than the patch in the St. John's area, these patches represent poor quality great gray owl nesting habitat due to their low canopy closure.

To put these impacts in context, approximately 83 acres of much higher quality (in terms of canopy closure) habitat exists elsewhere on the resort, and surrounding NFS lands provide hundreds of acres of quality habitat. The substantial amount of nesting habitat elsewhere does not preclude the possibility that an individual could choose to nest in the patches that would be removed by the proposed action. Furthermore, all the forested areas impacted by the proposed action (see Table 3-10) could be considered foraging habitat for great gray owls.

Given these minimal impacts on nesting and foraging habitat for great gray owls, our determination is that the proposed action may impact individuals but is not likely to cause a trend toward federal listing or loss of viability.

Northern Goshawk

While no northern goshawks were detected during surveys conducted for this project, some patches of nesting habitat for this species exist in the disturbance areas for the St. John's race arena, zip line, and traverses. The total amount of nesting habitat (patches of trees with dense canopy) disturbed by these projects would be approximately 7.8 acres, split among 12 patches. Other than the patch in the St. John's area, these patches represent poor quality goshawk nesting habitat due to their small size and low canopy closure.

To put these impacts in context, approximately 83 acres of much higher quality (in terms of canopy closure and patch size) habitat exists elsewhere on the resort, and surrounding NFS lands provide hundreds of acres of quality habitat. The substantial amount of nesting habitat elsewhere does not preclude the possibility that an individual could choose to nest in the patches that would be removed by the proposed action. Furthermore, all the forested areas impacted by the proposed action (see Table 3.10) could be considered foraging habitat for goshawks.

Given these impacts on nesting and foraging habitat for northern goshawks, and the importance of quality nesting habitat for nest success, our determination is that the proposed action may impact individuals but is not likely to cause a trend toward federal listing or loss of viability.

Yellowstone Cutthroat Trout

Impacts of the proposed action on Yellowstone cutthroat trout are related to water quality impacts in Fish Creek. Section 3.4.3.2 describes these impacts in detail. In sum, Option 1 for the Corbet's Cabin sewage could result in additional nutrients in Fish Creek, were a standard septic system used; however, current regulations would not allow such a system and an advanced system would result in no water quality impacts and no impacts on Yellowstone cutthroat trout. Option 2 would result in no impact on this species, due to sewage being treated at the Teton Village facility.

Potential impacts on Fish Creek due to sedimentation are described in section 3.4.3.1. In sum, BMPs in the form of design criteria and mitigation measures would prevent sediment from reaching Fish Creek and preclude impacts on Yellowstone cutthroat trout due to sedimentation.

Management Indicator Species

American Marten

A small amount (less than 1 acre) of marten habitat would be impacted by the St. John's race arena and parts of the zip line. Relative to the amount of habitat at JHMR and on the Forest, this impact would be

negligible. This species is common on the BTNF in suitable habitat. The proposed action would not have a measurable impact on Forest-wide population trends for this species.

Bighorn Sheep

Potential impacts of this alternative on bighorn sheep are described above in the Forest Service sensitive species section. There would be no impacts on bighorn sheep, and the proposed action would not affect population trends of bighorn sheep on the BTNF.

Rocky Mountain Elk

As elk are habitat generalists, the conversion of some forested areas to open areas would not change, and may improve, foraging habitat value at JHMR. Elk are currently at the management objective population in the Jackson herd unit. It is unlikely that this alternative would measurably impact elk population trends in the unit and on the BTNF.

Grizzly Bear

The impacts of this alternative on grizzly bears are described above in the threatened and endangered species section. While this alternative could have minor impacts on individuals, it would have no impact on population trends of grizzly bears on the BTNF.

Moose

The increased activity and habitat modification in the vicinity of the Solitude Station, including the two conveyor lifts and the Solitude Facility Traverse, may have detrimental effects on the quality of year-round moose habitat due to restricted local movement in that area. Additional summer activity in the area may deter use of the Solitude area by moose; however, moose at JHMR are often seen near high human-use areas. All of these effects occur at a small spatial scale when compared to the total acreage of moose habitat at JHMR and in the surrounding area. The Sublette moose herd is below management objectives, and no clear trend is discernable. Given the impacts of this alternative on moose, it is unlikely that this alternative would measurably impact population trends for moose in the Sublette herd or on the BTNF.

Mule Deer

As mule deer are habitat generalists, the conversion of some forested areas to open areas would not change the habitat value at JHMR. Foraging habitat would likely improve due to the removal of conifer cover that currently shades herbaceous vegetation and shrubs. While mule deer are currently below the management objective in the Sublette herd, the trend is up in recent years. It is unlikely that this alternative would measurably impact mule deer population trends in the herd and on the BTNF.

Bald Eagle

Potential impacts of this alternative on bald eagles are described above in the Forest Service sensitive species section. This alternative would have no impact on population trends of bald eagles on the BTNF.

Peregrine Falcon

The impacts of this alternative on peregrine falcons are described above in the Forest Service sensitive species section. This alternative would have no impact on population trends of peregrine falcons on the BTNF.

Yellowstone Cutthroat Trout

The impacts of this alternative on Yellowstone cutthroat trout are described above in the Forest Service sensitive species section. This alternative would have no impact on population trends of Yellowstone cutthroat trout on the BTNF.

Migratory Birds

Most of the migratory birds from Table 3-12 use habitats that are common at JHMR and in the surrounding areas. Forest nesters would be impacted by the proposed action through habitat loss; however, design criteria applied for this project would prevent tree cutting during the nesting season, thereby eliminating direct impacts on nesting individuals (Appendix A). The impacts on these species from habitat loss would not be substantial given the large amount of alternative habitat available at JHMR and on adjacent lands, and the relatively small amount of habitat lost.

Species such as Lewis's woodpecker, Williamson's sapsucker, willow flycatcher, and black rosy-finch use habitats that are uncommon at JHMR and in the surrounding areas. Both Lewis's woodpecker and Williamson's sapsucker 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.

Willow flycatchers primarily use riparian areas for nesting and feeding. The Amphitheater run and Solitude Facility Traverse projects would impact high-quality habitat for this species. However, no individuals have been documented at JHMR. Wetland mitigation projects may produce habitat for this species if willows are planted in these areas.

Black rosy-finches are common at JHMR, sometimes appearing in flocks of up to 200 individuals (eBird 2017). JHMR provides prime habitat for this species due to the many cleared ski runs present. The Casper Traverse would create additional prime habitat since this species prefers open, high-elevation habitats and nests in rocky or cliffy areas such as those found in Casper Bowl.

3.6.4 CUMULATIVE EFFECTS

As discussed in section 3.3, the cumulative actions considered in this analysis are any projects listed in the BTNF SOPA and GTNP PEPC that would have temporally and spatially overlapping impacts on the same resources affected directly or indirectly by these alternatives. Table 3-14 identifies these projects and summarizes their cumulative effects on wildlife.

Table 3-14. Cumulative actions from the BTNF SOPA and GTNP PEPC and their potential for cumulative effects.

Action	Cumulative Effects
Canada Lynx (Analysis area: Fall Creek North LAU)	
Teton-to-Snake Fuels Management	Under this project, large areas of lynx habitat south of JHMR in the Snake River and southern Teton Range would be treated using prescribed burns and mechanical treatments to reduce woody fuels, negatively affecting lynx and snowshoe hares. However, the projects are collectively consistent with the *Northern Rockies Lynx Management Direction*. The adverse impacts of the Teton-to-Snake Fuels Management project would not interact cumulatively with the minor and unlikely effects of the proposed action in any way that would substantially impact Canada lynx populations in the area.
Moose-Wilson Corridor Comprehensive Management Plan	This project could have temporary effects on Canada lynx during construction due to the loss of a small amount of lynx foraging habitat. These minor effects would not interact cumulatively with the minor and unlikely effects of the proposed action in any way that would produce a substantial impact on Canada lynx populations in the area.

Table 3-14 (cont'd). Cumulative actions from the BTNF SOPA and GTNP PEPC and their potential for cumulative effects.

Action	Cumulative Effects
Grizzly Bear (Analysis area: Individual home range defined as 12.5 miles from SUP)	
Teton-to-Snake Fuels Management	This fuels reduction project may negatively affect individuals if present during project operations. However, the project will not reduce secure grizzly bear habitat because no new permanent roads will be constructed and standard food storage regulations will apply. Post treatment habitats will transition to a more productive state with more herbaceous vegetation and mast crops, yielding a long-term beneficial impact on grizzly bear habitat. These net beneficial effects would not interact cumulatively with the minor impacts of the proposed action in any way that would substantially impact grizzly bear populations in the area.
Moose-Wilson Corridor Comprehensive Management Plan	The effects of the Moose-Wilson corridor project on grizzly bears are a small reduction in foraging area and a beneficial impact of reduced bear-human interaction. These effects would not interact cumulatively with the minor impacts of this project in any way that would substantially impact grizzly bear populations in the area.
Boreal Owl (Analysis area: Individual home range defined as 1.5 miles from SUP)	
Moose-Wilson Corridor Comprehensive Management Plan	The Moose-Wilson corridor project may impact individual boreal owls during construction due to noise and minor loss of habitat. These effects would not interact cumulatively with the minor impacts of this project in any way that would substantially impact boreal owl populations in the area.
Three-toed Woodpecker (Analysis area: Individual home range defined as 0.25 miles from SUP)	
None	No other projects from the BTNF SOPA are within the home range of a three-toed woodpecker at JHMR.
Great Gray Owl (Analysis area: Individual home range defined as 2.75 miles from SUP)	
Teton-to-Snake Fuels Management	This project will have mixed positive and negative effects on great gray owls. These effects are expected to be small and will be offset by mitigation measures designed to protect nesting habitat and to minimize human disturbance. These impacts would not interact cumulatively with the minor impacts of this project in any way that would threaten great gray owl populations in the area since the effects of both projects are so minor.
Moose-Wilson Corridor Comprehensive Management Plan	The Moose-Wilson corridor project may impact individual great gray owls during construction due to noise and construction disturbance. These effects would not interact cumulatively with the minor impacts of this project in any way that would substantially impact great gray owl populations in the area.
Northern Goshawk (Analysis area: Individual home range defined as 2 miles from SUP)	
Moose-Wilson Corridor Comprehensive Management Plan	The Moose-Wilson corridor project may impact individual northern goshawks during construction due to noise. These effects would not interact cumulatively with the minor impacts of this project in any way that would substantially impact northern goshawk populations in the area.

3.7 SCENIC RESOURCES

3.7.1 SCOPE OF ANALYSIS

- *How would the proposed infrastructure affect the scenic quality of the SUP area?*

The SUP area viewscape has been affected by 50 years of ski-area development but generally retains its natural character. Additional clearing and infrastructural development could alter that character and detract from the area's scenic integrity.

Indicators: Analysis of effects using the methods prescribed in the Forest Service Visual Management System (VMS), in accordance with the BTNF Forest Plan.

The 1996 EIS (Forest Service 1996) provides a detailed discussion of the VMS, describes the ski area setting using the concepts and terminology of the VMS, and identifies a series of viewpoints from which scenic impacts are to be assessed (p. 62). The EIS goes on to employ the VMS framework, including the viewpoints, to assess impacts of the previous JHMR MDP, which comprises projects of various types (i.e., base-area and on-mountain buildings, ski lifts, ski runs, access roads, hiking trails, and snowmaking) located across the SUP area (p. 4-50). The 2000 EA (Forest Service 2000) built on the same analytical approach to assess the effects of a series of ski run, hiking/biking trail, access road, snowmaking, and terrain park projects spread across the SUP area (p. 3-43). The 2015 EA (Forest Service 2015a) addressing the first phase of JHMR's recreation enhancement project continued to build on that approach to evaluate scenic resource impacts of another set of ski lifts, on-mountain buildings, ski runs, hiking/biking trail, snowmaking, and other infrastructure.

The 1996, 2000, and 2015 NEPA reviews concluded that the proposed ski area development was consistent with the Visual Quality Objectives (VQOs) assigned by the Forest Plan to the SUP area. The following assessment of the scenic impact of the current proposed action and no-action alternative, which include similar types of development, utilizes the same methodology and draws on the preceding analyses for context. The cited 1996, 2000, and 2015 NEPA documents are incorporated by reference and can be consulted for additional detail.

3.7.2 AFFECTED ENVIRONMENT

JHMR is in the Central Rockies Physiographic Region of the Rocky Mountain Forest Province. The principal landscape feature of the area is Jackson Hole, an alpine valley surrounded by the Teton Range on the west and the Gros Ventre Range on the east. The Snake River winds through the valley in a roughly north-south direction. The area is characterized by rugged, glaciated mountains exceeding 12,000 feet in elevation and montane depressions of parks with floors around 6,000 feet. The area features perennial snow fields on mountain peaks, green meadows, and alpine and glacial lakes. Characteristic vegetation is diverse as a result of climate and topography.

The valley outside the town of Jackson consists of privately-owned lands that are essentially rural ranchland in character. In recent years, some of these lands have been subdivided and developed. Public lands, including the BTNF and Grand Teton National Park (GTNP), are essentially natural in appearance. The visual resources of these lands are among the most spectacular found in the western U.S. and are a primary reason for the region's popularity as a tourist destination.

