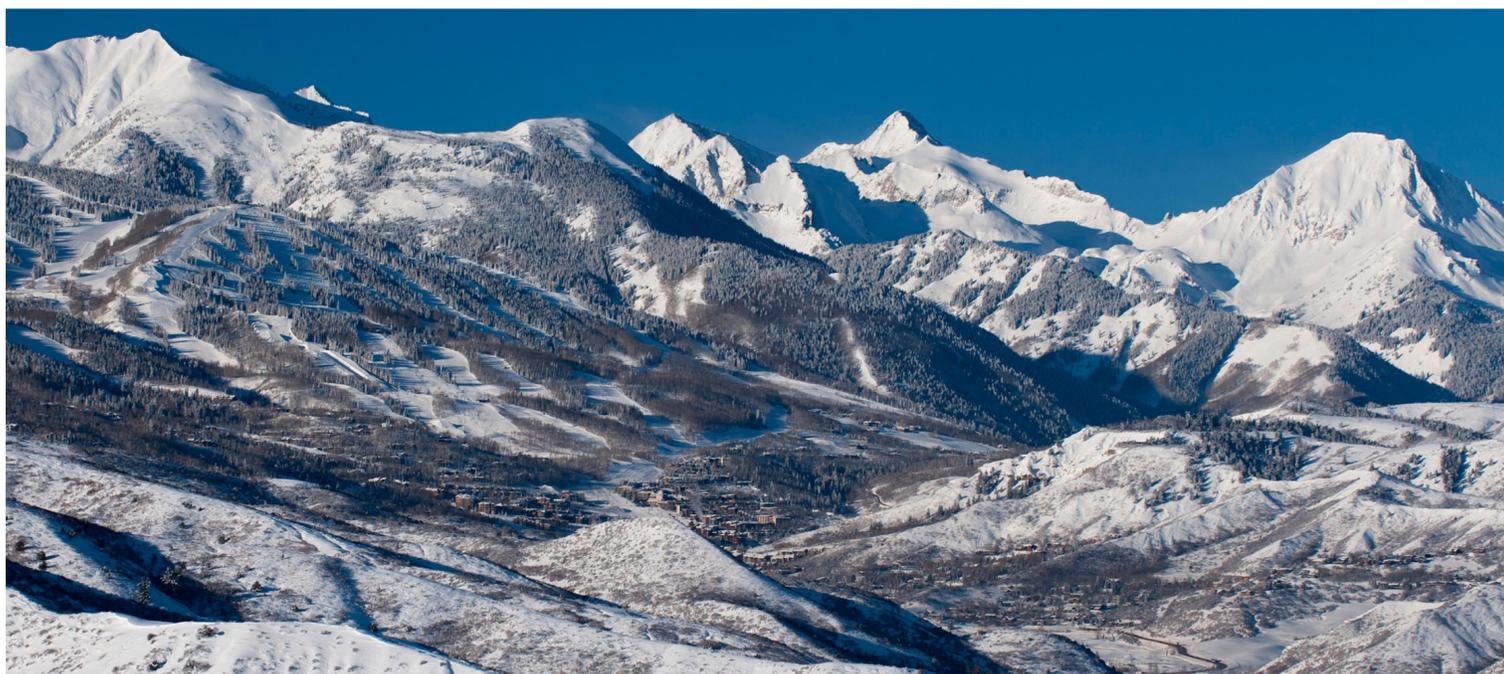


SNOWMASS SKI AREA SNOWMASS SKI TRAIL ENHANCEMENTS AND HIGH ALPINE LIFT REPLACEMENT ENVIRONMENTAL ASSESSMENT



DECEMBER 2014

USDA Forest Service
White River National Forest
Aspen-Sopris Ranger District



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**SNOWMASS SKI AREA
SNOWMASS SKI TRAIL ENHANCEMENTS AND
HIGH ALPINE LIFT REPLACEMENT
ENVIRONMENTAL ASSESSMENT
PITKIN COUNTY, COLORADO**

Proposed Action:
Snowmass Ski Area

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Location:
White River National Forest
Pitkin County, Colorado

Lead Agency:
USDA Forest Service
Aspen-Sopris Ranger District
White River National Forest
Pitkin County, Colorado

Abstract: This Environmental Assessment (EA) has been prepared to analyze a proposal for Snowmass Ski Area (Snowmass) to replace and realign the High Alpine lift, install snowmaking on *Green Cabin* and *Trestle* trails, perform six glading projects across 84 acres of terrain, and develop two new ski trails designed to improve skier circulation across the ski area. The proposed projects are within the existing Snowmass special use permit (SUP) area and are identified in the Snowmass Mountain Master Plan 2014 Addendum.

Snowmass is located on the White River National Forest in Pitkin County, Colorado and operates in accordance with the terms and conditions of a SUP issued by the US Forest Service. This EA discusses the Purpose and Need for the proposal; the process used to identify and develop alternatives; potential direct, indirect, and cumulative impacts of implementing the No Action Alternative (Alternative 1) and Alternative 2; and proposed project design criteria to minimize resource impacts.

Following review of public and agency comments on this EA, the Forest Supervisor will make a final determination as to which alternative best serves the public interest on National Forest System lands. The Selected Alternative can be a modification of alternatives presented.

Important Notice: Only those who submit timely and specific written comments will have eligibility to file an objection under 36 CFR §218.8. For objection eligibility, each individual or representative from each entity submitting timely and specific written comments must either sign the comment or verify identity upon request. Individuals and organizations wishing to be eligible to object must meet the information requirements in 36 CFR §218.25(a)(3). Comments received, including the names and addresses of those who comment, will become part of the public record for this project and will be subject to review pursuant to the Freedom of Information Act.

Comment Period: Specific written comments on the proposed project will be accepted for 30 calendar days following publication of the Legal Notice in the Glenwood Springs Post Independent. The publication date in the newspaper of record is the exclusive means for calculating the comment period. The regulations prohibit extending the length of the comment period. Written comments must be submitted via mail, fax, electronically, or in person (Monday through Friday, 8:00 a.m. to 4:30 p.m., excluding holidays) to: Scott Fitzwilliams, c/o Scott Kaden, Project Leader, 620 Main Street, Carbondale, CO 81623, FAX: (970) 963-1012. Electronic comments including attachments can be submitted to <https://cara.ecosystem-management.org/Public/CommentInput?Project=44643>.

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LIST OF ACRONYMS

AMSL	Above Mean Sea Level
ASC	Aspen Skiing Company
ATV	All Terrain Vehicle
BA	Biological Assessment
BE	Biological Evaluation
BEIG	Built Environment Image Guide
BGEPA	Bald and Golden Eagle Protection Act
BMP	Best Management Practice
CDA	Connected Disturbed Area
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CFS	Cubic Feet per Second
CNHP	Colorado Natural Heritage Program
CPW	Colorado Parks and Wildlife
CSCUSA	Colorado Ski Country USA
CWA	Clean Water Act
CWCB	Colorado Water Conservation Board
DN	Decision Notice
EA	Environmental Assessment
EIS	Environmental Impact Statement
EO	Executive Order
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
FHP	Forest Health Project
FONSI	Finding of No Significant Impact
GIS	Geographic Information System
ID Team	Interdisciplinary Team
LAU	Lynx Analysis Unit
MA	Management Area
MBTA	Migratory Bird Treaty Ac

MIS	Management Indicator Species
MM	Management Measures
MOU	Memorandum of Understanding
NEPA	National Environmental Policy Act of 1969
NFS	National Forest System
PDC	Project Design Criteria
PUD	Planned Unit Development
ROD	Record of Decision
SAOT	Skiers At One Time
SIO	Scenic Integrity Objective
SMS	Scenery Management System
SOLC	Species of Local Concern
SRLA	Southern Rockies Lynx Amendment
SUP	Special Use Permit
SWSD	Snowmass Water and Sanitation District
TES	Threatened, Endangered, and Sensitive
TOSV	Town of Snowmass Village
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
WCPH	Watershed Conservation Practices Handbook
WIZ	Water Influence Zone
WRENSS	Water Resources Evaluation on Non-Point Silviculture Sources
WRNF	White River National Forest

Chapter 1

Purpose and Need

1. PURPOSE AND NEED

A. INTRODUCTION

The set of projects analyzed in this document constitutes a federal action, which has the potential to affect the quality of the physical, biological, and human environment on public lands administered by the United States Forest Service (Forest Service). Therefore, these projects must be analyzed pursuant to the National Environmental Policy Act of 1969 (NEPA). Under NEPA, federal agencies must carefully consider environmental concerns in their decision-making processes and provide relevant information to the public for review and comment.

The White River National Forest (WRNF) has prepared this Environmental Assessment (EA) in compliance with NEPA and other relevant federal and state laws and regulations. This EA contains analyses consistent with NEPA, Council on Environmental Quality (CEQ) regulations, and Forest Service policy. It discloses potential direct, indirect, and cumulative environmental effects on the human and biological environment anticipated to result from implementation of the No Action Alternative and Proposed Action. Additionally, it is intended to ensure that planning reflects the opportunities and constraints posed by the immediate and surrounding area and that it minimizes potential recreation and resource conflicts. The document is organized into six chapters:

- **Chapter 1 – Purpose and Need:** includes information on the history of the project proposal, the purpose of and need for the project, and the proposal for achieving that Purpose and Need. Chapter 1 also details how the Forest Service informed the public of the proposal and how the public responded (scoping).
- **Chapter 2 – Description of Alternatives:** provides a detailed description of the two alternatives that are analyzed in detail—No Action and Proposed Action. This discussion also includes alternatives considered but eliminated from further analysis and mitigation measures.
- **Chapter 3 – Affected Environment and Environmental Consequences:** provides a description of the affected environment (i.e., existing conditions) according to resource area and describes the environmental consequences of implementing the No Action Alternative and the Proposed Action. Chapter 3 is organized by resource topic.
- **Chapter 4 – Consultation and Coordination:** provides a list of preparers and agencies consulted during the preparation of this EA.
- **Chapter 5 – References:** provides complete references for documents cited within this EA.
- **Chapter 6 – Figures:** includes the figures that are referred to throughout the analysis.