JHMR, as seen from a distance, is part of a landscape dominated by spectacular mountain peaks. The SUP portion of the Teton Range is visually dominated in the landscape by more spectacular peaks to the north in GTNP and does not draw as much attention from the casual visitor. Lower slopes present a uniform green and forested canopy. Closer views reveal a diversity of vegetation interspersed with grassy openings and rock outcrops that create a mosaic of texture, size, and color.

The spring-to-fall landscape consists of a mosaic of various shades of green, brown, and grey; the artificial clearings for ski runs and lifts are evident, interspersed among the natural clearings. In the wintertime, there is greater degree of visual contrast between the dark green of evergreen trees and the white clearings through trees for the ski lifts and runs. The area is essentially natural in appearance, but skiing infrastructure, residences, and commercial developments, primarily at the base area, are also evident.

To maintain architectural consistency and integration with the surroundings, structures within the SUP boundary are designed and built according to an established architectural theme, consistent with the Built Environment Image Guide (BEIG) for the Rocky Mountain Province and the design guidelines of the 1998 Teton Village master plan.

This evidence of human disturbance is present but not visually dominant. Ski trail and lift clearings are evident at the lower and middle elevations. On forested slopes, the artificial lines and patterns of vegetation clearings are evident, as are on-mountain structures – lifts and buildings – from closer vantage points. The sparse vegetation and exposed geology reduce the visual evidence of ski area development on the upper mountain.

The area has been assigned a high level of visual sensitivity because it is visible from several vantage points, including the Moose-Wilson Road, which offers some of the best close-up views of the resort. The area is also visible at a greater distance from the Jackson Hole Airport, Highway 26/89, GTNP, and other important viewpoints in the vicinity.

As noted above, the seven established viewpoints used in the 1996 EIS and the 2000 and 2015 EAs are also used in this analysis (see Figure 3-3). Most of these viewpoints are located along the Moose-Wilson Road (Highway 390) but share sightlines with other, more distant, viewpoints. As a result, assessment of scenic impacts from these viewpoints provides a conservative evaluation of effects on the larger viewshed. The viewpoints are:

- Viewpoint 1 is located within GTNP on Highway 390 approximately 1.1 miles northeast of JHMR. Ski runs on the upper slopes of Rendezvous Mountain are apparent but harmonize with natural clearings. Teton Village is not visible; the base of the mountain appears undisturbed. Rangeland and scattered residential buildings are visible in the foreground.
- Viewpoint 2 is approximately 0.8 miles northeast of JHMR on Highway 390. East-facing slopes are slightly more prominent in this view than at Viewpoint 1. The view is similar to that from the Jackson Hole Airport only at much closer proximity. The foreground presents a typical rural setting of Jackson Hole.
- Located at the intersection of Highway 390 and Teton Village Road, Viewpoint 3 offers the best line-of-sight direct view of the base facilities at JHMR. This view also simulates that of the Curtis Canyon Overlook and the GTNP-boundary pull-off on Highway 26 only at much closer proximity. Pastures in the foreground are used for grazing.
- Located on Highway 390 approximately 0.75 mile south of the main entrance to JHMR, Viewpoint 4 offers views of the southeast-facing slopes on Apres Vous Mountain and the development associated with Teton Village. As with most other viewpoints, runs are evident on the upper slopes of the ski terrain, although they blend with the surrounding environment and natural clearings. The foreground is pastureland used for cattle grazing.
- Also located on Highway 390, about 1.7 miles south of the JHMR entry, Viewpoint 5 offers the first unobstructed view of the resort for northbound travelers. This viewpoint is similar to what motorists would see from Highway 22, only at closer proximity. A large portion of base operations and Teton Village are obscured from view at this location. Ski runs are evident to the casual observer on the upper slopes. The foreground offers views of pasture land.

- Located 4.8 miles south of the main entrance on Highway 390, Viewpoint 6 is representative of a long-duration view as seen from residences and commercial establishments along the Moose-Wilson Road. Teton Village is not visible from this location, although ski runs are still evident on the upper slopes. Pastures dominate the foreground.
- Viewpoint 7 is located more than 6 miles south of JHMR on the Snake River Bridge on Highway 22, east of the intersection with Highway 390. Looking almost due north, the south-facing slopes are most visible. JHMR is not a dominant feature viewed by the casual observer from this distance. More dominant peaks in the Teton Range and the presence of the Snake River draws the casual observer's eye.

The Forest Plan assigns the VQOs of Modification and Partial Retention to the ski area. Under the Modification VQO, "management activities may visually dominate the original characteristic landscape. However, activities of vegetative and land form alterations 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 predominantly introduction of facilities such as buildings, signs, roads, etc., should borrow naturally established form, line, color, and texture so completely and at such a scale that its visual characteristics are compatible with the natural surroundings" (Forest Service 1974).

Under the Partial Retention VQO, "management activities are to remain visually subordinate to the characteristic landscape. 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 visually subordinate to the visual strength of the characteristic landscape" (Forest Service 1974).

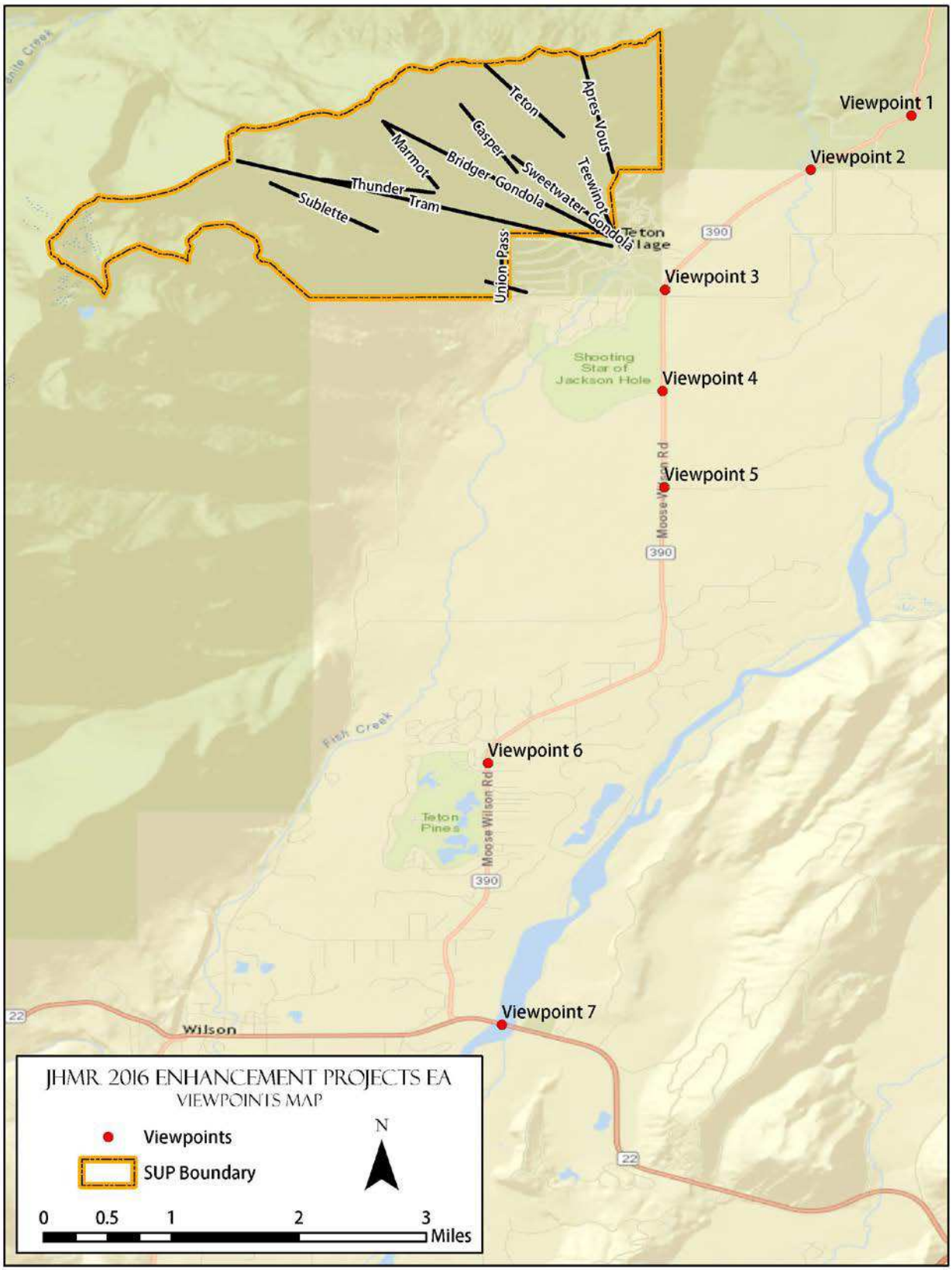

Figure 3-3. Viewpoints map.

3.7.3 DIRECT AND INDIRECT EFFECTS

3.7.3.1 Alternative A – No Action

Table 3-15 below summarizes the impacts of the no-action alternative. For additional details see the 2015 EA, section 3.7.3.2.

Table 3-15. Summary of no-action alternative scenic effects from seven viewpoints.

Project	
Sweetwater Gondola Cabin Storage Building	Visible only from nearest viewpoints (3 – 5) but would blend into developed lower-mountain context.
Eagle's Rest Lift Relocation	Visible only from nearest viewpoints (3 – 5) but would blend into developed lower-mountain context.
Casper Restaurant Remodel/Expansion	Visible on close examination from nearest viewpoints (1 – 4) but a minor impact due to distance, scale of infrastructure, and blending with background. Not discernible from other viewpoints due to distance, scale of infrastructure, or screening vegetation.
Storage Facility	Not visible from any viewpoints due to screening vegetation.
Ashley Ridge Run Upgrade and Realignment	Visible from all viewpoints except Viewpoint 6 (screening vegetation). Impact greatest from nearest viewpoints (2 – 4). Section below South Pass Traverse transects intact forest stand.
Solitude Run Development	Screened by vegetation from most northern viewpoint. Visible from other viewpoints but not a notable impact due to natural clearings and distance (roughly 1.5 miles from Highway 390).
Washakie Run Development	Visible from all but the southernmost viewpoint, but not a notable impact due to diversity of existing ground cover, limited amount of disturbance proposed, and distance.
Snowmaking System Expansion	Infrastructure not visible from any viewpoints due to scale of above-ground infrastructure. Possible change in location of mist, but likely indiscernible.
Gazex® Avalanche System Completion	Visible on close examination from nearest viewpoints (3 and 4) but not a notable impact due to scale of infrastructure, blending with background, and distance (2 miles from Highway 390).
Hiking/Biking Trail Network Expansion	Portions of trail system visible on close examination from nearest viewpoints (3 – 5), particularly segments crossing steep slopes off contour on the upper mountain. Much of system screened from any given viewpoint by topography, vegetation, or development. Upper mountain trails more than 1.5 miles from Highway 390.
Via Ferrata Installation	Not visible from any viewpoints due to distance and scale of infrastructure.
Zip Line Installation	Not visible from any viewpoints due to distance and scale of infrastructure.

3.7.3.2 Alternative B – Proposed Action

Drawing on the methodology established in the 1996 EIS and the 2000 and 2015 EAs, Table 3-16 summarizes the scenic impact of each element of the proposed action from each of the seven viewpoints described above, under Affected Environment. Figure 2-1 shows the location of each project element.

Photographs were taken of JHMR from each of the seven viewpoints in June 2015 to facilitate this analysis. They are included in the project record.

Table 3-16. Summary of project scenic effects from seven viewpoints.	
Project	
Solitude #2 Covered Conveyor	Not visible from any viewpoint except viewpoint 3 due to screening development and vegetation. From Viewpoint 3, not a notable impact as it would blend into developed lower-mountain context.
Pooh Bear Covered Conveyor	Not visible from any viewpoint except viewpoint 3 due to screening development and vegetation. From viewpoint 3, not a notable impact as it would blend into developed lower-mountain context.
St. John's Race Arena Handle Tow	Visible from viewpoints 1 and 2. Screened by vegetation from all other viewpoints. Impacts minimal due to the small scale of the infrastructure.
Amphitheatre Run	Only visible from viewpoint 3 due to screening from topography. Initially grading work would be visible until revegetation took place. Minimal impact.
St. John's Race Arena	Visible from nearest viewpoints (1 – 4). Most clearly visible from viewpoints 1 – 3 and partially screened by vegetation at viewpoint 4. Impact fairly substantial from viewpoints 1 and 2 since the aspect of the cleared area is toward these viewpoints. Distance from these viewpoints ranges from 0.8 to 1 mile.
Casper Bowl Traverse	Visible from all viewpoints but largely screened by the vegetation on the downslope side of the traverse. Due to the steep terrain, a cut of lighter colored material may be visible, but revegetation would reduce this effect. Impacts minimal due to vegetation screening, extent of disturbance, and distance from viewpoints.
Easy-Does-It Bypass Traverse	Visible from viewpoints 3 – 5. Screened from view by topography and vegetation from all other viewpoints. Minimal impact.
Upper Après Vous Traverse	Visible from viewpoints 6 and 7 but likely not discernable due to distance. Not a notable impact.
Solitude Facility Traverse	Only visible from viewpoint 3 due to screening by vegetation and topography. Not a notable impact due to context.
Ashley Ridge Traverse	Visible from viewpoints 1 – 3, partially visible from viewpoints 4 and 5, and screened by vegetation from 6 and 7. Minimal impact.
Moran Run	Visible from viewpoints 2 – 7. Grading work would be visible from these viewpoints until revegetation took place. Impacts minimal due to temporary nature.
Solitude Run (terrain park)	Grading work would be visible from all viewpoints until revegetation took place. Once ground cover was established this project would blend in with the surroundings yielding minimal impacts.
Solitude Station: Mountain Sports School Facility	Visible from viewpoints 3 – 5. Not a notable impact as it would blend in with the developed lower mountain context.
Corbet's Cabin	Visible from viewpoints 3 – 7. Not visible from GTNP. Minimal impact due to design of the structure (low and set into the mountain, colored to blend), context of existing tram dock, and distance from viewpoints. Reflection of sun from glass could be visible for short periods at certain times of day.
Bear Flats Café	Not visible from any viewpoint, shielded by vegetation and topography. No impact.
Restroom Facility – Base Area	Not visible from any viewpoint, shielded by topography, vegetation, and other structures. No impact.

Table 3-16 (cont'd). Summary of project scenic effects from seven viewpoints.	
Project	
Snowmaking System Expansion	Infrastructure not visible from any viewpoints due to scale of above-ground infrastructure. Possible change in location of mist, but likely indiscernible. No impact.
Zip Line	Visible from all viewpoints. Cable likely would not be discernable due to small diameter (3/4 inch). Terminals may be discernable from viewpoints 1 – 4. Minimal impact.
Wetland Mitigation Sites	Not visible from any viewpoint, shielded by topography, vegetation, and other structures. No impact.
Mountain Sports School Meeting Place	Not visible from any viewpoint, shielded by topography, vegetation, and other structures. No impact.

This analysis indicates that the St. John's race arena is the only project that could have a notable impact on scenic resources under the Proposed Action. This impact would result from clearing forest vegetation. As discussed in the 1996 EIS and the 2000 and 2015 EAs, clearing for such projects results in a stark contrast between the cleared areas and adjacent forest in the winter, and the shift to greens, browns, and greys after snowmelt softens the contrast. As noted above (Appendix A, measure 31), clearing edges would be feathered (i.e., trees cut to leave an irregular edge rather than a stark, straight border) to decrease contrast and lend a more natural appearance. Figure 3-4 illustrates the more stark, winter contrast.

This clearing would stand out as a break from the natural viewscape, as it would occur in a large, intact forest stand. The primary factor mitigating the impact of this project would be the setting; the project would add incrementally to visual evidence of 50 years of ski area development. It would fit in and be consistent with the current viewscape and with viewers' expectations.

JHMR is assigned by the Forest Plan to Desired Future Condition 9B, for which "The Visual Quality Objectives are Partial Retention and Modification. Facilities are often dominant, but harmonize and blend with the natural setting" (Forest Plan Appendix E, p. 65). Built as proposed, with required design criteria in place, this alternative would be consistent with the assigned VQOs.

3.7.4 CUMULATIVE EFFECTS

As discussed in section 3.3, the cumulative actions considered in this analysis are any projects listed in the BTNF SOPA and GTNP PEPC that would have temporally and spatially overlapping impact on the same resources affected directly or indirectly by the proposed action in the past, present, or reasonably foreseeable future. Both the Teton-to-Snake Fuels Management Project and the Moose-Wilson Corridor Comprehensive Management Plan meet the spatial and temporal overlap requirements.

The project area for the Teton-to-Snake Fuels Management Project begins approximately 2 miles south of the JHMR SUP boundary and extends an additional 15 miles to the south. As a result, management actions at the northern end of the project area would affect the same viewscape as the JHMR projects. Design criteria which would limit the impact of this project on scenic resources are required by the ROD. These include dropping visually sensitive treatment units, avoiding straight-line road and skid trail cuts, avoiding fall-line road alignments and road cuts over 5 feet, and prompt removal of equipment and treatment of debris.

Figure 3-4. St. John's race arena project from Viewpoint 2, current (top) and proposed (bottom).

The Moose-Wilson corridor project would not have significant effects on the viewscape; however, it would affect the viewing platform of the Moose-Wilson road. Metering on the Moose-Wilson road near the southern park entrance could slow traffic, resulting in additional opportunities for viewers to examine the viewscape from viewpoint 2. The most obvious change to the viewscape from viewpoint 2 would be the St. John's race arena. However, only viewers very familiar with the existing viewscape would be likely to notice the addition of the St. John's area clearing specifically. All other viewers would see it as an expected part of the context of the viewscape at a ski area.

With these considerations in mind, the proposed action coupled with these cumulative actions would not generate notable cumulative effects on scenic resources.

CHAPTER 4: CONSULTATION AND COORDINATION

4.1 PUBLIC SCOPING AND NOTICE AND COMMENT ON THE PROPOSED ACTION

In November 2016, the Bridger-Teton National Forest (BTNF) issued a public scoping notice summarizing Jackson Hole Mountain Resort's (JHMR) proposed 2016 Improvement Projects – Phase 2 (the proposed action) and inviting comments regarding the scope of the associated National Environmental Policy Act (NEPA) review. The projects included in the proposed action are described in detail in JHMR's current master development plan (MDP), accepted by the BTNF in August 2014.

A public scoping notice was mailed to the agencies, organizations, and individuals on the BTNF mailing list. The notice was also posted on the BTNF website at http://www.fs.usda.gov/goto/btnf/projects and made available on CD or in hard-copy form to anyone requesting it.

In addition to meeting NEPA's scoping requirements, this exercise also met the agency's obligations regarding public notice and comment on a proposed action, per the objection process mandated by 36 CFR 218, Subpart B.

The comment period formally began on November 28, 2016, when the BTNF's Legal Notice of Comment Period was published in the *Casper Star Tribune* (Newspaper of Record), and closed on December 28, 2016. Comment letters were received from four agencies, five organizations, and five individuals. The scoping notice and comment letters are included in the project record, as is a *Scoping Report and Response to Comment on the Proposed Action: Jackson Hole Mountain Resort 2016 Enhancement Projects*. A report documenting this comment process is included in the project record. It identifies commenters, comments received, and the disposition of those comments. Substantive public comments and our responses are summarized below.

Several commenters identified concerns with the proposed septic system at the expanded Corbet's Cabin, particularly the potential for contamination of waters in the Granite Creek watershed due to the area's geology. This issue is addressed in section 3.4 of this EA, and an option for piping liquid waste to the Teton Village treatment facility was included in the proposed action. The analysis addresses the range of impacts associated with both on-site wastewater treatment and piping.

The Wyoming Department of Game and Fish suggested several mitigation measures that are reflected in the analysis in section 3.4 and the list of design criteria and mitigation measures in Appendix A. Two commenters expressed concerns about flow reductions in creeks flowing from the resort's permit area. This issue is also addressed in section 3.4.

Wildlife concerns noted by several individual and agency comments centered on bighorn sheep, which were included in the analysis documented in section 3.6. The impacts of backcountry skiing on this species are specifically addressed. A range of other specific wildlife species identified by these commenters is also addressed.

In terms of scenic impacts, one commenter expressed concern about the impact of the proposed Corbet's Cabin upgrade. Section 3.7 addresses this concern. Another commenter stated that the traffic impacts of JHMR's proposed summer activities was not considered in the Park Service's assessment of the Moose-Wilson Road and therefore warranted analysis in this EA. As explained in section 1.7.2, traffic impacts are among the growth-related impacts not carried into in-depth analysis in this EA because they have been

sufficiently covered in past analyses addressing higher levels of visitation than would result from this proposed action.

In regard to the NEPA process itself, one commenter felt that public notice of the scoping opportunity and mapping associated with the scoping notice were insufficient. As explained in the scoping/notice-and-comment report, we are confident we went beyond the agency's notification processes, and that the mapping accompanying the scoping notice was sufficient.

That commenter also said that the resort's comfortable carrying capacity (CCC) was being misrepresented in the scoping notice and that the whole issue of CCC should be addressed in a supplement to the 1996 EIS prepared for the resort's then current MDP. The scoping/notice-and-comment report explains that CCC has several functions in ski area planning and permitting. Its function in permitting is to set an upper limit on daily skier numbers that will maintain a quality experience. Calculations for this analysis show that the potential for added daily skier numbers is within the bounds of past analysis and does not require additional assessment. Further discussion of CCC is beyond the scope of this analysis, and no supplement to the 1996 EIS is warranted.

That commenter also felt that the 1996 EIS had not addressed the impact of summer recreational development and thus did not provide a sufficient baseline for assessing subsequent development proposals. This too indicated the need to supplement the 1996 EIS. However, that document did in fact address the effects of summer recreational development, as did the subsequent 2015 EA, setting an appropriate baseline for the discussion of those effects in pertinent Chapter 3 sections of this EA.

This commenter believed that NEPA required preparation of a cost/benefit analysis to determine if the proposed projects actually provide benefits to the largest segments of the population of users. However, the Council on Environmental Quality regulations on NEPA implementation merely allow for cost/benefit analysis if it is "relevant to the choice among environmentally different alternatives" (40 CFR 1502.23). That is not the case in this assessment. Forest Service policy is to allow market forces to determine pricing without manipulation by the agency.

Two commenters were concerned over the visual and other impacts of the equipment and materials stored by the resort on the west side of Teewinot run. Since this proposed action would not affect that situation, this matter is outside the scope of this analysis.

Another commenter questioned whether a zip line was an appropriate use of NFS land. Zip lines are among the summer recreational amenities specifically listed in the *Ski Area Recreational Opportunity Enhancement Act of 2011.* The proposed zip line would provide a different way of experiencing the forest, supplemented with interpretive signs and information, and it would be collocated with existing winter sports infrastructure. As a result, it would be consistent with law and Forest Service policy.

This commenter also questioned the purpose and need for an upgraded Corbet's Cabin facility. Corbet's Cabin was built as a temporary, construction-related facility with wooden footings when the Tram was constructed in 1965. As indicated in the scoping notice, the existing facility is outdated and undersized, particularly in light of the 140,000 riders now using the Tram each summer. These factors dictate the need for a substantial upgrade and expansion, though it will undoubtedly alter the experience of long-time users of the facility.

The remaining comments were supportive of the overall proposal or separate elements of it.

4.2 OTHER CONSULTATION

Other consultation completed in association with this EA process includes the following:

- Consultation with Wyoming's State Historic Preservation Office (SHPO) on National Historic Preservation Act compliance (see section 1.7.2).

- Informal consultation with the FWS on Endangered Species Act compliance (see section 3.6). In a letter dated April 12, 2017 (FWS 2017), the FWS concurred with the findings documented in the BA prepared for this project (Cirrus 2017).
- Government-to-government consultation with Native American Tribal groups (see section 1.7.2).

CHAPTER 5: LIST OF PREPARERS

Name	Position	Contribution
Forest Service Team		
Dale Deiter	Jackson District Ranger	Project oversight.
Ray Spencer	ID Team Leader/Winter Sports	Project administration and ID team coordination.
John Kuzloski	NEPA Coordinator	NEPA compliance review.
Martina Keil	Botanist	Agency direction on vegetation analysis.
Darin Martens	Landscape Architect	Agency direction on scenic resources analysis.
John Paul Schubert	Archaeologist	Agency direction on heritage resources analysis.
Patrick Barry	Fisheries Biologist	Agency direction aquatic resources analysis.
Kerry Murphy	Wildlife Biologist	Agency direction on wildlife analysis.
Ronna Simon	Hydrologist	Agency direction watershed analysis.
Brian Goldberg	GIS Specialist	GIS data provision and management.
Cirrus Ecological Solutions, LC Team		
Neal Artz	Project Manager	Project management, NEPA oversight, QA/QC review, and preparation of scenic and heritage resources analyses.
Matt Westover	Assistant Project Manager and Wildlife Biologist	Management assistance and preparation of wildlife and fish analysis.
Eric Duffin	Hydrologist	Preparation of soil, water, and watershed resources analysis.
Tim Royer	Botanist and Wetland Specialist	Preparation of vegetation analysis.
Judy Seamons	Document Production Specialist	Document production and preparation of the project record.
Delmatier, Inc., Botanical Consulting		
Charmaine Delmatier	Botanist	Review of vegetation analysis.
Thunderbird Environmental, LLC		
Darby Hittle, LEP	Environmental Professional	Assistance in analysis of Corbet's Cabin wastewater disposal options.

CHAPTER 6: REFERENCES

Arno, S.F., and R. Hoff. 1990. *Pinus albicaulis* Elgelm. Whitebark pine *in* Silvics of North America, Vol. 1, Conifers. Agriculture Handbook. USDA Forest Service.