Additional documentation, including more detailed analyses of study area resources, may be found in the project file located at the Aspen-Sopris Ranger District office of the WRNF.

B. BACKGROUND

Snowmass Ski Area (Snowmass) is located on the WRNF, approximately 5 miles west-northwest of Aspen, Colorado (refer to the Vicinity Map). Snowmass operates under a special use permit (SUP) administered by the Aspen-Sopris Ranger District of the WRNF. The *2002 White River National Forest Land and Resource Management Plan* (Forest Plan) provides general standards and guidelines for the operation of Snowmass regarding its activities and operations on National Forest System (NFS) lands. The SUP and associated summer and winter operating plans, as well as other resource management documents, provide more specific guidance for annual winter and summer ski area operations and projects.

According to the terms of its SUP, Aspen Skiing Company (ASC) is required to prepare a Master Plan to identify management direction and opportunities for future four-season management of the resort on NFS lands. The current Master Plan—the *Snowmass Mountain Master Plan 2014 Addendum (2014 Master Plan)*—was accepted by the Forest Service in July 2014 as a supplement to the *2003 Snowmass Mountain Master Plan Amendment*. Forest Service acceptance of the 2014 Master Plan does not constitute approval for individual projects. The implementation of individual projects identified in the 2014 Master Plan is contingent upon subsequent site-specific analysis/approval in accordance with the NEPA process.

This Environmental Assessment (EA) analyzes several projects identified in the 2014 Master Plan, including: the High Alpine lift replacement and realignment, *Green Cabin* and *Trestle* trail snowmaking, glading projects across the ski area, and construction of the *Elk Camp Lower Bypass* trail and the *Level 3* trail. The “Alternatives Considered in Detail” section in Chapter 2 provides a full description of this project under the “Alternative 2 – The Proposed Action” heading. Contingent upon the NEPA process, implementation of any approved projects could potentially begin as early as summer 2015.

C. PURPOSE AND NEED OF THE PROPOSED ACTION

The purpose of the proposed projects is to address existing constraints and conditions and further improve the skiing experience at Snowmass Ski Area. The projects would meet the following needs:

- 1. Improve guest circulation in the High Alpine lift pod;**
- 2. Improve the reliability of snow conditions on Green Cabin trail;**
- 3. Expand the variety of gladed terrain offerings for multiple ability levels;**
- 4. Address skier circulation issues in the Elk Camp area; and**
- 5. Facilitate the movement of novice skiers between the Elk Camp Meadows and base areas.**

The existing conditions driving these needs are further described below.

1. Improve guest circulation in the High Alpine lift pod

The existing High Alpine lift is a fixed-grip, two-person lift and is more than 35 years old. It has exceeded its functional capability and does not meet current guest expectations with respect to lift ride time. The existing location of the top and bottom lift terminals do not adequately and efficiently serve surrounding terrain including *Upper Green Cabin* trail. There is a need for a lift alignment and capacity that better meets guest circulation needs in the High Alpine lift pod, improves access to *Upper Green Cabin*, and improves circulation for skiers moving between the *Cirque* area and the *Hanging Valley Wall* area.

2. Improve the reliability of snow conditions on Green Cabin trail

Unreliable snow coverage between the *Big Burn* area and *Green Cabin* trail creates skier circulation challenges and limits ways guests can ski within this area. With a realignment of the High Alpine lift, there is a need for reliable snow conditions on *Green Cabin* to meet anticipated skier densities and use.

3. Expand the variety of gladed terrain offerings for multiple ability levels

The existing gladed terrain at Snowmass is primarily classified at an expert ability level. There is need for intermediate and advanced ability level gladed terrain to provide a gladed ski experience for a variety of ability levels.

4. Address skier circulation issues in the Elk Camp area

Skier congestion frequently occurs in the *Elk Camp* area. For those higher ability level guests traveling through *Elk Camp* to the *Alpine Springs* area, the congestion and high skier densities of this area detracts from the guest experience and can cause skier conflicts. There is a need for reduced congestion in the *Elk Camp* area and alternate means for guests to more directly access the *Alpine Springs* or *Base Village* areas.

5. Facilitate the movement of novice skiers between the Elk Camp Meadows and base areas

Novice skiers using the Elk Camp Meadows area are typically not sufficiently skilled to ski or ride the steeper pitches on *Lower Funnel* trail and typically ride the gondola to Assay Hill for their first experience on Level 3 teaching terrain. There is a need for improved access for Level 3 ski school students between the Elk Camp Meadows and base areas.

D. SCOPE OF ANALYSIS

Scope consists of the range of actions, alternatives, and impacts to be considered within this environmental analysis. It includes the geographical, spatial, and temporal boundaries associated with the actions, alternatives, and impacts. Individual project elements are discussed in detail in Chapter 2. A detailed scope of this environmental analysis is presented at the beginning of each resource section in Chapter 3. The scope of analysis for this proposal is defined by the Snowmass SUP boundary and adjacent NFS lands.

E. INTERAGENCY COORDINATION

In accordance with regulatory direction, and in furtherance of cooperative management among federal agencies charged with oversight of environmental and natural resources; federal, state, local, and tribal entities with a likely interest and/or jurisdiction in the Proposed Action were sent scoping notices and/or consulted prior to and throughout this EA.

F. PUBLIC INVOLVEMENT AND IDENTIFICATION OF ISSUES

In August 2014, a scoping notice was mailed to approximately 45 community residents, interested individuals, public agencies, and other organizations. This notice was specifically designed to elicit comments, concerns, and issues pertaining to the Proposed Action. A legal notice was published on August 28, 2014 in the Glenwood Post Independent, the newspaper of record for the WRNF, announcing the opportunity to comment on the Proposed Action. In order to be most effective, the public was asked to submit comments by September 26, 2014. In response to the Forest Service's solicitations for public comment, 12 letters were received.

From these letters, substantive comments were extracted, entered into a database, and categorized by resource issue. The Forest Service considered the information gathered through public scoping along with the input of the Forest Service Interdisciplinary Team (ID Team) in identifying specific resources that require in-depth analysis in Chapter 3 of this EA. The Forest Service identified specific areas of concern and classified them as being either "*issues*" or "*non-issues*." *Issues* may warrant the generation of an alternative, can be addressed by project design criteria or mitigation, or generally require in-depth analysis and disclosure. *Non-issues* are beyond the scope of the project, are already decided by law, regulation or policy, or are not relevant to the decision.

Each *issue* below includes a list of indicators which were identified as a means of measuring or quantifying the anticipated level of impact on a particular resource. While some indicators are necessarily qualitative in nature, every effort was made to utilize indicators that are quantitative, measurable, and predictable.

THE HUMAN ENVIRONMENT

Recreation

Proposed projects within the Snowmass SUP area have the potential to affect the recreation experience.

Study Area: Snowmass SUP area

Indicators:

- Quantification of existing and proposed terrain acreage (including gladed areas) by ability level
- Discussion, and where possible, quantification of skier circulation across the ski area
- Discussion of ski area boundary management as it related to improvements to gladed terrain adjacent to ski area boundary

Scenery

Development of proposed projects, including associated infrastructure, could be visible from Brush Creek Road and from the Town of Snowmass Village.

Study Area: Snowmass SUP area as visible from identified viewpoints

Indicators:

- Discussion of existing scenic integrity of the Snowmass SUP and potential changes to this condition
- Compliance with Forest Plan standard and guidelines for scenery management within the SUP area and from established viewpoints by meeting Scenic Integrity Objectives
- Compliance with the intent of the Built Environment Image Guide (BEIG) for all proposed structures. Structures should meet Forest Plan scenery guidelines for materials, colors, and reflectivity

THE BIOLOGICAL ENVIRONMENT

Vegetation

Plant communities (including Threatened, Endangered, and Sensitive [TES] species and regionally important plants) may be altered as a result of proposed projects.

Study Area: Snowmass SUP area

Indicators:

- Identification and disclose impacts of any federally listed threatened and endangered species, Forest Service Region 2 sensitive species, and WRNF species of local concern (SOLC) present in the study area
- Quantification (acreage) of proposed ground disturbance and overstory vegetation removal effects by species

- Identify design criteria and BMPs to avoid the spread of noxious or other undesirable weed species and to manage existing populations toward eradication or acceptable levels when eradication is not realistic
- Disclosure and analysis of WRNF noxious weed design features

Wildlife

Development of the proposed projects, including associated infrastructure, would require vegetation removal and could increase human presence within the project area. Increased use of the area, loss of habitat, and habitat fragmentation could disrupt terrestrial wildlife, including TES species and Management Indicator Species (MIS) that may utilize habitat within the Snowmass SUP area.

Study Area: Snowmass SUP area and adjacent NFS lands

Indicators:

- Quantification (acres) and qualification of *existing* wildlife habitat and proposed *alteration, fragmentation, or removal* of wildlife habitat, by species. Include specifically lynx diurnal security habitat, winter forage habitat, and denning habitat
- Disclosure of effects to TES and MIS wildlife species
- Identification of effects within immediate and adjacent Lynx Analysis Units (LAU)
- Identification of impacts to water quality and stream health related to aquatic species through potential increases in sedimentation

Soils/Geology

Ground disturbance associated with construction and operation of proposed projects has potential to increase erosion/soil compaction and lead to a loss of organic material.