AWWA (Austrian Water and Waste Association). 2000. Wastewater Treatment in Mountain Regions. OEWAV Recommended Guidelines No. 1. Guidelines of the Austrian Water and Waste Association. Download at http://www.hydro-it.com/extern/life/regelblatt/re_english.pdf

Bartos, D.L. 2007. Chapter 3 - Aspen. In: Hood, S.M.; Miller, M., editors. Fire ecology and management of the major ecosystems of southern Utah. Gen. Tech. Rep. RMRS-GTR-202. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. p. 39-55.

Bockino, N. 2012. Greater Yellowstone whitebark spatial data update. GIS metadata. Greater Yellowstone whitebark pine subcommittee.

Buehler, D. A. 2000. Bald Eagle (Haliaeetus leucocephalus). The Birds of North America. <http://bna.birds.cornell.edu/bna/species/506>. Accessed 4 Aug 2014.

Bull, E. L., and P. A. Duncan. 1993. Great Gray Owl (Strix nebulosa). The Birds of North America. <http://bna.birds.cornell.edu/bna/species/041>. Accessed 5 Jan 2015.

Cannon, K. P. and J. M. Peart. 2015. Class I Cultural Resource Overview for the Jackson Hole Mountain Resort Permit Renewal Project. USU Archaeological Services, Inc. Logan, UT. February.

Case, J. C. and D. R. Gilmer. 1990. Preliminary Map of Landslides on the Teton Village Quadrangle. Wyoming State Geological Survey, Laramie, Wyoming. [*reference from 1996 EIS]

Cirrus 2017. Biological Assessmnet for Jackson Hole Mountain Resort 2016 Enhancement Projects - Phase 2 on the Jackson Ranger District of the Bridger-teton National Forest. 22 pp. March 14, 2017.

Clark, T. W., E. Anderson, C. Douglas, and M. Strickland. 1987. Martes americana. Mammalian Species 298:1–8.

Copeland, J. P., K. S. McKelvey, K. B. Aubry, A. Landa, J. Persson, R. M. Inman, J. Krebs, E. Lofroth, H. Golden, J. R. Squires, A. Magoun, M. K. Schwartz, J. Wilmot, C. L. Copeland, R. E. Yates, I. Kojola, and R. May. 2010. The bioclimatic envelope of the wolverine (Gulo gulo): do climatic constraints limit its geographic distribution? Canadian Journal of Zoology 88:233–246.

Courtemanch, A. B. 2014. Seasonal habitat selection and impacts of backcountry recreation on a formerly migratory bighorn sheep population in northwest Wyoming, USA. University of Wyoming.

Covington S. and M. Ransmeir. 2005. Grand Teton National Park Geologic Resource Evaluation Scoping Report. Geologic Resources Division, National Park Service. Denver, Colorado. August 22, 2005.

Delmatier, C. 2014. Rare plant survey and extended general floristic checklist, Jackson Hole Mountain Resort 2014. Delmatier Inc., Rock Springs, Wyoming.

Delmatier, C. 2015a. Personal communication from Charmaine Delmatier regarding the presence of large-flower triteleia near the proposed Sweetwater Gondola alignment.

Delmatier, C. 2015b. Personal communication from Charmaine Delmatier regarding special-status plant surveys conducted in the spring of 2015.

Delmatier, C. 2017. Comprehensive Vegetative Summary (1994-2016), Rare Plant Survey and Extended Floristic Checklist, Jackson Hole Mountain Resort, (As Part of the BTNF Environmental

Assessment, Phase 2 for the 2013 JHMR Master Development Plan, as amended in 2016). Delmatier Inc., Rock Springs, WY. 104 pp.

eBird. 2017. eBird Explorer. <www.ebird.org>.

Eddy-Miller, C.A., Wheeler, J.D., and Essaid, H.I. 2009. Characterization of interactions between surface water and near-stream groundwater along Fish Creek, Teton County, Wyoming, by using heat as a tracer. U.S. Geological Survey Scientific Investigations Report 2009–5160.

Eddy-Miller, C.A., Peterson, D.A., Wheeler, J.D., and Leemon, D.J. 2010. Characterization of water quality and biological communities, Fish Creek, Teton County, Wyoming. 2007–08: U.S. Geological Survey Scientific Investigations Report. 2010–5188, 70 p., available at http://pubs.usgs.gov/sir/2010/5188/.

Eddy-Miller, C.A., Peterson, D.A., Wheeler, J.D., Edmiston, C.S., Taylor, M.L., and Leemon, D.J. 2013. Characterization of water quality and biological communities, Fish Creek, Teton County, Wyoming, 2007–2011. U.S. Geological Survey Scientific Investigations Report 2013–5117, available at http://pubs.usgs.gov/sir/2013/5117/.

Eddy-Miller, C.A., Sando, Roy, MacDonald, M.J., and Girard, C.E., 2016, Estimated nitrogen and phosphorus inputs to the Fish Creek watershed, Teton County, Wyoming, 2009–15: U.S. Geological Survey Scientific Investigations Report 2016–5160, 29 p., https://doi.org/10.3133/sir20165160 .

eFloras. 2017. Physaria integrifolia. Flora of North America. Missouri Botanical Garden, St. Louis, MO & Harvard University Herbaria, Cambridge, MA. Available online at: http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=250094880. Accessed February 2017.

EPA. 2005. National management measures to protect and restore wetlands and riparian areas for the abatement of nonpoint source pollution. EPA-841-B005-003. United States Environmental Protection Agency, Office of Water, Washington DC.

EPA (Environmental Protection Agency). 2007. Biological Nutrient Removal Processes and Costs. United States Environmental Protection Agency. Office of Water, Washington, D.C. 20460 (4305T). EPA-823-R-07-002. June 2007. Download at https://nepis.epa.gov/Exe/ZyPDF.cgi/60000G2U.PDF?Dockey=60000G2U.PDF

Fertig, W., C. Refsdal, and J. Whipple. 1994. Wyoming Rare Plant Field Guide. Wyoming Rare Plant Technical Committee. Cheyenne, WY.

Fertig, W. 2000a. Status of Plant Species of Special Concern in US Forest Service Region 4 in Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie, WY.

Fertig, W. 2000b. State species abstract (*Asplenium trichomanes-ramosum*) green spleenwort, Family Aspleniaceae. Wyoming Natural Diversity Database, University of Wyoming, Laramie, WY.

Fertig, W. 2000c. State species abstract (*Carex incurviformis* var. *danaensis*) seaside sedge, Family Cyperaceae. Wyoming Natural Diversity Database, University of Wyoming, Laramie, WY.

Fertig, W. 2000d. State species abstract (*Descurainia torulosa*) Wyoming tansymustard, Family Brassicaceae. Wyoming Natural Diversity Database, University of Wyoming, Laramie, WY.

Fertig, W. 2000e. State species abstract (*Ericameria discoidea* var. *linearis*) narrowleaf golderweed, Family Asteraceae. Wyoming Natural Diversity Database, University of Wyoming, Laramie, WY.

Fertig, W. 2000f. State species abstract (*Parrya nudicaulis*) Naked-stemmed parrya, Family Brassicaceae. Wyoming Natural Diversity Database, Laramie, WY.

Fertig, W. 2000g. State species abstract (*Saussurea weberi*) Weber's saw-sort, Family Asteraceae. Wyoming Natural Diversity Database, Laramie, WY.

Fertig, W. 2001. State species abstract (*Erigeron lanatus*) woolly fleabane, Family Asteraceae. Wyoming Natural Diversity Database, University of Wyoming, Laramie, WY.

Fertig, W. 2007. State species abstract (*Spiranthes diluvialis*) Ute ladies'-tresses, Family Orchidaceae. Wyoming Natural Diversity Database, University of Wyoming, Laramie, WY.

Fertig, W. 2008. State species abstract (*Androsace chamaejasme* ssp. *carinata*) sweet-flowered rock jasmine, Family Primulaceae. Wyoming Natural Diversity Database, Laramie, WY.

Fertig, W., and B. Heidel. 2008. State species abstract (*Lesquerella paysonii*) Payson's bladderpod, Family Brassicaceae. Wyoming Natural Diversity Database, Laramie, WY.

Flatten, F. 2003. Determining Appropriate Winter Logging Conditions for Protection of the Soil Resource. Okanogan & Wenatchee National Forests. December 2003 Draft.

Flitner Strategies. 2014. Fish Creek: A Situation Assessment. Prepared for Friends of Fish Creek. Prepared by Flitner Strategies. August 13, 2014.

Forest Service. 1990. Bridger-Teton National Forest Land and Resource Management Plan as amended. Bridger-Teton National Forest, Jackson, WY.

Forest Service. 1996. Jackson Hole Ski Area Final Environmental Impact Statement and Record of Decision. Jackson Ranger District, Bridger-Teton National Forest, Jackson, WY.

Forest Service. 2000. Jackson Hole Mountain Resort Environmental Assessment and Decision Notice/Finding of No Significant Impact. Jackson Ranger District, Bridger-Teton National Forest, Jackson, WY.

Forest Service. 2006. Watershed Conservation Practices Handbook – FHS 2509.25. Forest Service Handbook, Rocky Mountain Region (Region 2), Denver CO. Amendment 2509.25-2006-1. Effective Date: May 5, 2006.

Forest Service. 2007. Northern Rockies Lynx Management Direction Record of Decision. USDA Forest Service, Northern Region, Missoula, MT.

Forest Service. 2008. MOU between the USDA Forest Service and the USFWS to Promote the Conservation of Migratory Birds. USDA Forest Service, Washington, DC.

Forest Service. 2009. Bridger Teton National Forest. Five Year Monitoring Report (formerly referred to as the Comprehensive Evaluation Report). Version 1.0. September 23, 2009.

Forest Service. 2010. A Framework for Sustainable Recreation. Recreation, USDA Forest Service Heritage and Volunteer Resources, June 25.

Forest Service. 2012a. National Best Management Practices for Water-Quality Management on National Forest System Lands. Volume 1: National Core BMP Technical Guide. USDA-Forest Service. FS-990a. April 2012.

Forest Service. 2015a. *Environmental Assessment: Jackson Hole Mountain Resort Recreation Enhancements Project.* Jackson Ranger District, Bridger-Teton National Forest. July

Forest Service. 2015b. Jackson Hole Mountain Resort Recreation Enhancement Projects: Class I Overview and Site Evaluation. BT-15-972. James R. Schoen. Bridger-Teton National Forest, Jackson, WY. April 20.

Forest Service. 2015c. Decision Notice and Finding of No Significant Impact: Jackson Hole Mountain Resort Recreational Enhancements Project. Jackson Ranger District, Bridger-Teton National Forest. August.

Forest Service. 2015d. NFMA/NEPA Resource-Worksheet for Small Projects - Jackson and/or Buffalo Ranger District. USDA Forest Service, Jackson, WY.

Furniss, M.J., S. Flanagan, and B. McFadin. 2000. Hydrologically-connected roads: an indicator of the influence of roads on chronic sedimentation, surface water hydrology, and exposure to toxic chemicals. USDA Forest Service, Stream Systems Technology Center, Stream Notes, July, 2000. Fort Collins, CO. FWS. 1975. Endangered and Threatened Wildlife, Amendment Listing the Grizzly Bear of the 48 Conterminous States as a Threatened Species. Federal Register 40:31734–31736.

FWS. 1975. Endangered and Threatened Wildlife, Amendment Listing the Grizzly Bear of the 48 Conterminous States as a Threatened Species. Federal Register 40:31734–31736.

FWS. 2000. Endangered and Threatened Wildlife and Plants; Determination of Threatened Status for the Contiguous U . S . Distinct Population Segment of the Canada Lynx and Related Rule. Federal Register 65:1–36.

FWS. 2006. Canada Lynx Conservation Agreement with the Forest Service. United States Department of the Interior, Fish and Wildlife Service, Portland, OR.

FWS. 2008. Birds of Conservation Concern. USFWS, Division of Migratory Bird Management, Arlington, Virginia.

FWS. 2014. Revised Designation of Critical Habitat for the Contiguous United States Distinct Population Segment of the Canada Lynx and Revised Distinct Population Segment Boundary. Federal Register 79:54782–54846.

FWS. 2016. Endangered and Threatened Wildlife and Plants; Review of Native Species That Are Candidates for Listing as Endangered or Threatened; Annual Notification of Findings on Resubmitted Petitions; Annual Description of Progress on Listing Actions. Federal Register 81(232):87246-87272.

FWS. 2017. Letter of concurrence with Biological Assessment. Wyoming Field Office. April 12.

Gabrielle, D., B. Bledsoe. D. Merritt, and E. Wohl. 2009. The impacts of ski slope development on stream channel morphology in the White River National Forest, Colorado, USA. Geomorphology (103) 375-388.

Gruell, G.E. and L. L. Loope. 1974. Relationships among aspen, fire, and ungulate browsing in Jackson Hole, Wyoming. U. S. Department of Agriculture, Forest Service. Intermountain Research Station, Ogden, UT. http://digitalcommons.usu.edu/cgi/viewcontent.cgi?article=6238&context=aspen_bib.