Study Area: Areas proposed for ground disturbance throughout the Snowmass SUP area

Indicators:

- Discussion of soil conditions and baseline inventory of soil organic matter
- Identification and estimated quantification (acres) of temporary and permanent ground disturbance according to high/moderate/low erodibility soils classes
- Quantification (acres) of bare/poorly vegetated ground from past ski area construction and ground-disturbing activities
- Quantification of existing rill/gully erosion areas
- Analysis of increased erosion hazard due to temporary and permanent ground disturbance

Watershed and Aquatic Resources

Implementation of terrain modifications associated with proposed projects (vegetation removal, grading, utility installation/burial, snowmaking installation, and road restoration) has the potential to affect stream and riparian health.

Study Area: Snowmass SUP area, including streams tributary to the Roaring Fork River

Indicators:

- Anticipated temporary and permanent changes in water yield (acre feet) and peak flows (cfs), and subsequent watershed effects
- Discussion of existing stream health conditions and water influence zone (WIZ) impacts, within the context of the following stream health metrics: bank stability, fine sediment, residual pool depth, wood frequency, and macroinvertebrates. Evaluation of compliance with Watershed Conservation Practices Handbook (WCPH) and Forest Plan requirements
- Qualitative and quantitative discussion of existing surface drainage conditions within the context of Forest Plan Standards for Management Area 8.25
- Quantification and discussion of existing drainage concerns and treatment areas, including areas of rilling and gulying
- Development and analysis of drainage management measures to maintain or improve stream health
- Quantity (acres) of impacts to WIZ
- Changes (acres) in connected disturbed area (CDA)
- Quantification (acres) of ground disturbing activities located on highly erodible soils as it pertains to stream health
- In-stream flow analysis on Snowmass Creek

Waters of the U.S., including Wetlands

Identified wetlands throughout the project area could be temporarily and/or permanently affected by construction and implementation of proposed projects.

Study Area: Snowmass SUP area

Indicators:

- Area of wetlands and riparian areas existent within the project area (acres/linear feet)
- Disclosure of wetland functions and values within the project area
- Narrative description of wetland communities and riparian areas classifications and disclosure of anticipated temporary and/or permanent impacts (acres/linear feet)

G. ISSUES/RESOURCES ELIMINATED FROM FURTHER ANALYSIS

The ID Team considered the potential impacts on traffic, air quality, environmental justice, social and economic resources, noise, cultural and heritage resources, and special designations such as wilderness; however, it was determined that there would be no measurable effects to these resources from construction and operation of any of the alternatives or measurable difference between the alternatives. Therefore these resources were eliminated from further analysis in the EA. Refer to the introduction to Chapter 3 for additional information.

H. CONSISTENCY WITH FOREST SERVICE POLICY

LAND AND RESOURCE MANAGEMENT PLAN CONSISTENCY

Snowmass operations carried out on NFS lands within the SUP area must comply with the management direction as provided in the 2002 Forest Plan. The Forest Plan includes 33 separate Management Areas (MA) for different portions of the Forest based on ecological conditions, historic development, and anticipated future conditions. The Snowmass SUP area falls within Management Area 8.25: Ski Areas – Existing and Potential, which directs:

“Facilities may be intensively used throughout the year to satisfy a variety of seasonal recreational demands. Base areas that serve as entrance portals are designed as gateways to public lands. Forested areas are managed as sustainable cover with a variety of species and age classes in patterns typical of the natural landscape character of the area. Protection of scenic values is emphasized through application of basic landscape aesthetics and design principles, integrated with forest management and development objectives.”¹

As part of this analysis, the Proposed Action and Purpose and Need were reviewed to determine consistency with the Forest-wide Goals and Objectives as well as the specific Standards and Guidelines for MA 8.25. The Proposed Action was weighed against pertinent Forest-wide and management area standards and guidelines; no inconsistencies between the proposal and pertinent standards and guidelines were identified. The Forest Plan Consistency Analysis is contained in the official project file.

The Purpose and Need is consistent with the 2002 Forest Plan General Recreation Standards and Guidelines. The 2002 Forest Plan acknowledges an increasing demand for recreation on the WRNF, and states,

“Satisfy demand for recreation services that are supplied by private-sector permittees at authorized sites or areas before new sites or areas are permitted.” (p. 2-34)

¹ USDA Forest Service, 2002a

The theme of Management Area 8.25 is discussed in the 2002 Forest Plan:

“Ski areas are developed and operated by the private sector to provide opportunities for intensively managed outdoor recreation activities during all seasons of the year. This management area also includes areas with potential for future development.” (p. 3-80)

FOREST SERVICE MANAGEMENT DIRECTION

The enabling authorities for the Forest Service are contained in many laws enacted by Congress and in the regulations and administrative directives that implement these laws.² These authorities allow the Forest Service to provide recreation opportunities to facilitate the use, enjoyment, and appreciation of National Forests.

The Forest Service is authorized to approve certain uses of NFS lands under the terms of SUPs.³ Generally, SUPs for recreational developments are issued and administered for uses that serve the public, promote public health and safety, and protect the environment.

I. RELATIONSHIP TO PREVIOUS ANALYSES AND APPROVALS

This EA incorporates by reference previous NEPA documents pertaining to activities within the Snowmass SUP area, including:

- 1994 Snowmass Ski Area Environmental Impact Statement and Record of Decision (1994 Snowmass EIS and ROD)
- 2006 Final Environmental Assessment for the Snowmass Ski Area Master Plan Amendment Ski Area Improvements (2006 Snowmass EA)
- 2006 Burnt Mountain Environmental Assessment (2006 Burnt Mountain EA)
- 2013 Snowmass Ski Area Environmental Assessment for the Burnt Mountain Egress Trail (2013 Snowmass EA)

This EA also incorporates previous NEPA documents pertaining to the 8.25 Management Area.

- Final Environmental Impact Statement to accompany the Land and Resource Management Plan – 2002 Revision

J. DECISION TO BE MADE

This EA documents the site-specific environmental analysis for the Proposed Action as well as the No Action Alternative. Based on the analysis documented within this EA, the Responsible Official—Scott

² These laws include: the Organic Administrative Act (1897), the Weeks Act (1911), the Multiple Use Sustained Yield Act (1960), the Forest and Rangeland Renewable Resources Planning Act (1974), the National Forest Management Act (1976), and the National Forest Ski Area Permit Act (1986).

³ 16 USC 497

Fitzwilliams, WRNF Forest Supervisor—will decide whether to allow implementation of the Proposed Action in whole or in part, or select the No Action Alternative. The Responsible Official is not limited to choosing the Proposed Action or the No Action Alternative, but may develop an entirely new alternative created from components of the No Action Alternative and the Proposed Action analyzed in this EA. The decision document will include a determination of the significance of the effects and assess the decision's consistency with the 2002 Forest Plan. Should a Finding of No Significant Impact (FONSI) determination be reached, a decision by the Responsible Official would be documented in a Decision Notice (DN).

In addition to determining whether or not to approve implementation of an action alternative analyzed in this document, the Responsible Official will also specify project design criteria (PDC) to be implemented with the selection of an action alternative. The Responsible Official may also require additional PDC not discussed within this document.

K. OTHER NECESSARY PERMITS, LICENSES, ENTITLEMENTS AND/OR CONSULTATION⁴

This EA is designed to serve as an analysis document for parallel processes at several levels of government. The Forest Service decision would apply only to NFS lands analyzed within this EA. However, potential effects resulting from implementation of an action alternative on lands and activities administered by other federal, state, and local jurisdictions are also disclosed within this EA. The U.S. Army Corps of Engineers (USACE) has developed protocols for the delineation of wetlands. These procedures were followed for the delineation of wetlands within or adjacent to project element areas.

Decisions by jurisdictions to issue or not issue approvals related to this proposal may be aided by the analyses presented in this EA. While the Forest Service assumes no responsibility for enforcing laws, regulations, or ordinances under the jurisdiction of other governmental agencies, Forest Service regulations require permittees to abide by applicable laws and conditions imposed by other jurisdictions. In addition to requisite Forest Service approvals, the following permits or approvals may be required to implement an action alternative:

- US Fish and Wildlife Service, Endangered Species Act (ESA) Informal Section 7 Consultation
- USACE, Clean Water Act 404 Permit
- State of Colorado, Stormwater Management Plan
- State of Colorado, Burn Permit
- Town of Snowmass Village, Planned Unit Development (PUD) Amendment

⁴ Per 40 CFR 1502.25(b)

Chapter 2

Description of Alternatives

2. DESCRIPTION OF ALTERNATIVES

A. INTRODUCTION

Chapter 2 describes the alternatives considered within this environmental analysis. As required by the Council on Environmental Quality (CEQ), the alternatives considered are presented in comparative form.⁵ Chapter 2 defines the issues and provides both the Responsible Official and the public with a clear basis for choice between alternatives. PDC designed to lessen or avoid impacts anticipated to occur as a result of implementation of the action alternative are also outlined.

B. ALTERNATIVES CONSIDERED IN DETAIL

The range of alternatives the Forest Service ID Team considered for this analysis was bound by the Purpose and Need underlying the Proposed Action, as well as by the issues which arose from internal and external scoping (detailed in Chapter 1). NEPA requires that an environmental analysis examine a range of alternatives, which are “reasonably related to the purpose of the project.” Furthermore, Forest Service Handbook 1909.15 directs the ID Team to “consider a full range of reasonable alternatives to the proposed action that address the significant issues and meet the Purpose and Need for the Proposed Action.”⁶ Additional alternatives were considered but were determined to be unreasonable and were therefore eliminated from detailed analysis. A discussion of these alternatives and design components considered but eliminated from detailed analysis is found below, including a brief explanation of the reasons for their elimination, following the discussion of alternatives considered in detail.