Handley, J. and W. Fertig. 2008. State species abstract (*Draba globosa*) rockcress draba, Family Brassicaceae. Wyoming Natural Diversity Database, University of Wyoming, Laramie, WY.

Hayward, G. D., and R. E. Escano. 1989. Goshawik nest-site characteristics in western Montana and northern Idaho. The Condor 91:476–479.

Hayward, G. D., and P. H. Hayward. 1993. Boreal Owl (Aegolius funereus). The Birds of North America. <http://bna.birds.cornell.edu/bna/species/063/>. Accessed 1 Jan 2015.

Heidel, B. 2008a. State species abstract (*Lesquerella paysonii*) Payson's bladderpod, Family Brassicaceae. Wyoming Natural Diversity Database, Laramie, WY.

Heidel, B. 2008b. State species abstract (*Astragalus diversifolius*) meadow milkvetch, Family Fabaceae. Wyoming Natural Diversity Database, University of Wyoming, Laramie, WY.

Heidel, B. 2008c. State species abstract (*Astragalus paysonii*) Payson's milkvetch, Family Fabaceae. Wyoming Natural Diversity Database, University of Wyoming, Laramie, WY.

Heidel, B. 2012. Sensitive and rare plant species inventory in the Salt River and Wyoming Ranges, Bridger Teton National Forest. Wyoming Natural Diversity Database, Laramie, WY.

Heidel, B. and W. Fertig. 2008a. State species abstract (*Astragalus shultziorum*) Shultz's milk-vetch, Family Fabaceae. Wyoming Natural Diversity Database, University of Wyoming, Laramie, WY.

Heidel, B. and W. Fertig. 2008b. State species abstract (*Astragalus terminalis*) railhead milkvetch, Family Fabaceae. Wyoming Natural Diversity Database, University of Wyoming, Laramie, WY.

Heinemeyer, K., and J. R. Squires. 2014. Wolverine – Winter Recreation Research Project: Investigating the Interactions between Wolverines and Winter Recreation, 2014 Progress Report.

Holden, T. 2004. Biological Assessment of Lynx for the Jackson Hole Mountain Resort Development Projects, Fall Creek Watershed. Jackson Ranger District, Bridger-Teton National Forest, Jackson, WY.

ICST. 2007. Final Conservation Strategy for the Grizzly Bear in the Greater Yellowstone Area. Available at: http://www.fws.gov/mountain-prairie/species/mammals/grizzly/ConservationStrategy grizzlybearGYA.pdf.

IGBST. 2016. Yellowstone Grizzly Bear Investigations 2013 Report of the Interagency Grizzly Bear Study Team. U.S. Geological Survey, Bozeman, MT.

Inman, R. M., M. L. Packila, K. H. Inman, A. J. McCue, G. C. White, J. Persson, B. C. Aber, M. L. Orme, K. L. Alt, S. L. Cain, J. A. Fredrick, B. J. Oakleaf, and S. S. Sartorius. 2012. Spatial ecology of wolverines at the southern periphery of distribution. Journal of Wildlife Management 76:778–792.

JHMR. 2013. Mountain Master Development Plan: Jackson Hole Mountain Resort. Jackson Hole Mountain Resort Corporation, Teton Village, WY.

Jackson Hole Mountain Resort (JHMR). 2014. Stormwater Pollution Prevention Plan. SWPPP Amendment No. 004. Prepared by: Jackson Hole Mountain Resort. Teton Village, WY.

Jackson Hole Ski Corporation(JHSC) and Sno.engineering, Inc. 1994. Jackson Hole Resort Master Plan. Sno.engineering, Frisco, Colorado. 226pp. [*reference from 1996 EIS]

JHSC and Forest Service. 1997. Vegetation management plan for the Jackson Hole Ski Area. Jackson Hole Ski corporation and Bridger-Teton National Forest.

Jackson Hole Ski Corporation (JHSC). 2015. Unpublished pictures of revegetation and reclamation efforts on graded ski slopes, 2013-2014.

Johnson, S.L. 2008. Compensatory mitigation for losses of aquatic resources: Final rule. U.S. Army Corps of Engineers, DoD; and Environmental Protection Agency. Federal Register 73:19594-19705.

Ladyman, J.A.R. 2004. Draba globosa Payson (Beavertip draba): A technical conservation assessment. USDA Forest Service, Rocky Mountain Region. Available online at: http://www.fs.fed.us/r2/projects/scp/assessments/drabaglobosa.pdf. Accessed April 2015.

Leonard, D. L. J. 2001. American Three-toed Woodpecker(Picoides dorsalis). The Birds of North America. <http://bna.birds.cornell.edu/bna/species/588>.

Longshore, K., and D. B. Thompson. 2013. Detecting short-term responses to weekend recreation activity: Desert bighorn sheep avoidance of hiking trails. Wildlife Society Bulletin 37:698–706.

Loope, L.L. and G.E. Gruell. 1973. The ecological role of fire in the Jackson Hole area, northwestern Wyoming. Quaternary Research. 3:425-443.

Love, J. D., J. C. Reed, Jr., and A. C. Christiansen. 1992. Geologic Map of Teton National Park, Teton County, Wyoming. U.S. Geol. Surv. Misc. Inv. Map I-2031. Washington, D.C.

Markow, S. and W. Fertig. 2000. State species abstract (*Listera convallarioides*) broad-leaved twayblade, Family Orchidaceae. Wyoming Natural Diversity Database, University of Wyoming, Laramie, WY.

Markow, S. and W. Fertig 2008. State species abstract (*Kelloggia galioides*) milk kelloggia, Family Rubiaceae. Wyoming Natural Diversity Database, University of Wyoming, Laramie, WY.

Medville, D., J. Hempel, C. Plantz, and E. Werner. 1979. Solutional Landforms on Carbonates of the Southern Teton Range, Wyoming. NSS Bulletin Quarterly Journal of the National Speleological Society Alpine Karst Symposium. Vol 41 No. 3 July 1979 pp. 70-79.

Mills, S. and W. Fertig. 2000. State species abstract (*Carex luzulina* var. *atropurpurea*) black and purple sedge, Family Cyperaceae. Wyoming Natural Diversity Database, University of Wyoming, Laramie, WY.

Miller, R. and R. Donahue. 1990. Soils: an introduction to soils and plant growth. Sixth Edition. Prentice Hall Englewood Cliffs, NJ 07632.

Murphy, K., J. Wilmot, J. P. Copeland, D. Tyers, J. R. Squires, R. M. Inman, M. I. Pakila, and D. McWhirter. 2011. Wolverine Conservation in Yellowstone National Park, Final Report. National Park Service, Yellowstone National Park, Wyoming.

NatureServe. 2015. Canis lupus. NatureServe Explorer. <http://explorer.natureserve.org>. Accessed 7 Apr 2015.

NatureServe. 2017. Oncorhynchus clarkii bouvieri. NatureServe Explorer2. <http://explorer.natureserve.org>.

NatureServe. 2017. An online encyclopedia of life.

NHD. 2015. Coordinated effort between the United States Department of Agriculture-Natural Resources Conservation Service (USDA-NRCS), the United States Geological Survey (USGS), and the Environmental Protection Agency (EPA). National Hydrography Data Set for Teton County, Wyoming. http://datagateway.nrcs.usda.gov Accessed March 2015.

NPS (National Park Service). 2011. Director's Order #12: Conservation Planning, Environmental Impact Analysis, and Decision-Making. U.S. Department of the Interior, National Park Service, 1849 C Street, N.W. Washington, D.C. 20240.

Pioneer. 2002. Snowshow Hare Survey Report. Pioneer Environmental Services, Inc., Logan, UT.

Pioneer. 2013. Aquatic Resource Inventory Report for Jackson Hole Mountain Resort Teton Village, Wyoming. Prepared for: Bill Schreiber Jackson Hole Mountain Resort Teton Village, Wyoming. Prepared by: Pioneer Environmental Services, Inc. November 7.

Rodel, S., C. Platschek, and R. Kolbitsch. 2016. Guideline for Disposal of Residues from Wastewater Treatment in Sensitive Mountain Regions. International Journal of Water and Wastewater Treatment. Volume 2.3. Sciforschen Open Hub for Scientific Research. Available for download at https://www.sciforschenonline.org/journals/water-and-waste/article-data/IJWWWT-2-123/IJWWWT-2-123.pdf

Ruediger, B., J. Claar, S. Gniadek, B. Holt, L. Lewis, S. Mighton, B. Naney, G. Patton, T. Rinaldi, J. Trick, A. Vandehey, F. Wahl, N. Warren, D. Wenger, and A. Williamson. 2000. Canada Lynx Conservation Assessment and Strategy. Forest Service, Fish and Wildlife Service, Bureau of Land Management, and National Park Service, Missoula, MT.

Schreiber, B. 2015a. Jackson Hole Mountain Resort, Mountain manager. Personal communication with E. Duffin (Cirrus Ecological Solutions, Watershed Scientist) re: rehabilitation procedures at JHMR.

Schreiber, B. 2017. Email communication to Neal Artz, Cirrus Ecological Solutions, LC, Feb. 7.

SHPO. 2015. Wyoming State Historic Preservation Office. Letter of concurrence with BTNF finding of no adverse impact on historic properties. May 18.

Soil Conservation Service (SCS). 1985. Classification and Correlation of the Soils of the Teton National Forest, Wyoming parts of Teton, Fremont, Park, Sublette, and Lincoln Counties. Soil Conservation Service, USDA. West Technical Center, Portland, Oregon.

Squires, J. R., and R. T. Reynolds. 1997. Northern Goshawk (Accipiter gentilis). The Birds of North America. <http://bna.birds.cornell.edu/bna/species/298>.

TVWSD (Teton Village Water and Sewer District). 2016. Comment letter to Bridger Teton National Forest, Jackson Ranger District re. Jackson Hole Mountain Resort 2016 Enhancement Projects. December 21, 2016.

USGS. 2017. Breeding Bird Survey. <https://www.pwrc.usgs.gov/bbs/index.cfm>. Accessed 1 Jan 2015.

Washington State Department of Health. 1992. Basic Principles of Onsite Sewage – Training Syllabus Basic On-Site Systems.

Welsh, S.L., N.D. Atwood, S. Goodrich, and L.C. Higgins. 2015. A Utah Flora 5th Edition. Print Services, Brigham Young University, Provo, UT.

Wemple, B., J. Shanley, J. Denner, D. Ross, and K. Mills. 2007. Hydrology and water quality in two mountain basins of the northeastern US: assessing baseline conditions and effects of ski area development. Hydrological Processes. Published online in Wiley InterScience (www.interscience.wiley.com). DOI: 10.1002/hyp.6700.

WGFD. 2015*a*. Untitled Report on Harvested Wildlife Populations. Wyoming Game and Fish Department.

WGFD. 2015*b*. 2015 Targhee Bighorn Sheep Classification Summary Report. Wyoming Game and Fish Department.

WGFD, FWS, NPS, USDA Wildlife Services, and E. S. and N. A. T. F. and G. Department. 2014. 2013 Wyoming Gray Wolf Population Monitoring and Management Annual Report. Wyoming Game and Fish Department, Cheyenne, WY.

White, C. M., N. J. Clum, T. J. Cade, and W. G. Hunt. 2002. Peregrine Falcon. The Birds of North America. <http://bna.birds.cornell.edu/bna/species/660>.

WNHD. 2015. Wyoming Natural Heritage Database Records - GIS data.

Woodbridge, B., and C. D. Hargis. 2006. Northern goshawk inventory and monitoring technical guide. USDA Forest Service, Washington, DC.

WYDEQ (Wyoming Department of Environmental Quality). 2001. Wyoming Surface Water Classifications List. Wyoming Department of Environmental Quality, Water Quality Division, Surface Water Standards. June 21, 2001.

WYDEQ (Wyoming Department of Environmental Quality). 2004. Silviculture Best Management Practices. Wyoming Nonpoint Source Management Plan. Wyoming Department of Environmental Quality.

WYDEQ (Wyoming Department of Environmental Quality). 2013. Chapter 1: Wyoming Surface Water Quality Standards. Effective Date: 9/24/2013 to current. Reference Number 020.0011.1.09242013.

WYDEQ (Wyoming Department of Environmental Quality). 2016. Wyoming's 2014 Integrated 305(b) and 303(d) Report. Prepared by Wyoming Department of Environmental Quality, Water Quality Division, Watershed Section. 122 W. 25th St, Herschler Building 4-W, Cheyenne, WY 82002. Document #16-0126. http://sgirt.webfactional.com/wqd/water-quality-assessment/resources/reports/.

Wyoming Natural Diversity Database (WYNDD). 2012. Wyoming plant species of concern list. Available at: http://www.uwyo.edu/wyndd/species-of-concern/plants/vascular-plants.html. Accessed February 2017.

APPENDIX A – MITIGATION MEASURES

Section 2.5 of the EA discusses design criteria that were in place prior to initiating the effects analysis and mitigation measures that are either standard practice or were identified in the course of the analysis. Specific actions in both of these categories are listed below.

DESIGN CRITERIA

Erosion Control

1. Disturbed site rehabilitation at JHMR is conducted in accordance with the resort's *Storm Water Pollution Prevention Plan* (SWPPP; JHMR 2011), which was prepared and is implemented as a condition of completing development projects at the resort under the Wyoming Pollutant Discharge Elimination System General Permit (see section 3.4). The SWPPP, updated annually to address projects slated for implementation that year, includes: appropriate best management practices (BMPs) for erosion control, sediment control, and site stabilization; operational controls; and provisions for maintenance and inspection.
2. As stated in the SWPPP, JHMR will implement any additional BMPs required by the BTNF, including ski area 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; see Mitigation Measures below).

Water Quality

3. Vehicle service, storage, and refueling areas are to be at least 150 feet from stream channels, riparian, and wetland areas, and should be on level ground. All petroleum products and other substances capable of polluting surface or groundwater should be stored within a diked area large enough to contain the largest theoretical spill (110%). Cleanup actions are to be taken immediately, and materials are to be stockpiled in the immediate area. Spills are to be reported to Wyoming DEQ (WYDEQ 2004).

Vegetation Management

4. Soil disturbance will be minimized, and existing topsoil will be conserved for replacement.
5. Where possible, disturbance of native vegetation will be avoided.
6. In areas where tree selection is discretionary (e.g., feathering the edges of cleared runs), whitebark pine trees will not be removed.
7. Slash created by tree removal will be disposed of either through utilization, burning, chipping, mastication, lopping and scattering, or removal from the site within a specified timeframe.
8. JHMR will follow Forest Service policy (FSM 2070) and use genetically appropriate native materials for rehabilitation and restoration when possible. Locally-collected native seed material will be used for rehabilitation and restoration to retain genetic viability and fitness. Seedbed preparation in areas to be rehabilitated or restored will include practices such as incorporating recycled woodchips into topsoil or using soil erosion-control mats. A qualified Forest Service botanist or ecologist will be involved in development, review, and/or approval of plant materials selected for use in site rehabilitation and restoration.
9. Any areas of native vegetation that will be disturbed and have not been previously surveyed for special-status plants will be surveyed prior to construction. Results will be reported to the Forest Service Permit Administrator, and appropriate measures to mitigate impacts will be implemented.

10. All construction equipment and vehicles used will be cleaned and certified free of noxious weeds and their seeds prior to entrance onto the BTNF. This restriction will include equipment and vehicles intended for both on- and off-road use, whether they are owned, leased, or borrowed by either contractors or subcontractors.
11. Any fill material proposed for the project, including any imported topsoil, will be first inspected by the invasive plant specialist to determine if it is weed-free, from a certified source, and thus safe to bring onto the BTNF.
12. Any straw bales, chips, or other imported mulch used in conjunction with the proposed action will come from a certified weed-free source.

Wildlife Protection

13. No tree cutting will occur between May 15 and July 15 to protect nesting of neo-tropical migrant and other birds.

Scenic Integrity

14. Permanent buildings will be designed and built in compliance with the *Built Environment Image Guide for the National Forests and Grasslands* (Forest Service 2001, FS-710). Ensuring that architectural style, building materials, size, and color are consistent with the existing visual character and meet the adopted scenery objectives. Compliance will be confirmed through Forest Service engineering review prior to construction.
15. The edges of cleared ski runs will be feathered to appear more like natural openings in forest cover, flowing with the topography and blending with the natural vegetation.

Accessibility

16. All public buildings will be designed and constructed in accordance with the *Accessibility Guidebook for Ski Areas Operating on Public Lands – 2012 Update* (Forest Service 2012b). Compliance will be confirmed through Forest Service engineering review prior to construction.

Undiscovered Cultural Resources

17. If any previously unidentified prehistoric or historic cultural resources are identified or encountered at any time during construction, efforts shall be made to 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 so that Tribal concerns will not be overlooked.
18. If unmarked human remains are encountered at any time during construction, all work in the vicinity of the find shall cease, with the remains covered and protected in place, and the Forest Service Permit Administrator notified 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.
19. If any previously unidentified Traditional Cultural Places or sacred sites are identified or encountered at any time during construction, efforts shall be made to 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 so that Tribal concerns will not be overlooked.

Wetland and Riparian Resources

20. The amount of wetland area disturbed will be minimized when avoidance is not practical.

21. Trench breakers will be used when snowmaking or other utility lines cross sloped wetland areas. Trench breakers will be placed at the lower wetland boundary so that groundwater is not drained through the trench and out of the wetland.

22. Stream channels that are relocated in the Amphitheater run under the proposed action will be designed and constructed to natural conditions of gradient, cross-section form, sinuosity, and materials. They will be monitored for at least 5 years after construction to ensure that no headcutting or excessive lateral erosion is occurring, and to ensure that revegetation is successful.

MITIGATION MEASURES

Best Management Practices (BMPs) listed in this section were selected from *National Best Management Practices for Water-Quality Management on National Forest System Lands, Volume 1: National Core BMP Technical Guide, USDA-Forest Service, FS-990a, April 2012*. These include both standard planning BMPs and BMPs to mitigate specific impacts identified in this analysis. The BMPs in this section are organized in the same order as they appear in Forest Service (2012a), but specific BMPs that are not applicable have been deleted.

Fac-2. Facility Construction and Stormwater Control

- Obtain Clean Water Act (CWA) 402 stormwater discharge permit coverage from the appropriate State agency or the U.S. Environmental Protection Agency (EPA) when more than 1 acre of land will be disturbed through construction activities.
- Obtain CWA 404 permit coverage from the U.S. Army Corps of Engineers when dredge or fill material will be discharged to waters of the United States.
- Establish designated areas for equipment staging, stockpiling materials, and parking to minimize the area of ground disturbance (see BMP Road-9 [Parking Sites and Staging Areas] and BMP Road-10 [Equipment Refueling and Servicing]).
- Establish and maintain construction area limits to the minimum area necessary for completing the project and confine disturbance to within this area.
- Develop and implement a post construction site vegetation plan using suitable species and establishment techniques to revegetate the site in compliance with local direction and requirements per Forest Service Manual (FSM) 2070 and FSM 2080 for vegetation ecology and prevention and control of invasive species.
- Schedule, to the extent practicable, construction activities to avoid direct soil and water disturbance during periods of the year when heavy precipitation and runoff are likely to occur.
    - Limit the amount of exposed or disturbed soil at any one time to the minimum necessary to complete construction operations.
    - Limit operation of equipment when ground conditions could result in excessive rutting, soil puddling, or runoff of sediments directly into waterbodies.
- Maintain erosion and stormwater controls as necessary to ensure proper and effective functioning.
    - Prepare for unexpected failures of erosion control measures.
    - Implement corrective actions without delay when failures are discovered to prevent pollutant discharge to nearby waterbodies.
- Routinely inspect construction sites to verify that erosion and stormwater controls are implemented and functioning as designed and are appropriately maintained.

Fac-3. Potable Water Supply Systems

- Perform water supply and system disinfection activities in a manner such that disinfectant residuals and byproducts will not affect nearby surface water or groundwater.

- Ensure that permit holder-owned and other authorized drinking water systems on NFS lands are operated and maintained according to direction in FSM 7423.

Fac-4. Sanitation Systems

- Use qualified personnel to locate, design, inspect, operate, maintain, and manage sanitation systems.
- Coordinate all phases of sanitation system management (planning, design, installation, inspection, operation, and maintenance) with appropriate State and local agencies to ensure compliance with applicable regulations.
- Design and operate waste collection, treatment, and disposal systems appropriate for the type and volume of waste generated at the site consistent with direction in FSH 7409.11, chapter 50.
- Follow applicable regulations and guidelines when locating toilets, wastewater disposal, and leach fields.
    - Use suitable setback distances from water bodies or other sensitive areas when siting facilities.
    - Use proper field investigations and soil tests to determine suitable soils for onsite treatment and disposal systems.
- Prepare and maintain an operation and maintenance plan for all waste treatment or disposal facilities (FSM 7410).
    - Inspect vaults, septic tanks, and other wastewater systems at regular intervals to ensure that capacities are not exceeded and that the system is functioning properly and in compliance with applicable State and local regulations.
    - Implement follow-up actions identified in the inspections as needed to ensure that the system is working properly.
    - Include procedures in operation and maintenance plans to contain or avoid releases of pollutants in floods or other emergencies.

Fac-5. Solid Waste Management

- Develop a Solid Waste System consistent with direction in FSM 7460 and FSH 7409.11, chapter 80 that defines and describes collection, transportation, storage, and final disposal methods for solid waste generated at facilities.
- Use suitable public relations and information tools and enforcement measures to encourage the public to use proper solid waste disposal measures.
    - Encourage recycling of materials where practicable.
    - Encourage the public to “pack it in-pack it out” in areas where practicable.
- Provide receptacles for trash at developed facilities.
    - Place bear-proof trash and recycling receptacles in areas that are convenient to the facility’s users.
    - Place bear-proof trash and recycling receptacles in locations away from waterbodies.
    - Provide bear-proof receptacles that discourage wildlife foraging as suitable for the area (e.g., bears, raccoons, birds) and suitably confine materials until collected.
    - Collect trash on a routine schedule to prevent the receptacles from overflowing.
- Dispose of collected garbage at properly designed and operated municipal-, county-, or State-authorized sanitary landfills or waste recycling sites where groundwater and surface water are adequately protected.
- Obtain necessary State or local permits for solid waste disposal sites.

Fac-9. Pipelines, Transmission Facilities, and Rights-of-Way

- Use design and construction measures that sustain long-term wetland or stream function when a buried transmission line, pipeline, or tower support must be placed in a wetland or cross a stream (see BMP AqEco-2 [Operations in Aquatic Ecosystems]).

- Use suitable measures for pipeline thickness, corrosion prevention, pipeline casing, cathodic protection and pipeline valves, and shut-off systems to prevent or minimize spills or leaks where pipelines cross waterbodies.

Fac-10. Facility Site Reclamation

- Regularly review the need for and use of stockpiles, materials, supplies, and facilities.
- Surplus, repurpose, or recycle unneeded usable materials where practicable.
  - Dispose of unneeded materials through the appropriate solid waste handlers.
  - Consult the forest pollution prevention coordinator for proper disposal of hazardous materials.
- Develop and implement a reclamation plan to rehabilitate and restore, to the extent practicable, the natural ecological components, structures, and processes consistent with land management plan desired conditions, goals, and objectives at sites where structures or facilities have been permanently removed.
  - Remove unneeded structures.
  - Re-establish original slope contours, surface, and subsurface hydrologic pathways where practicable and as opportunities arise.
  - Improve infiltration capacity on compacted areas of the site.
  - Establish effective ground cover on disturbed sites to avoid or minimize accelerated erosion and soil loss.
  - Use suitable species and establishment techniques to revegetate the site in compliance with local direction and requirements per FSM 2070 and FSM 2080 for vegetation ecology and prevention and control of invasive species.
- Consider long-term management of the site and nearby areas to promote project success.
  - Use suitable measures to limit human, vehicle, and livestock access to site as needed to allow for recovery of vegetation.

Rec-10. Ski Runs and Lifts

- Use applicable practices of Mechanical Vegetation Management Activities BMPs when clearing vegetation for ski runs and lift lines.
  - Use yarding equipment suitable to the steepness of the terrain to avoid or minimize adverse effects to soil and water quality (see BMP Veg-1 [Vegetation Management Planning]).
- Use applicable practices of BMP Veg-2 (Erosion Prevention and Control) to provide erosion and stormwater controls when constructing ski runs and lifts.
  - Clear and construct ski runs and lift lines in sections to limit the area of exposed disturbed soil at any one time.
  - Stabilize a completed section before beginning work on the next section.
- Avoid diverting streams and minimize disrupting swales, ephemeral channels, and wetlands.
- Minimize grading or recontouring of hill slopes to maintain intact soil horizons and infiltrative properties.
- Cut stumps flush with soil surface or grind in place instead of grubbing when clearing trees from ski runs wherever practicable.
- Use applicable practices of BMP Road-7 (Stream Crossings) to design and construct stream crossings to minimize riparian and channel disturbance and pass anticipated flood flows and associated debris, while allowing desired aquatic organism passage.
  - Maintain normal stream patterns, geometry, and habitat features to the extent practicable.
- Use low-pressure construction and maintenance equipment whenever practicable to reduce surface impact on steep slopes.

- Stockpile biologically active topsoil removed during excavation for use in reclamation.
    - Store stockpiled topsoil separately from other vegetative slash, soil, or rock and protect from wind and water erosion, unnecessary compaction, and contaminants.
- Use suitable species and establishment techniques to revegetate the site in compliance with local direction and requirements per FSM 2070 and FSM 2080 for vegetation ecology and prevention and control of invasive species.
- Maintain desired ground cover with irrigation, fertilization, or other treatments as necessary.
- Use suitable measures to direct overland flow on slopes into areas with intact soil horizons to encourage infiltration and disconnect overland flow from waterbodies.
- Treat disturbed soil to promote onsite water capture and infiltration.
- Prohibit traffic on disturbed areas during periods of excessive soil moisture, precipitation, or runoff.
- Monitor revegetation response (height, root growth, ground coverage, etc.) in terms of its capacity to avoid or minimize erosion during runoff.
    - Perform additional revegetation or erosion control as needed to protect water quality and soil integrity.