ALTERNATIVE 1 – NO ACTION

The No Action Alternative provides a baseline for comparing the effects of the action alternatives. The No Action Alternative essentially reflects a continuation of existing management practices without changes, additions, or upgrades. Specifically, no changes to the High Alpine lift, snowmaking infrastructure, gladed terrain, or developed ski trails would be approved under the No Action Alternative. Figure 1 depicts existing conditions, which would continue under the No Action Alternative.

ALTERNATIVE 2 – THE PROPOSED ACTION

The Proposed Action includes a lift replacement/realignment, additional snowmaking, six areas of gladed skiing, and two new developed ski trails. Specific components of the Proposed Action are listed in the following paragraphs. All proposed facilities would be colored to match the surrounding landscape, using dark summer colors and non-reflective materials. Figure 2 depicts projects contained within the Proposed Action.

⁵ 40 CFR 1502

⁶ USDA Forest Service, 2008

Following the scoping period, some minor changes were made to the Proposed Action in response to resource issues and the availability of additional site-specific design information. In particular, the layout of the *Elk Camp Bypass* trail was modified to reflect an updated grading plan, and the acreage of proposed improvements to *Sneaky's Glade* was reduced in order to reduce impacts to Canada lynx habitat.

High Alpine Lift Replacement/Realignment

The existing fixed-grip, two-person, High Alpine lift would be replaced with a detachable-grip, four-person lift in a new alignment. Chairs would be spaced so as to maintain the existing uphill capacity of the lift—1,200 persons per hour (pph). The bottom terminal is proposed on *Upper Green Cabin* trail, approximately 1,000 linear feet downhill and northwest of the High Alpine Restaurant. The top terminal would be located approximately 500 linear feet uphill and southwest of the existing High Alpine lift top terminal. The proposed lift would require approximately 6 acres of vegetation clearing and approximately 2 acres of grading. The existing top terminal location would be returned to natural grade and the existing lift line would be reclaimed, as would the road cut from the existing top terminal to the ski patrol building. The proposed lift corridor would require a minimum 60-foot clearing width. Clearing distances from each side of the lift centerline would be feathered, mimicking natural forest edges.

The proposed lift realignment would improve access to *Upper Green Cabin*, provide more convenient access for skiers moving between the *Cirque* and the *Hanging Valley Wall*, and provide additional terrain along the new lift line corridor and associated gladed areas. Current access to the *Hanging Valley Wall* would not change.

Construction and maintenance access to the top terminal would be provided via an existing road and a proposed road spur that generally follows *Upper Green Cabin*. The existing road to the top terminal location would be improved (including rock removal and limited grading) to a width of 12 feet to allow for service access by vehicles no larger than pick-up trucks and ATVs. In order to maintain a sustainable slope, cut and fill grading would be necessary just west of the High Alpine Restaurant. Major top terminal lift components would be transported to the summit via bulldozer directly up *Upper Green Cabin*. To access the proposed bottom terminal location, the abandoned road down *Green Cabin* would be improved and realigned, essentially creating a new road.

Snowmaking

Snowmaking is proposed on *Green Cabin* from the Sheer Bliss Pond to the top terminal of the Alpine Springs lift in order to assure reliable snow coverage. Snowmaking is also proposed on *Trestle*, from the point where the Big Burn lift crosses *Trestle* to the intersection of *Trestle* and *Green Cabin*. Snowmaking guns would not be located on the bridge on *Trestle*, but snowmaking on either side would be used to supply snow coverage for the bridge. The water line would be insulated and suspended below the bridge.

In total, approximately 26 acres of terrain are proposed for snowmaking. Approximately 8,400 feet of water lines, air lines, and electrical lines would be installed to facilitate this snowmaking.

Glading Projects

Six areas of gladed skiing projects, totaling approximately 84 acres, are proposed for implementation. Approximately 30 to 40 percent of tree basal area would be cleared from gladed areas; however, some areas are naturally gladed and would require little tree removal. Glading would be conducted in a way that opens skiable lines while maintaining the age and species class diversity of existing tree stands. Trees would be removed via skidding where possible (i.e., where there are roads in the vicinity of the project) or other methods including, but not limited to, bucking, chipping, or burning. See the “Logging Methods” section below for a location-specific description of how trees would be removed. All of the proposed gladed areas are currently skied to varying degrees.

Sneaky’s Glade

Sneaky’s Glade is an intermediate gladed area near the western operational boundary of the ski area. The upper section of this glade would be thinned. The project would result in approximately 14 acres of glading.

Freefall/Glissade Glade

Freefall/Glissade Glade is an advanced gladed area on the skier’s right side of *Garrett Gulch*. The area between *Freefall* and *Glissade* would be gladed to improve the transition from the bottom of *Freefall* to the top of *Glissade*. This project would result in approximately 9 acres of glading.

Reidar’s Glade

Reidar’s Glade is an advanced gladed area on the skier’s right side of the lower portion of *Reidar’s Run*. Additional clearing would occur within this natural glade to expand the overall glade skiing opportunities in this area. This project would result in approximately 29 acres of glading.

Castle Glade

Castle Glade is an expert gladed area between *Baby Ruth* and *Hanging Valley Glade*. This project would result in approximately 9 acres of glading.

Long Shot Glade

The *Long Shot Glade* would be located on the skier’s left side of *Long Shot* and would provide approximately 15 acres of intermediate level gladed skiing.

Upper Green Cabin Glade

The *Upper Green Cabin Glade* would be located on the skier’s left side of *Upper Green Cabin* and would provide approximately 8 acres of intermediate level gladed skiing.

Developed Trails

Elk Camp Lower Bypass Trail

The proposed *Elk Camp Lower Bypass* trail would connect *Turkey Trot* with *Adam's Avenue*. The *Elk Camp Lower Bypass* would diverge from *Turkey Trot* to the left immediately south of Rayburn's Pond and intersect *Adam's Avenue* on the west side of *Funnel*. The proposed trail would reduce congestion around the Elk Camp Restaurant and the Elk Camp lift loading area by allowing advanced skiers to bypass this area and return more directly to the Alpine Springs or Base Village areas. This trail would circumvent a long flat area near Elk Camp. In addition to eliminating this flat section, the trail would reduce the total length of the trip between *Hanging Valley Wall* and the Alpine Springs lift by more than 0.3 mile. Approximately 2 acres of vegetation removal and 1 acre of grading would be necessary to construct this trail.

Level 3 Trail

A new trail would be constructed between *Funnel* and *Naked Lady* to facilitate movement of Level 3 ski school students from Elk Camp Meadows to the base area. Currently, the steeper pitches on *Lower Funnel* prevent some ski school students from skiing down from Elk Camp Meadows to Level 3 terrain on Assay Hill, the next area of ski school progression. The trail would use existing portions of *Funnel Bypass*, *Funnel*, and *No Name*. From *No Name*, the trail would traverse approximately 500 feet of terrain to the existing lower portion of *Naked Lady*.

The proposed trail would average 30 feet wide, and would require approximately 1 acre of vegetation clearing and less than 1 acre of grading.

Logging Methods

To remove cleared overstory vegetation from the proposed High Alpine lift line, six areas of glading, and two developed ski trails, as described in the Proposed Action, ASC would implement any of following logging methods. Prior to implementation, consideration would be taken to choose the method, or combination of methods, that would be both practical and would minimize resource impacts. The potential options for each site, as identified below, allow for flexibility and are attentive to location-specific conditions.

High Alpine Lift Replacement Lift Line (above 10,500 feet elevation)

Along the upper portion of the proposed lift line, the terrain is relatively steep with limited road access. The preferred method for timber removal would be aerial logging by a "Highline Cable" process. The secondary method would be aerial logging by helicopter. The tertiary method would be skidding timber over snow, if the timing of implementation is appropriate. For all methods, timber would be transferred to a log deck adjacent to the intersection of the construction access road and lift line. From this location, timber would be transported off-site. Slash generated through the clearing process would be chipped or

burned. If slash is chipped, wood chips would be applied to the forest floor (to a maximum depth of 3 inches) as they will eventually decompose and become part of the soil organic matter. This process would help meet Forest Service policy direction of maintaining/improving levels of soil organic matter and nutrients on all lands. If burned, slash would be burned either on site or near the log deck (provided the trees are delivered to the log deck with branches attached).

High Alpine Lift Replacement Lift Line (below 10,500 feet elevation)

Along lower portions of the proposed lift line, the terrain is flatter and timber removal would be accomplished by conventional means using heavy equipment (e.g., log skidder, skid steer, etc.). The access road to the lower terminal nearly parallels the lower portion of the lift line so that log decks could be situated at various locations for pick-up by a logging truck. Slash would be chipped or burned.

Long Shot, Castle, Reidar's, and Freefall/Glissade Glades

These four areas of proposed glading are relatively remote with no convenient road access, and are situated on steep terrain. Because the proposed glading in these areas would remove 30 to 40 percent of tree basal area—including live, standing dead, and fallen dead trees—variable methods of timber removal would be used. Methods would include aerial helicopter logging (primarily for merchantable timber), stacking of bucked sections of smaller trees, burning, and/or chipping.

Upper Green Cabin and Sneaky's Glades

These two areas are relatively flat and accessible from nearby roads. Therefore, timber removal would likely occur by conventional means using heavy equipment. However, once more specific and detailed project planning is complete, a portion of the timber removal in these areas could also be accomplished by helicopter.

Elk Camp Lower Bypass and Level 3 Trails

These two proposed ski trails are located near existing roads. Timber removal would likely occur by conventional means using heavy equipment. Heavy equipment would not cross stream channels and/or wetlands within project areas.

ALTERNATIVES AND DESIGN COMPONENTS CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

The range of alternatives considered by the Responsible Official includes all reasonable alternatives to the Proposed Action that are analyzed in the document, as well as other alternatives eliminated from detailed study. Alternatives not considered in detail may include, but are not limited to, those that fail to meet the

Purpose and Need, are technologically infeasible or illegal, or would result in an unreasonable environmental harm.⁷ These alternatives are discussed below.

Do Not Replace High Alpine Lift

Commenters suggested that the High Alpine lift should remain in its current condition, as a fixed-grip double lift, expressing concern that the installation of a detachable quad lift could attract lower ability level skiers and lead to increased instances of injury on the terrain in this pod. Commenters suggested that the corridor of the realigned lift, and associated tree removal, would disrupt the recreation experience on *Upper Green Cabin* and *Reidar's Glades*. Furthermore, commenters expressed concern that an upgraded lift would increase the capacity of the lift and associated terrain, thereby diminishing the skiing experience. This alternative was eliminated from detailed analysis because it would not address the Purpose and Need related to skier circulation in the High Alpine pod. Additionally, chairs on the proposed lift would be spaced in such a way so as not to increase capacity compared to existing conditions. Additionally, signage could be used to educate skiers about the difficult nature of the terrain, thereby minimizing increases in risk.

Do Not Improve Gladed Terrain Areas

Commenters suggested that there should not be any further improvements to gladed terrain, expressing concern that improvements to gladed areas could displace wildlife, eliminate habitat, and create a less-natural recreation experience. This alternative was eliminated from detailed analysis because it would not meet the Purpose and Need to expand the variety of gladed terrain options for lower ability level skiers. Additional tree removal in gladed areas can help to make the terrain more approachable and suitable for less-advanced skiers.

More Groomed Advanced or Expert Terrain

Commenters suggested that there is a need for additional groomed advanced and/or expert terrain. This alternative was eliminated from detailed analysis because it does not meet the Purpose and Need of the project and the proposed glading projects would improve the variety of terrain options. Additionally, this suggestion represents an operational alternative which would not require NEPA analysis.

Replace High Alpine Lift with Newer Fixed-Grip Technology

Commenters suggested that the High Alpine lift be replaced with newer fixed-grip technology, but not realigned. By replacing this lift with similar technology in the same alignment, skier circulation would remain unaltered. This design component was eliminated from detailed analysis because it would not meet the Purpose and Need of improving guest circulation in the High Alpine lift pod. In particular, this alternative would not reduce the lift ride time.

⁷ Ibid.

ALTERNATIVE COMPARISON MATRIX

Table 2-1 is provided to aid the reader in comparing and contrasting each of the alternatives by project element.

**Table 2-1:
Alternative Comparison**

	Alternative 1 No Action	Alternative 2 Proposed Action
GLADED SKI TERRAIN		
Beginner (acres)	0	0
Intermediate (acres)	0	37
Advanced (acres)	0	38
Expert (acres)	0	9
<i>Total (acres)^a</i>	<i>0</i>	<i>84</i>
HIGH ALPINE LIFT REPLACEMENT^b		
Lift Type	Fixed-grip double	Detachable-grip quad
Uphill Capacity (pph)	1,200	1,200
Length (feet)	4,589	5,285
Vertical Gain (feet)	1,387	1,645
Bottom Terminal Elevation (feet)	10,405	10,221
Top Terminal Elevation (feet)	11,792	11,866
Vegetation Clearing (acres)	0	6
Grading (acres)	0	2
SNOWMAKING		
Coverage Area (acres)	0	26
Length of Snowmaking Pipe (feet)	0	8,400
Grading (acres)	0	6
ELK CAMP LOWER BYPASS TRAIL		
Vegetation Clearing (acres)	0	2
Grading (acres)	0	1
LEVEL 3 TRAIL		
Vegetation Clearing (acres)	0	1
Grading (acres)	0	<1

^a Some portions of proposed gladed projects overlap with existing gladed areas and therefore would not add to the total of gladed terrain at Snowmass.

^b Under Alternative 1, the existing High Alpine lift would remain. The information for the Alternative 1 – High Alpine Lift Replacement project depicts the existing condition that would remain.

C. SUMMARY COMPARISON OF ENVIRONMENTAL CONSEQUENCES BY ALTERNATIVE

For the purpose of comparison, the environmental consequences associated with implementation of the previously described alternatives are summarized in Table 2-2. For detailed discussions of potential effects resulting from implementation of either of the alternatives, including cumulative effects, refer to Chapter 3.

**Table 2-2:
Summary Comparison of Direct and Indirect Environmental Consequences**

Alternative 1			Alternative 2																																						
RECREATION																																									
Issue: Proposed projects within the Snowmass SUP area have the potential to affect the recreation experience.																																									
<i>Indicator: Quantification of existing and proposed terrain acreage (including gladed areas) by ability level</i>																																									
<table border="1"> <thead> <tr> <th>Ability Level</th> <th>Existing Developed Ski Trails (acres)</th> <th>Existing Gladed Ski Terrain (acres)</th> </tr> </thead> <tbody> <tr> <td>Beginner</td> <td>200</td> <td>0</td> </tr> <tr> <td>Intermediate</td> <td>1,499</td> <td>67</td> </tr> <tr> <td>Advanced</td> <td>340</td> <td>226</td> </tr> <tr> <td>Expert</td> <td>895</td> <td>105</td> </tr> <tr> <td>Total</td> <td>2,934</td> <td>398</td> </tr> </tbody> </table>			Ability Level	Existing Developed Ski Trails (acres)	Existing Gladed Ski Terrain (acres)	Beginner	200	0	Intermediate	1,499	67	Advanced	340	226	Expert	895	105	Total	2,934	398	<table border="1"> <thead> <tr> <th>Ability Level</th> <th>Developed Ski Trails (acres)</th> <th>Gladed Ski Terrain (acres)</th> </tr> </thead> <tbody> <tr> <td>Beginner</td> <td>201</td> <td>0</td> </tr> <tr> <td>Intermediate</td> <td>1,501</td> <td>93</td> </tr> <tr> <td>Advanced</td> <td>340</td> <td>254</td> </tr> <tr> <td>Expert</td> <td>895</td> <td>114</td> </tr> <tr> <td>Total</td> <td>2,937</td> <td>461</td> </tr> </tbody> </table> <p>Note: the difference between proposed and existing gladed terrain according to these tables is 63 acres. This differs from the total acreage of proposed glading projects (84 acres) due to areas of overlap between proposed and existing glades.</p>			Ability Level	Developed Ski Trails (acres)	Gladed Ski Terrain (acres)	Beginner	201	0	Intermediate	1,501	93	Advanced	340	254	Expert	895	114	Total	2,937	461
Ability Level	Existing Developed Ski Trails (acres)	Existing Gladed Ski Terrain (acres)																																							
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Total	2,937	461																																							
<i>Indicator: Discussion, and where possible, quantification of skier circulation across the ski area</i>																																									
<p>Skier circulation is poor in the High Alpine lift area due to the long lift ride time and difficulty of traversing to Upper Green Cabin. Additionally, circulation is poor between the <i>Cirque</i>, <i>Upper Green Cabin</i>, <i>Hanging Valley Wall</i>, and <i>Elk Camp</i>.</p>			<p>The replacement and realignment of the High Alpine lift would improve skier circulation in the High Alpine pod and would facilitate circulation between the <i>Cirque</i> and <i>Hanging Valley Wall</i>. The proposed <i>Elk Camp Lower Bypass</i> trail would alleviate skier congestion near Elk Camp and improve the experience for skiers round-tripping <i>Hanging Valley Wall</i>. The proposed <i>Level 3</i> trail would improve circulation for beginner skiers moving from the Elk Camp Meadows area to Assay Hill.</p>																																						

**Table 2-2:
Summary Comparison of Direct and Indirect Environmental Consequences**

Alternative 1	Alternative 2
<i>Indicator: Discussion of ski area boundary management as it relates to improvements to gladed terrain adjacent to ski area boundary</i>	
The Snowmass operational boundary is roped and signed as closed. Access to areas outside of the operational boundary occurs via resort exit points.	Additional glading of terrain along the western operational boundary could increase trespasses into closed areas, increase human use of wilderness areas and bighorn sheep habitat, and require increased boundary management and search and rescue efforts. However, instances of skiers exiting the SUP area are anticipated to be minimal due to the difficult terrain in this area.
SCENERY	
Issue: Development of proposed projects, including associated infrastructure, could be visible from Brush Creek Road and from the Town of Snowmass Village.	
<i>Indicator: Discussion of the existing scenic integrity of the Snowmass SUP and potential changes to this condition</i>	
The Snowmass SUP area is characterized by existing facilities vegetation clearings typical of developed ski areas. Vegetation types are diverse throughout the SUP area.	Proposed trail and lift clearing, and infrastructure projects, would not significantly affect the existing scenic integrity of the SUP area. Although proposed projects would be visible from certain locations, PDC would reduce impacts to scenic integrity.
<i>Indicator: Compliance with Forest Plan standards and guidelines for scenery management within the SUP area and from established viewpoints by meeting Scenic Integrity Objectives</i>	
Existing facilities and ski area-related clearings meet the SIO of <i>Very Low</i> .	Proposed trail and lift clearing, and infrastructure projects, would meet the SIO of <i>Very Low</i> . PDC would ensure that vegetation clearing borrows form and line from natural features, and that new facilities blend with their background.
<i>Indicator: Compliance with the intent of the Built Environment Image Guide (BEIG) for all proposed structures. Structures should meet Forest Plan scenery guidelines for materials, colors and reflectivity.</i>	
N/A	With the application of PDC, new facilities would comply with the BEIG. The terminals and towers of the High Alpine lift would use appropriate materials and would be colored to blend in with the surrounding landscape (in summer).
VEGETATION	
Issue: Plant communities (including Threatened, Endangered, and Sensitive [TES] species and regionally important plants) may be altered as a result of the proposed projects.	
<i>Indicator: Identification and disclose impacts of any federally listed threatened and endangered species, Forest Service Region 2 sensitive species, and WRNF species of local concern (SOLC) present in the study area</i>	
No impact to TES or SOLC.	The projects would result in no effect to TES species and may impact individual Region 2 sensitive <i>Botrychium</i> species.