Rec-11. Ski Area Snowmaking

- Manage snowmaking and snow farming to avoid or minimize slope failures and gully erosion on the hillslopes and excessive bank erosion and sediment in receiving streams.
    - Limit snowmaking on graded terrain to the extent practicable to minimize surface runoff and subsequent erosion from reduced infiltration capacity.
- Avoid contaminating return water with chemicals or other pollutants.
- Monitor all aspects of the process and correct problems as they occur to avoid or minimize long-term effects.
    - Regularly inspect snowmaking lines and equipment to prevent accidental discharges and erosion due to equipment failure.

Rec-12. Ski Area Facilities

- Use applicable practices of BMP Fac-6 (Hazardous Materials), BMP Fac-7 (Vehicle and Equipment Wash Water), and BMP Road-10 (Equipment Refueling and Servicing) for activities related to storage and maintenance of ski area vehicles and equipment.
- Use applicable practices of BMP Fac-3 (Potable Water Supply Systems) for drinking water, BMP Fac-4 (Sanitation Systems) for managing human waste, and BMP Fac-5 (Solid Waste Management) for managing solid waste at ski area facilities.

Road-2. Road Location and Design

Location

- Relocate existing routes or segments that are causing, or have the potential to cause, adverse effects to soil, water quality, and riparian resources, to the extent practicable.
    - Obliterate the existing road or segment after the relocated section is completed (see BMP Road-6 [Road Storage and Decommissioning]).

Predesign

- Consider the road RMOs and likely future maintenance schedule in the initial design.
- Conduct suitable site investigations, data collection, and evaluations commensurate with the anticipated design and sensitivity of the area to soil, water quality, and riparian resource impacts.

  - Consider subsurface conditions and conduct suitable investigations and stability analyses for road and bridge locations where slope instability can occur due to road construction.
  - Conduct a suitable soils and geotechnical evaluation to identify susceptibility to erosion and stable angles of repose.

Design

- Design the road to fit the ground and terrain with the least practicable impacts to soil, water quality, and riparian resources considering the purpose and life of the road, safety, and cost.
  - Use road standards that minimize impacts for grade and alignment (e.g., width, turning radius, and maximum slope).
  - Use low impact development treatments that reduce long-term maintenance needs wherever practicable.
- Design the road to maintain stable road prism, cut, and fill slopes.
  - Design cut and fill slope ratios to reduce soil loss from mass failures.
  - Use structural or nonstructural measures as necessary to stabilize cut and fill slopes.
- Design the road surface drainage system to intercept, collect, and remove water from the road surface and surrounding slopes in a manner that minimizes concentrated flow in ditches, culverts, and over fill slopes and road surfaces.
  - Use structural or nonstructural measures suitable to the road materials, road gradient, and expected traffic levels.
  - Use an interval between drainage features that is suitable for the road gradient, surface material, and climate.
  - Use suitable measures to avoid or minimize erosion of ditches.
- Design the road subsurface drainage system to intercept, collect, and remove groundwater that may flow into the base course and subgrade, lower high-water tables, and drain water pockets.
  - Use suitable subsurface dispersion or collection measures to capture and disperse locally shallow groundwater flows intercepted by road cuts.
  - Use suitable measures to release groundwater into suitable areas without causing erosion or siltation.
- Design the road for minimal disruption of natural drainage patterns and to minimize the hydrologic connection of the road segment or network with nearby waterbodies.
  - Use suitable structural or nonstructural measures to avoid or minimize gully formation and erosion of fill slopes at outfalls of road surface drainage structures.
  - Use suitable measures to avoid, to the extent practicable, or minimize direct discharges from road drainage structures to nearby waterbodies.
  - Provide sufficient buffer distance at the outfalls of road surface drainage structures for water to infiltrate before reaching the waterbody.
  - Use applicable practices of BMP Road-7 (Stream Crossings) to limit the number and length of water crossing connected areas to the extent practicable.
- Design road surface treatment to support wheel loads, stabilize the roadbed, reduce dust, and control erosion consistent with anticipated traffic and use.
  - Consider whether road closures or roadway surface drainage and erosion protection can adequately mitigate adverse effects to soil, water quality, and riparian resources.
- Design roads within the AMZ (when no practicable alternative exists outside of the AMZ to achieve access objectives) to maintain desired conditions, goals, and objectives for AMZ structure, function, and processes (See BMP Plan-3 [AMZ Planning]).

  - Use suitable measures to minimize or mitigate effects to waterbodies and other sensitive areas when adverse impacts cannot be practicably avoided.
- Design waterbody crossings to avoid or minimize adverse effects to soil, water quality, and riparian resources to the extent practicable consistent with road use, legal requirements, and cost considerations (See BMP Road-7 [Stream Crossings]).
- Design a post-construction site vegetation plan, including short- and long-term objectives, using suitable species and establishment techniques to revegetate the site in compliance with local direction and requirements per FSM 2070 and FSM 2080 for vegetation ecology and prevention and control of invasive species.

Road-3. Road Construction and Reconstruction.

- Do not permit sidecasting within the AMZ.
  - Avoid or minimize excavated materials from entering waterbodies or AMZs.
- Develop and follow blasting plans when necessary.
  - Use restrictive blasting techniques in sensitive areas and in sites that have high landslide potential.
  - Avoid blasting when soils are saturated.
- Remove slash and cull logs to designated sites outside the AMZ for storage or disposal.
  - Consider using cull logs in aquatic ecosystem projects to achieve aquatic resource management objectives as opportunities arise.
- Use suitable measures in compliance with local direction to prevent and control invasive species.

Road-6. Road Storage and Decommissioning.

Develop site-specific BMP prescriptions for the following practices, as appropriate or when required, using State BMPs, Forest Service regional guidance, land management plan direction, BMP monitoring information, and professional judgment.

All Activities

- Establish effective ground cover on disturbed sites to avoid or minimize accelerated erosion and soil loss.
  - Use suitable species and establishment techniques to stabilize and revegetate the site in compliance with local direction and requirements per FSM 2070 and FSM 2080 for vegetation ecology and prevention and control of invasive species.

Road Storage

- Evaluate all stream and waterbody crossings for potential for failure or diversion of flow if left without treatment.
  - Use suitable measures to reduce the risk of flow diversion onto the road surface.
  - Consider leaving existing crossings in low-risk situations where the culvert is not undersized, does not present an undesired passage barrier to aquatic organisms, and is relatively stable.
  - Remove culverts, fill material, and other structures that present an unacceptable risk of failure or diversion.
  - Reshape the channel and streambanks at the crossing-site to pass expected flows without scouring or ponding, minimize potential for undercutting or slumping of streambanks, and maintain continuation of channel dimensions and longitudinal profile through the crossing site.
  - Use suitable measures to avoid or minimize scour and downcutting.
- Use suitable measures to ensure that the road surface drainage system will intercept, collect, and remove water from the road surface and surrounding slopes in a manner that reduces concentrated flow in ditches, culverts, and over fill slopes and road surfaces without frequent maintenance.

- Use suitable measures to stabilize unstable road segments, seeps, slumps, or cut or fill slopes where evidence of potential failure exists.

Road Decommissioning

- Evaluate risks to soil, water quality, and riparian resources and use the most practicable, cost-effective treatments to achieve long-term desired conditions and water quality management goals and objectives.
- Use applicable practices of BMP Fac-2 (Facility Construction and Stormwater Control) for stormwater management and erosion control when obliterating system roads.
- Implement suitable measures to re-establish stable slope contours and surface and subsurface hydrologic pathways where necessary to the extent practicable to avoid or minimize adverse effects to soil, water quality, and riparian resources.
    - Remove drainage structures.
    - Recontour and stabilize cut slopes and fill material.
    - Reshape the channel and streambanks at crossing sites to pass expected flows without scouring or ponding, minimize potential for undercutting or slumping of streambanks, and maintain continuation of channel dimensions and longitudinal profile through the crossing site.
    - Restore or replace streambed materials to a particle size distribution suitable for the site.
    - Restore floodplain function.
- Implement suitable measures to promote infiltration of runoff and intercepted flow and desired vegetation growth on the road prism and other compacted areas.
- Use suitable measures in compliance with local direction to prevent and control invasive species.

Road-7. Stream Crossings

All Crossings

- Use suitable surface drainage and roadway stabilization measures to disconnect the road from the waterbody to avoid or minimize water and sediment from being channeled into surface waters and to dissipate concentrated flows.
- Use suitable measures to avoid, minimize, or mitigate damage to the waterbody and banks when transporting materials across the waterbody or AMZ during construction activities.

Stream Crossings

- Locate stream crossings where the channel is narrow, straight, and uniform, and has stable soils and relatively flat terrain to the extent practicable.
    - Select a site where erosion potential is low.
    - Orient the stream crossing perpendicular to the channel to the extent practicable.
    - Keep approaches to stream crossings to as gentle a slope as practicable.
    - Consider natural channel adjustments and possible channel location changes over the design life of the structure.
- Design the crossing to pass a normal range of flows for the site.
    - Design the crossing structure to have sufficient capacity to convey the design flow without appreciably altering streamflow characteristics.
    - Install stream crossings to sustain bankfull dimensions of width, depth, and slope and maintain streambed and bank resiliency and continuity through the structure.
- Use suitable measures to avoid or minimize scour and erosion of the channel, crossing structure, and foundation to maintain the stability of the channel and banks.

- Culverts
    - Align the culvert with the natural stream channel.
    - Cover culvert with sufficient fill to avoid or minimize damage by traffic.
    - Construct at or near natural elevation of the streambed to avoid or minimize potential flooding upstream of the crossing and erosion below the outlet.
    - Install culverts long enough to extend beyond the toe of the fill slopes to minimize erosion.
    - Use suitable measures to avoid or minimize water from seeping around the culvert.
    - Use suitable measures to avoid or minimize culvert plugging from transported bedload and debris.
    - Regularly inspect culverts and clean as necessary.

Standing Water and Wetland Crossings

- Disturb the least amount of area as practicable when crossing a standing waterbody.
- Provide for sufficient cross drainage to minimize changes to, and avoid restricting, natural surface and subsurface water flow of the wetland under the road to the extent practicable.
    - Locate and design roads or road drainage to avoid dewatering or polluting wetlands.
    - Avoid or minimize actions that would significantly alter the natural drainage for flow patterns on lands immediately adjacent to wetlands.
- Use suitable measures to increase soil-bearing capacity and reduce rutting from expected vehicle traffic.
- Construct fill roads only when necessary.
    - Construct fill roads parallel to water flow and to be as low to natural ground level as practicable.
    - Construct roads with sufficient surface drainage for surface water flows.

Road-10. Equipment Refueling and Servicing

Develop site-specific BMP prescriptions for the following practices, as appropriate or when required, using State BMPs, Forest Service regional guidance, land management plan direction, BMP monitoring information, and professional judgment.

- Plan for suitable equipment refueling and servicing sites during project design.
    - Allow temporary refueling and servicing only at approved locations, located well away from the AMZ, groundwater recharge areas, and waterbodies.
- Develop or use existing fuel and chemical management plans (e.g., Spill Prevention Control and Countermeasures [SPCC], spill response plan, and emergency response plan) when developing the management prescription for refueling and servicing sites.
- Locate, design, construct, and maintain petroleum and chemical delivery and storage facilities consistent with applicable local, State, and Federal regulations.
- Use suitable measures around vehicle service, storage and refueling areas, chemical storage and use areas, and waste dumps to fully contain spills and avoid or minimize soil contamination and seepage to groundwater.
- Ensure that contractors and permit holders provide documentation of proper training in handling hazardous materials.
- Use suitable measures to avoid spilling fuels, lubricants, cleaners, and other chemicals during handling and transporting.
- Prohibit excess chemicals or wastes from being stored or accumulated in the project area.
- Remove service residues, used oil, and other hazardous or undesirable materials from NFS land and properly dispose them as needed during and after completion of the project.

- Clean up and dispose of spilled materials according to specified requirements in the appropriate guiding document.
- Report spills and initiate suitable cleanup action in accordance with applicable State and Federal laws, rules, and regulations.
    - Remove contaminated soil and other material from NFS lands and dispose of this material in a manner consistent with controlling regulations.
- Prepare and implement a certified SPCC Plan for each facility, including mobile and portable facilities, as required by Federal regulations.
- Use applicable practices of BMP Fac-10 (Facility Site Reclamation) to reclaim equipment refueling and services site when the need for them ends.

Veg-1. Vegetation Management Planning.

Develop site-specific BMP prescriptions for the following practices, as appropriate or when required, using State BMPs, Forest Service regional guidance, land management plan direction, BMP monitoring information, and professional judgment.