**Table 2-2:
Summary Comparison of Direct and Indirect Environmental Consequences**

Alternative 1	Alternative 2
<i>Indicator: Quantification (acreage) of proposed ground disturbance and overstory vegetation removal effects by species</i>	
Alternative 1 would result in 0 acre of disturbance.	Alternative 2 would result in approximately 10 acres of grading. Overstory vegetation removal would consist of approximately 8 acres of spruce-fir and 1 acre of aspen. In addition, the glading projects would result in the 30 to 40% removal of spruce-fir forest across 67 acres. Approximately 15 acres of glading projects would occur within areas characterized as barren or forblands. The remaining 2 acres of glading overlap with the High Alpine lift corridor and were analyzed as overstory vegetation removal.
<i>Indicator: Identify design criteria and BMPs to avoid the spread of noxious or other undesirable weed species and to manage existing populations toward eradication or acceptable levels when eradication is not realistic</i>	
Project Design Criteria and the existing weed management plan at Snowmass address existing conditions.	Project Design Criteria are included in Table 2-3.
<i>Indicator: Disclosure and analysis of WRNF noxious weed design features</i>	
With Project Design Criteria applied the spread of noxious weeds within project areas should be managed.	With Project Design Criteria applied the spread of noxious weeds within project areas should be managed.
WILDLIFE	
Issue: Development of the proposed projects, including associated infrastructure, would require vegetation removal and could increase human presence within the project area. Increased use of the area, loss of habitat, and habitat fragmentation could disrupt terrestrial wildlife, including TES species and Management Indicator Species (MIS) that may utilize habitat within the Snowmass SUP area.	
<i>Indicator: Quantification (acres) and qualification of existing wildlife habitat and proposed alteration, fragmentation, or removal of wildlife habitat, by species. Include specifically lynx diurnal security habitat, winter forage habitat, and denning habitat</i>	
No impacts would occur to wildlife habitat.	The landscape is characterized by a mixture of spruce-fir, mixed conifer, aspen, and lodgepole pine forest, in addition to ski trails dominated by grasslands and shrublands, and alpine tundra in the uppermost portions of the permit area, which all provide habitat for a variety of wildlife species. Overstory vegetation removal would consist of approximately 8 acres of spruce-fir and 1 acre of aspen. In addition, the glading projects would result in the 30 to 40% removal of spruce-fir forest across 67 acres and 15 acres of forblands. Approximately 8 acres of forblands and 1 acre of willows would be cleared. Species impacts are disclosed in Table 3D-3 and Table 3D-4. Specific to lynx, 0 acre of impacts to diurnal security habitat; 25 acres of denning habitat would occur (21 acres of which are located within areas proposed for glading); and 8 acres of winter foraging habitat would

**Table 2-2:
Summary Comparison of Direct and Indirect Environmental Consequences**

Alternative 1	Alternative 2
	be impacted (6 acres of which are located within areas proposed for glading).
<i>Indicator: Disclosure of effects to T&E, MIS, and Region 2 sensitive wildlife species</i>	
No impact to threatened and endangered species, MIS or Region 2 sensitive species.	<p><u>Threatened and Endangered</u>: Alternative 2 may affect, but is not likely to adversely affect Canada lynx and would have no effect on Colorado River fish.</p> <p><u>Region 2 Sensitive</u>: For species that have the potential to be present within the project area, Alternative 2 would have no impact on northern goshawk, boreal owl, white-tailed ptarmigan, flammulated owl, and purple martin. For species that have the potential to be present within the project area, Alternative 2 may impact individuals for the following species: marten, hoary bat, pygmy shrew, olive-sided flycatcher, boreal toad, and northern leopard frog.</p> <p><u>MIS</u>: Alternative 2 would have no impact on the ability of the Forest to meet the objectives of improving habitat conditions for identified MIS.</p>
<i>Indicator: Identification of effects within immediate and adjacent lynx analysis units (LAU)</i>	
No impact to LAUs.	Alternative 2 would impact 0.14% of lynx habitat within the LAU.
<i>Indicator: Identification of impacts to water quality and stream health related to aquatic species through potential increases in sedimentation</i>	
No impact to water quality and stream health; therefore, there would be no impact to aquatic species.	The proposed project would not affect aquatic species at the project level.
SOILS AND GEOLOGY RESOURCES	
Issue: Ground disturbance associated with construction and operation of proposed projects has potential to increase erosion/soil compaction and lead to a loss of organic material.	
<i>Indicator: Discussion of soil conditions and baseline inventory of soil organic matter</i>	
<p>Previous disturbance in the watershed includes tree removal and grading associated with ski area infrastructure. In total, nearly 2,000 acres of the SUP area has been cleared for ski area development which has potential to result in a loss of, or degradation to soil organic matter within the analysis area.</p> <p>A bare ground assessment revealed approximately 230 acres of the analysis area could benefit from receiving additional rehabilitation. This rehabilitation would occur through a collaborative effort between ASC and the Forest Service in the future and is separate from this analysis process.</p>	<p>Construction of proposed projects has potential to increase soil compaction, and reduce organic material and water uptake. These impacts could increase erosion hazard within the mapped soil units. Implementation of appropriate PDC would minimize these impacts.</p>

**Table 2-2:
Summary Comparison of Direct and Indirect Environmental Consequences**

Alternative 1	Alternative 2																																																																											
<i>Indicator: Identification and estimated quantification (acres) of temporary and permanent ground disturbance according to high/moderate/low erodibility soils classes</i>																																																																												
<p>Previous disturbance in the analysis area includes tree removal and grading associated with ski area infrastructure such as ski trails, hiking/biking trails, lift installation, roads, and facilities. K-factor values of surface soil horizons range from 0.08 at the low end up to 0.32.</p> <table border="0"> <tr><td>220B</td><td>357.2</td><td>Moderate</td></tr> <tr><td>285D</td><td>21.4</td><td>Low-Moderate</td></tr> <tr><td>338B</td><td>290.9</td><td>Moderate</td></tr> <tr><td>360C</td><td>79.3</td><td>Moderate</td></tr> <tr><td>367B</td><td>345.2</td><td>Low-Moderate</td></tr> <tr><td>376C</td><td>38</td><td>Moderate</td></tr> <tr><td>380B</td><td>228.5</td><td>Low</td></tr> <tr><td>383B</td><td>34</td><td>Moderate</td></tr> <tr><td>385D</td><td>21.3</td><td>Low-Moderate</td></tr> <tr><td>446C</td><td>3.1</td><td>Low</td></tr> <tr><td>932B</td><td>78.9</td><td>Low</td></tr> <tr><td>932D</td><td>1.0</td><td>Low</td></tr> <tr><td>AG 66</td><td>1.0</td><td>Moderate</td></tr> <tr><td>CQ</td><td>92.0</td><td>N/A</td></tr> <tr><td>4-RL</td><td>93.0</td><td>N/A</td></tr> <tr><td>W</td><td>1.3</td><td>N/A</td></tr> </table>	220B	357.2	Moderate	285D	21.4	Low-Moderate	338B	290.9	Moderate	360C	79.3	Moderate	367B	345.2	Low-Moderate	376C	38	Moderate	380B	228.5	Low	383B	34	Moderate	385D	21.3	Low-Moderate	446C	3.1	Low	932B	78.9	Low	932D	1.0	Low	AG 66	1.0	Moderate	CQ	92.0	N/A	4-RL	93.0	N/A	W	1.3	N/A	<p>The Proposed Action would result in some level of ground disturbance (varying between glading, grading, etc.) within soils that have Low to Moderate erodibility. Soils disturbed during tree removal activities would have a range of impacts to erodibility depending on removal technique. Disturbed soils would be rehabilitated in accordance with PDC.</p> <table border="0"> <tr><td>220B</td><td>15.8</td><td>Moderate</td></tr> <tr><td>285D</td><td>8.6</td><td>Low-Moderate</td></tr> <tr><td>338B</td><td>0.6</td><td>Moderate</td></tr> <tr><td>360C</td><td>30.8</td><td>Moderate</td></tr> <tr><td>367B</td><td>37.7</td><td>Low-Moderate</td></tr> <tr><td>380B</td><td>2.5</td><td>Low</td></tr> <tr><td>4-RL</td><td>1.6</td><td>N/A</td></tr> <tr><td>932B</td><td>1.5</td><td>Low</td></tr> <tr><td>932D</td><td>0.5</td><td>Low</td></tr> </table>	220B	15.8	Moderate	285D	8.6	Low-Moderate	338B	0.6	Moderate	360C	30.8	Moderate	367B	37.7	Low-Moderate	380B	2.5	Low	4-RL	1.6	N/A	932B	1.5	Low	932D	0.5	Low
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<i>Indicator: Quantification (acres) of bare/poorly vegetated ground from past ski area construction and ground-disturbing activities</i>																																																																												
<p>Approximately 230 acres of the analysis area could benefit from receiving additional rehabilitation. This rehabilitation would occur through a collaborative effort between ASC and the Forest Service in the future and is separate from this analysis process.</p>	<p>In addition to the approximately 230 acres of currently bare ground, the proposed projects have potential to cause bare ground/poorly vegetated areas within an additional 81 acres of glading, 8.5 acres of tree removal and 10 acres of grading. With implementation of PDCs, rehabilitation of soils and revegetation would minimize increases in bare ground.</p>																																																																											
<i>Indicator: Quantification of existing rill/gully erosion areas</i>																																																																												
<p>No areas existing rilling and gullying have been identified in the analysis area. Continued drainage management would minimize rilling and gullying from ongoing ski area operations.</p>	<p>Tree removal and grading have potential to result in increased overland flow creating areas of rilling and gullying. Application of identified PDC would minimize the risk for future rilling/gullying and is anticipated to ensure consistency with Forest Plan standards.</p>																																																																											

**Table 2-2:
Summary Comparison of Direct and Indirect Environmental Consequences**

Alternative 1	Alternative 2																																
<i>Indicator: Analysis of increased erosion hazard due to temporary and permanent ground disturbance</i>																																	
<p>The susceptibility of soils within the SUP area to irreversible damage to soil productivity from timber harvest ranges from “slight” to “severe” (although primarily the susceptibility is “slight” to “moderately low”).</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>EROSION HAZARD</th> <th>ACRES</th> </tr> </thead> <tbody> <tr> <td>Severe</td> <td>70</td> </tr> <tr> <td>High</td> <td>5</td> </tr> <tr> <td>Moderately High</td> <td>39</td> </tr> <tr> <td>Moderately Low</td> <td>360</td> </tr> <tr> <td>Low</td> <td>901</td> </tr> <tr> <td>Slight</td> <td>622</td> </tr> <tr> <td>Grand Total</td> <td>1998</td> </tr> </tbody> </table>	EROSION HAZARD	ACRES	Severe	70	High	5	Moderately High	39	Moderately Low	360	Low	901	Slight	622	Grand Total	1998	<p>The susceptibility of soils disturbed by the proposed projects to irreversible damage to soil productivity ranges from slight to severe. However, grading, which is associated with the most extensive impacts to ground cover and loss of A-horizon, would only occur in soils mapped as having “slight” to “moderately low” susceptibility. Depending on the methods of tree removal, impacts to ground cover and soil organic matter resulting from glading projects could be minimal. With implementation of identified PDC, impacts would be minimized.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>EROSION HAZARD</th> <th>ACRES</th> </tr> </thead> <tbody> <tr> <td>Severe</td> <td>7</td> </tr> <tr> <td>High</td> <td>1</td> </tr> <tr> <td>Moderately High</td> <td>7</td> </tr> <tr> <td>Moderately Low</td> <td>13</td> </tr> <tr> <td>Low</td> <td>48</td> </tr> <tr> <td>Slight</td> <td>24</td> </tr> <tr> <td>Grand Total</td> <td>100</td> </tr> </tbody> </table>	EROSION HAZARD	ACRES	Severe	7	High	1	Moderately High	7	Moderately Low	13	Low	48	Slight	24	Grand Total	100
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Issue: Implementation of terrain modifications associated with proposed projects (vegetation removal, grading, utility installation/burial, snowmaking installation, and road restoration) has the potential to affect stream and riparian health.																																	
<i>Indicator: Anticipated temporary and permanent changes in water yield (acre feet) and peak flows (cfs), and subsequent watershed effects</i>																																	
No impacts to water yield or peak flows.	Water yields and peak runoff flow rates originating from the study area watersheds would increase up to 2 and 1 percent relative to existing condition. Refer to Table 3F-12 and Table 3F-13 for more information.																																

**Table 2-2:
Summary Comparison of Direct and Indirect Environmental Consequences**

Alternative 1	Alternative 2
<i>Indicator: Discussion of existing stream health conditions and water influence zone (WIZ) impacts, within the context of the following stream health metrics: bank stability, fine sediment, residual pool depth, wood frequency, and macroinvertebrates. Evaluation of compliance with Watershed Conservation Practices Handbook and Forest Plan requirements</i>	
For watersheds in the analysis area, the bank stability metric was determined to be “diminished,” all other metrics were classified as “robust.”	With the implementation of PDCs, the proposed projects would not have a negative impact on existing stream health. PDCs contained in Table 2-3 would ensure compliance with Forest Plan and Watershed Conservation Practices Handbook requirements.
<i>Indicator: Qualitative and quantitative discussion of existing surface drainage conditions within the context of Forest Plan Standards for Management Area 8.25</i>	
Ruts, rill erosion, and evidence of road drainage flowing into the creek were observed in some areas near steep sections of roads and/or road segments proximate to stream channels.	With the implementation of PDCs contained in Table 2-3, there would be minimal impacts to surface drainage conditions and Forest Plan Standards would be met. Additionally, the Forest Service and ASC would coordinate to implement drainage rehabilitation projects to improve drainage conditions across the SUP.
<i>Indicator: Quantification and discussion of existing drainage concerns and treatment areas, including areas of rilling and gullying</i>	
Some incidence of ruts, rill erosion, and evidence of road drainage flowing into the creek were observed. Refer to Table 3F-8 and Table 3F-9 for a quantification of existing CDA.	The implementation of PDCs and future rehabilitation projects would minimize the frequency and severity of drainage concern areas across Snowmass.
<i>Indicator: Development and analysis of drainage management measures to maintain or improve stream health</i>	
No impacts.	PDCs included in Table 2-3 include measures to maintain or improve stream health.
<i>Indicator: Quantity (acres) of impacts to WIZ</i>	
No impacts.	Approximately 0.1 acre of tree clearing and 0.3 acre of grading would occur within the WIZ under the Proposed Action. In addition, about 1.8 acres of glading would take place in the WIZ of East Fork Brush Creek watershed. Approximately 1.5 acres of temporary disturbance associated with installation of snowmaking pipelines would occur within the WIZ.
<i>Indicator: Changes in connected disturbed area (CDA) (acres)</i>	
Certain sections of existing mountain roads within the study watersheds were determined to be connected to the stream network (a total of 1.69 acres).	Impacts within the WIZ (approximately 2.2 acres of permanent impacts and 1.5 acres of temporary impacts) could lead to increased CDA. This acreage of CDA would be reduced with application of required PDCs for erosion and sediment control.
<i>Indicator: Quantification (acres) of ground disturbing activities located on highly erodible soils as it pertains to stream health</i>	
No impact.	No projects are proposed on highly erodible soils.

**Table 2-2:
Summary Comparison of Direct and Indirect Environmental Consequences**

Alternative 1	Alternative 2
<i>Indicator: Instream flow analysis on Snowmass Creek (if necessary)</i>	
<p>Instream flow rights on Snowmass Creek are owned by the Colorado Water Conservation Board (CWCB). Currently, because water needed for snowmaking operations is drawn from Ziegler Reservoir and/or from one or more of the on-mountain storage ponds (and not directly from the Snowmass Creek) impacts to the CWCB decreed instream flow water right on Snowmass Creek are minimized or avoided.</p>	<p>Because the instantaneous demand of snowmaking water would not increase as a result of the proposed snowmaking, impacts to the Snowmass Creek instream flows are not anticipated to occur under the Proposed Action. Snowmass would continue to comply with the CWCB instream flows by utilizing water stored in-priority in Ziegler Reservoir and in its on-mountain storage ponds.</p>
WATERS OF THE U.S., INCLUDING WETLANDS	
Issue: Identified wetlands throughout the project area could be temporarily and/or permanently affected by construction and implementation of proposed projects.	
<i>Indicator: Area of wetlands and riparian areas existent within the project area (acres/linear feet)</i>	
<p>Existing wetlands within project area: 1.35 acres Existing streams within the project area: approximately 1,000 feet</p>	<p>Existing wetlands within project area: 1.35 acres Existing streams within the project area: approximately 1,000 feet (approximately 90% of this total stream length is within areas proposed for glading, the remaining 10% is within areas proposed for ground disturbance)</p>
<i>Indicator: Disclosure of wetland functions and values within the project area</i>	
<p>Wetlands in the project areas provide a variety of ecological functions, including the following:</p> <ol style="list-style-type: none"> 1. Support of wildlife habitat 2. Support of aquatic habitat 3. Flood flow attenuation 4. Short- and long-term water storage 5. Water quality 6. Sediment retention/bank stabilization 7. Production/food web support 	<p>Under the Proposed Action, wetlands in the project areas would continue to provide all of the ecological functions listed under Alternative 1. Most would still function at the level that they do currently. Terrestrial wildlife habitat would continue to be provided for some species such as amphibians and white-crowned sparrow.</p> <p>For riparian tree-nesting birds, such as northern flicker, house wren, blackcapped and mountain chickadees, habitat quality would be decreased by 0.14 acre due to tree clearing in wetland areas.</p>
<i>Indicator: Narrative description of wetland communities and riparian areas classifications and disclosure of anticipated temporary and/or permanent impacts (acres/linear feet)</i>	
<p>Wetland plant communities present within the project areas include palustrine emergent herbaceous wetlands and palustrine shrub wetlands. Under the No Action Alternative, there would be no impacts to these wetlands.</p>	<p>Under the Proposed Action, impacts that fall under the jurisdiction of the Clean Water Act would be limited to 170 square feet of wetland temporarily impacted by installation of the snowmaking system on lower <i>Green Cabin</i>.</p> <p>Additionally, the <i>Elk Camp Lower Bypass</i> trail and <i>Level 3</i> trail would result in <0.5 acre of woody vegetation clearing within wetlands. These impacts would not be subject to regulation under the Clean Water Act.</p>

D. PROJECT DESIGN CRITERIA

In order to minimize potential resource impacts from construction and implementation of the proposed projects, the (PDC) detailed in Table 2-3 have been incorporated into the Proposed Action. PDC were devised by Forest Service specialists in the pre-analysis and analysis phases to reduce potential environmental impacts associated with project elements and ensure compliance with law and/or regulations. They include, but are not limited to, Best Management Practices (BMPs), Forest Plan standards and guidelines, and standard operating procedures. The potential effects of implementing the Proposed Action (disclosed in Chapter 3) assume these PDC are applied.

PDC come from federal, state, and local laws; regulations and policies; forest management plans; scientific recommendations; or from experience in implementing similar projects. The bulk of the PDC provided in Table 2-3 are considered common practices that ski area managers have historically used in alpine and sub-alpine environments to prevent or decrease potential resource impacts. They are highly effective methods that can be planned in advance and adapted to site conditions as needed.