- Ensure the timber sale contract, stewardship contract, or other implementing document includes BMPs from the decision document to avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources.
    - Use appropriate standard B and C provisions and regional or local provisions to address measures and responsibilities consistent with the BMPs in the decision document in the timber sale or stewardship contract.
    - Delineate all protected or excluded areas, including AMZs and waterbodies, on the sale area map or project map.
    - Delineate approved water locations, staging areas, and borrow areas on the sale area map or project map.
    - Ensure that the final unit location, layout, acreage, and logging system or mechanical treatment and Knutson-Vandenberg Act plans are consistent with the decision document.
- Use contract modification procedures to the extent practicable to modify unit design, treatment methods, or other project activities where necessary to avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources based on new information or changed conditions discovered during project implementation.

Veg-2. Erosion Prevention and Control

- Establish designated areas for equipment staging and parking to minimize the area of ground disturbance (see BMP Road-9 [Parking Sites and Staging Areas]).
- Develop an erosion control and sediment plan that covers all disturbed areas including skid trails and roads, landings, cable corridors, temporary road fills, water source sites, borrow sites, or other areas disturbed during mechanical vegetation treatments.
- Refer to State or local forestry or silviculture BMP manuals, guidebooks, and trade publications for effective structural and nonstructural measures to—
    - Apply soil protective cover on disturbed areas where natural revegetation is inadequate to prevent accelerated erosion before the next growing season.
    - Maintain the natural drainage pattern of the area wherever practicable.
    - Control, collect, detain, treat, and disperse stormwater runoff from disturbed areas.
    - Divert surface runoff around bare areas with appropriate energy dissipation and sediment filters.
    - Stabilize steep excavated slopes.

- Use suitable species and establishment techniques to cover or revegetate disturbed areas in compliance with local direction and requirements per FSM 2070 and FSM 2080 for vegetation ecology and prevention and control of invasive species.
- Use suitable measures in compliance with local direction to prevent and control invasive species.
- Install sediment and stormwater controls before initiating surface-disturbing activities to the extent practicable.
- Operate equipment when soil compaction, displacement, erosion, and sediment runoff would be minimized.
    - Avoid ground equipment operations on unstable, wet, or easily compacted soils and on steep slopes unless operation can be conducted without causing excessive rutting, soil puddling, or runoff of sediments directly into waterbodies.
    - Evaluate site conditions frequently to assess changing conditions.
    - Adjust equipment operations as necessary to protect the site while maintaining efficient project operations.
- Install suitable stormwater and erosion control measures to stabilize disturbed areas and waterways on incomplete projects before seasonal shutdown of operations or when severe storm or cumulative precipitation events that could result in sediment mobilization to waterbodies are expected.
- Routinely inspect disturbed areas to verify that erosion and stormwater controls are implemented and functioning as designed and are suitably maintained.
- Implement mechanical treatments on the contour of sloping ground to avoid or minimize water concentration and subsequent accelerated erosion.

APPENDIX B – LIST OF ALL SPECIAL-STATUS PLANT SPECIES CONSIDERED

Table B-1 shows the full list of special-status plant species considered in this analysis, including plants that are federally listed as threatened or endangered, Forest Service sensitive, MIS, or Wyoming Species of Concern or Species of Potential Concern. Inclusion in this list was based on professional judgment of the Forest botanist and Charmaine Delmatier, the third-party botanist contracted by JHMR to conduct the mountain-wide plant inventories over the past 21 years. This list includes 27 taxa and provides relevant information concerning their known or probable occurrence in the Jackson Hole Mountain Resort Recreation Enhancement Projects area. Those species known to occur in the SUP area were carried into detailed analysis in the EA (section 3.5).

Table B-1. Special-status plant species considered in the JHMR Recreation Enhancements Project EA.

Species Name	Habitat Description	Status and Rank	Known Occurrences in the SUP Area	Habitat Present in the SUP Area	Risk (likelihood of effects from proposed action)
Threatened or Endangered Species					
Ute ladies'-tresses (Spiranthes diluvialis)	Gravel bars, wet meadow terraces, oxbows, seeps, springs, fens, lakes, and excavations within suitable settings, including ditches and quarries at elevations on slightly alkaline soils between 720 and 7,000 feet (Fertig 2007).	Threatened	No	Yes	None[1]
Region 4 Sensitive Known to Occur on the BTNF					
Sweet-Flowered Rock Jasmine (*Androsace chamaejasme* ssp. *carinata*)	Preferred habitat is on exposed settings of rocky ridge crests, slopes with rock outcrops and thin soils of limestone or dolomite substrate at 8,500 to 10,800 feet elevation. (Fertig 2008)	R4 Sensitive	No	Yes	None[1]
Pink Agoseris (*Agoseris lackschewitzii*)	This species is found in mid-montane to subalpine wet meadow, saturated soils at 8,500 to 10,600 feet in elevation (Fertig, Refsdal, and Whipple 1994).	R4 Sensitive	No	Yes	None[1]

Table B-1 (cont'd). Special-status plant species considered in the JHMR Recreation Enhancements Project EA.

Species Name	Habitat Description	Status and Rank	Known Occurrences in the SUP Area	Habitat Present in the SUP Area	Risk (likelihood of effects from proposed action)
Meadow Milkvetch (*Astragalus diversifolius* var. *diversifolius*)	This species is found in moist, often alkaline meadows and swales in sagebrush valleys at 4,400 to 6,300 feet elevation. Recorded from one historical site in Green River basin (Heidel 2008b).	R4 Sensitive	No	No	None
Starvling Milkvetch (*Astragalus jejunus* var. *jejunus*)	This species is found on dry barren ridges and bluffs of shale and stone, clay or cobblestones at 6,000 to 7,100 feet elevation (Fertig, Refsdal, and Whipple 1994).	R4 Sensitive	No	No	None
Payson Milkvetch (*Astragalus paysonii*)	This species occurs primarily in disturbed areas on sandy soils that have a low cover of forbs and grasses at elevations of 5,850 to 9,600 feet (Heidel 2008c)	R4 Sensitive	No	No	None
Seaside Sedge (*Carex incurviformis*)	This species occurs primarily in alpine and subalpine moist tundra and wet rock ledges 10,000 to 12,200 elevation (Fertig 2000c).	R4 Sensitive	No	No	None
Black and Purple Sedge (*Carex luzulina* var. *atropurpea*)	This species is found in subalpine wet meadows and stream sides at 10,000 to 10,600 feet elevations (Mills and Fertig 2000).	R4 Sensitive	No	No	None
Wyoming Tansymustard (*Descurainia torulosa*)	Wyoming tansymustard is restricted to the southern Absaroka Range and the Rock Springs Uplift. Habitat is sandy soil at the base of cliffs composed of volcanic breccia or sandstone, under slight overhangs, in cavities in the volcanic rock, or on	R4 Sensitive	No	No	None

Table B-1 (cont'd). Special-status plant species considered in the JHMR Recreation Enhancements Project EA.

Species Name	Habitat Description	Status and Rank	Known Occurrences in the SUP Area	Habitat Present in the SUP Area	Risk (likelihood of effects from proposed action)
	ledges. It is found at elevations of 7,700 to 10,500 feet (Fertig 2000d).				
Rockcress Draba (*Draba apiculata*, *Draba globosa, Draba densifolia* var. *apiculata*)	Rockcress draba is found in moist, gravelly alpine meadows and talus slopes, often on limestone-derived soils. Found from 8,100 to 12,400 feet (Handley and Fertig 2008).	R4 Sensitive, Wyoming Species of Concern	Yes	Yes	Low
Narrowleaf Goldenweed (*Ericameria discoidea* var. *linearis*)	This species is typically found in semi-barren, whitish clay flats and slopes, gravel bars, and sandy lakeshores at elevations of 7,700 to 10,300 feet (Fertig 2000e).	R4 Sensitive	No	No	None
Woolly Daisy (*Erigeron lanatus*)	This species is found on alpine or subalpine limestone talus slopes at elevations between 10,800 and 11,100 feet elevation (Fertig 2001).	R4 Sensitive	No	Yes	None[1]
Payson's Bladderpod (*Lesquerella paysonii*)	This species is endemic to the carbonate mountain ranges of west-central Wyoming, eastern Idaho, and southwestern Montana. It is found on rocky, sparsely-vegetated slopes, often calcareous substrates at elevations of 5,500 to 10,600 feet (Heidel 2008a).	R4 Sensitive, Wyoming Species of Potential Concern	Yes	Yes	Low
Naked-stemmed parrya (*Parrya nudicaulis*)	This species is found on alpine talus, often on limestone substrates at 10,700 to 11,400 feet elevation (Fertig 2000f)	R4 Sensitive	No	Yes	None[1]

Table B-1 (cont'd). Special-status plant species considered in the JHMR Recreation Enhancements Project EA.

Species Name	Habitat Description	Status and Rank	Known Occurrences in the SUP Area	Habitat Present in the SUP Area	Risk (likelihood of effects from proposed action)
Creeping Twinpod (*Physaria integrifolia* var. *monticola*)	Found on barren, rocky, calcareous hills and slopes at 6,500 to 8,600 feet elevation (Fertig, Refsdal, and Whipple 1994). No longer a valid taxon.	R4 Sensitive (if variety monticola)	Yes	Yes	None – species is no longer a valid taxon.
Whitebark Pine (*Pinus albicaulis*)	This species grows in pure stands near the treeline and in mixed stands in subalpine forests from under 8000 to over 10,000 feet in Wyoming (Arno and Hoff 1990).	Candidate, R4 Sensitive	Yes	Yes	Low
Greenland Primrose (*Primula egalikensis*)	This species is found in wet meadows along streams and calcareous montane bogs from 6,600 to 8,000 feet (Fertig, Refsdal, and Whipple 1994).	R4 Sensitive	No	No	None
Weber's Saussurea (*Saussurea weberi*)	Restricted to the Gros Ventre and northern Wind River ranges Habitat is on alpine talus slopes and gravel fields from 9,600 to 11,500 feet (Fertig 2000g).	R4 Sensitive	No	Yes	None[1]
Soft Aster (*Symphyotrichum molle*)	In Wyoming, this species has been found in the Bighorn Mts and Hoback Canyon. It prefers sagebrush grasslands and mountain meadows in calcareous soils at 6,400 to 8,500 feet elevation (Fertig, Refsdal, and Whipple 1994).	R4 Sensitive	No	No	None

Table B-1 (cont'd). Special-status plant species considered in the JHMR Recreation Enhancements Project EA.

Species Name	Habitat Description	Status and Rank	Known Occurrences in the SUP Area	Habitat Present in the SUP Area	Risk (likelihood of effects from proposed action)
Management Indicator Species					
Shultz's milkvetch (*Astragalus shultziorum*)	Distribution centered in Wyoming in the Teton, Salt, and Wind River ranges. Found primarily in subalpine forb communities on shallow, rocky, calcareous soils at elevations of 8,800 to 11,500 feet (Heidel and Fertig 2008a).	MIS, Wyoming Species of Potential Concern	Yes	Yes. The SUP area is within the elevation range, and subalpine forb communities on shallow soils are present.	Low
Quaking aspen (*Populus tremuloides*)	Found throughout the BTNF. It occurs in pure stands, or mixed with subalpine fir, lodgepole pine, Douglas-fir, whitebark pine, or Engelmann spruce. In lower elevations, it forms a mosaic with shrublands (NatureServe 2015).	MIS	Yes	Yes	Low
Wyoming Species of Concern or Species of Potential Concern					
Aromatic pussytoes (*Antennaria aromatica*)	This species is found in crevices on sparsely vegetated ridgelines and summits at and above the timberline on limestone-derived soils at 4,500 to 10,800 feet in elevation (Fertig 2000a).	Wyoming Species of Potential Concern	Yes	Yes	Low
Green spleenwort (*Asplenium trichomanes-ramosum*)	Crevices on north-facing limestone outcroppings in spruce/subalpine fir forests at elevations between 5,800 and 9,900 feet (Fertig 2000b).	Wyoming Species of Concern	Yes	Yes	Low

Table B-1 (cont'd). Special-status plant species considered in the JHMR Recreation Enhancements Project EA.

Species Name	Habitat Description	Status and Rank	Known Occurrences in the SUP Area	Habitat Present in the SUP Area	Risk (likelihood of effects from proposed action)
Railhead milkvetch (*Astragalus terminalis*)	Gravelly outwash terraces, stony or grassy hillsides, and cushion plant communities on summit flats of brownish-sandy clay soil with abundant surface gravel between elevations between 6,400 and 7,500 feet (Heidel and Fertig 2008b).	Wyoming Species of Concern	No	Yes	None[1]
Milk kelloggia (*Kelloggia galioides*)	Woods and open slopes at elevations between 7,100 and 8,200 feet (Markow and Fertig 2008).	Wyoming Species of Concern	Yes	Yes	Low
Broad-leaved twayblade (*Listera convallarioides*)	Margins of waterbodies and other moist areas in coniferous or aspen/alder forests at elevations between 6,400 and 9,000 feet (Markow and Fertig 2000).	Wyoming Species of Concern	Yes	Yes	Low
Large-flower triteleia (*Triteleia grandiflora*)	Grasslands or sagebrush and pinyon-juniper woodlands to pine-forest slopes and hills (NatureServe 2015).	Wyoming Species of Concern	Yes	Yes	Low

[1]Although potential habitat and indicator species associated with this species may be present, it has not been observed at JHMR during mountain-wide plant inventories conducted over the past 21 years.