**Table 2-3:
Project Design Criteria and Best Management Practices**

WILDLIFE
Surveys for migratory birds and threatened, endangered, and sensitive species shall be conducted by qualified biologists prior to the construction season if construction activities are proposed to start prior to July 15.
Construction of approved projects should occur, to the extent practicable, outside the portion of the nesting period (March 1 to July 15) of migratory birds (non-Forest Service threatened, endangered, and sensitive species) when active nests are present. Construction may occur within that nesting period if surveys show no nests or altricial young present, or as otherwise approved by the Forest Service Responsible Official.
If flamulated or boreal owl nests are located within project areas, direct mortality of eggs and/or nestlings shall be avoided by conducting tree removal in nesting habitat outside of the May 21 to July 15 nesting period, or as otherwise approved by the Forest Service Responsible Official.
If olive-sided flycatcher nests are located within project areas, direct mortality of eggs and/or nestlings shall be avoided by conducting tree removal in nesting habitat outside of the June 1 to July 15 nesting period, or as otherwise approved by the Forest Service Responsible Official.
Surveys for active raptor nests and avian cavity nesting activity shall be conducted by qualified biologists prior to the construction season. To allow for successful nesting and young rearing, no project ground disturbing activities shall be allowed within a quarter-mile of active raptor nests until after July 31, or as otherwise approved by the Forest Service Responsible Official. To protect breeding adults and young raptors in avian cavity nests, a no-activity buffer of 1 acre around detected cavity trees shall be implemented until July 31, or as otherwise approved by the Forest Service Responsible Official.
To reduce the risk for human/wildlife conflicts in areas where food or trash could be present, all trash containers should be bear proof and any locations that have food products stored outside of a building should have bear proof food containers.
All construction activities should be confined to daylight hours, excluding emergencies.
Construction workers should not be allowed to bring dogs on site during construction.
No food/drink should be kept/stored in construction worker vehicles. All windows should be kept closed and doors locked on all vehicles to prevent bear entry.
Reduce sediment sources (CDA) on existing and proposed trails and stream crossings to prevent impact to aquatic species.
CULTURAL AND HERITAGE RESOURCES
If undocumented historic and/or prehistoric properties are located during ground disturbing activities or planning activities associated with approved construction activities, all construction in the immediate vicinity would cease and they would be treated as specified in 36 CFR §800.11 concerning Properties Discovered During Implementation of an Undertaking.
NOXIOUS WEEDS
Pretreatment of existing infestations with approved herbicides within the project area should be conducted prior to project implementation. Herbicide choices and application rates for treatment are available from the District/Forest Weed Program Manager.
Ensure that prior to moving on to NFS lands all off-road equipment is free of soil, seeds, vegetative matter, or other debris that could contain or hold noxious weed seeds. "Off-road equipment" includes all construction machinery or off highway vehicles, except for trucks, service vehicles, water trucks, pickup trucks, cars, and similar vehicles. Equipment will be inspected prior to entering the Forest to see that it is free of debris.

**Table 2-3:
Project Design Criteria and Best Management Practices**

<p>All disturbed ground will be revegetated with native plant species. Utilize seed mix approved by the Forest Botanist and certified to be free of weed species. Seed mixes that incorporate native plant species similar to those within the project area are desirable. Any mulch used in revegetation efforts must be certified to be free of weed species. Use of wood and other non-straw fibers (i.e., coir, jute, or coconut) mulch and erosion control materials would help meet this objective.</p>
<p>Snowmass will employ a qualified specialist to monitor the project area for three years after completion for presence of invasive plants and successful establishment of desirable vegetation. The qualified specialist will complete an annual report to be submitted to the Forest Service by November 1 for each of the three years of required monitoring. Invasive plants should be retreated, as needed.</p>
<p>VEGETATION</p>
<p>Avoid trampling of native plant communities through designation of formal paths in heavy use areas, and other appropriate means.</p>
<p>Adequately mark leave trees and trail clearing limits to avoid mistakes in clearing limits during construction.</p>
<p>Areas cleared of vegetation alongside trails should be fully reclaimed after construction, where possible.</p>
<p>Implement Forest Service approved revegetation guidelines to all disturbed sites.</p>
<p>Effective ground cover (mulch) upon completion of ground disturbing activities would meet minimum level of the pre-treatment habitat type.</p>
<p>Efforts should be made to retain or transplant seedlings and saplings to other areas to maintain vegetation cover (with regards to lodgepole pine mortality).</p>
<p>Any Engelmann spruce that is felled must be either removed from the area or treated within one year after felling to prevent the buildup of spruce bark beetle. Treatments can include burning, burying or peeling the bark off felled Engelmann spruce.</p>
<p>Consider the health and windthrow potential of residual trees as the major selection factors, when possible, during the selection of trees for removal.</p>
<p>SCENIC RESOURCES</p>
<p>Facility and structure design, scale, color of materials, location, and orientation will be incorporated into proposed buildings and structures to meet or exceed the scenic integrity objective for this project area and the Built Environment Image Guide (BEIG) guidelines.</p>
<p>Facilities or structures including buildings, lift terminals and chairs need to meet reflectivity guidelines. This includes any reflective surfaces (metal, glass, plastics, or other materials with smooth surfaces), that do not blend with the natural environment. They should be covered, painted, stained, chemically treated, etched, sandblasted, corrugated, or otherwise treated to meet the solar reflectivity standards. The specific requirements for reflectivity are as follows: Facilities and structures with exteriors consisting of galvanized metal or other reflective surfaces will be treated or painted dark non-reflective colors that blend with the forest background to meet an average neutral value of 4.5 or less as measured on the Munsell neutral scale. The colors should be muted, subdued colors because they blend well with the natural color scheme. The Forest Service Handbook No. 617, "National Forest Landscape Management for Ski Areas, Volume 2, Chapter 7, refers recommended colors for ski areas on page 37 of that handbook. The colors are darker colors; greens, browns, navy blue, grays and black. Building designs will be submitted to the Forest Service for review and approval through the White River Design Process.</p>
<p>Follow FSM guidelines (Section 2380) and BEIG guidelines:</p> <ul style="list-style-type: none"> • The scenic character will be protected through appropriate siting of buildings and the use of low-impact materials and colors (e.g., indigenous construction materials, such as stone and wood, as well as low-reflective glass and roofing materials). • Remain in context with the landscape (i.e., rustic, craftsman, and country lodge styles). • Architecture, materials, and colors should follow the Forest Service's BEIG.

**Table 2-3:
Project Design Criteria and Best Management Practices**

Avoid straight edges where removing trees. The edges of lift lines, trails and structures, where the vegetation is removed, need to use a variable density cutting (feathering) technique applied to create a more natural edge that blends into the existing vegetative. Edges should be non-linear, and changes in tree heights along the edges of openings should be gradual rather than abrupt. Soften hard edges by selective removal of trees of different ages and heights to produce irregular corridor edges where possible.
Stumps should be cut as low as possible to the ground to avoid safety hazard and to meet scenery objectives.
Re-grade to restore a natural terrain appearance. Where there is disturbed ground for new structures include new buildings, lifts, and associated terminals, towers and foundation placements, road realignments, and water storage ponds and structures including culverts and bridges. Put any excess material back to the area with grading to avoid stockpile of material and maintain a natural appearance at transitions. Any site grading should blend disturbance into the existing topography to achieve a natural appearance and minimize cuts and fills at the transition with proposed grading and existing terrain.
Vegetation should be retained where possible to screen facilities from key viewpoints.
Vegetation should be retained to provide for a variety of species and size classes in order to perpetuate forest cover and provide a more natural appearance.
Utilities must be buried as per Forest Plan Standard.
All disturbed areas shall be revegetated after the site has been satisfactorily prepared. Seeding should be repeated until satisfactory revegetation is accomplished. Reseed with a native seed mixture using a variety of native seed grasses, wildflowers and forbs. Any seed mixes should be approved by the Forest Botanist.
All facilities including trails and signs must meet Forest Service Accessibility Guidelines. Forest Service Outdoor Recreation Accessibility Guidelines: http://www.fs.fed.us/recreation/programs/accessibility/
GEOLOGY AND SOILS
During construction, maintenance and operations, stockpile top soil to the extent possible to maintain organic matter.
Prior to construction, soil surveys will be completed within the disturbance area to ensure no net loss of soil organic matter.
Prior to construction, a detailed site erosion control plan will be prepared. This plan shall include the following components: <ul style="list-style-type: none"> • Silt fences, straw bales, straw wattles, and other standard erosion control BMPs shall be employed to contain sediment onsite. • Jute-netting or appropriate erosion-control matting on steep fill slopes (i.e., land with a slope angle of 35% or greater) will be utilized to protect soils and enhance conditions for vegetation re-establishment. Biodegradable netting (erosion control blankets and matting) should be used; netting should be free of persistent plastic/polypropylene materials. • Promptly revegetate disturbed areas. Seed mixtures and mulches will be free of noxious weeds. To prevent soil erosion, non-persistent, non-native perennials or sterile perennials may be used while native perennials become established. The Forest Service must approve the seed mixtures prior to implementation, unless previously approved seed mixes are employed.
Reclaim disturbed areas promptly when use ends to prevent resource damage and invasion of noxious weeds. Ensure proper drainage, rip compacted areas, and apply a Forest Service-approved seed mix and organic soil amendments to facilitate revegetation.
Use existing roads unless other options will produce less long-term sediment. Reconstruct for long-term soil and drainage stability.
Vegetative buffers will be maintained adjacent to intermittent or perennial drainages and wetlands, to the extent possible. Where avoidance of the vegetative buffer is not possible, disturbance will be minimized.

**Table 2-3:
Project Design Criteria and Best Management Practices**

In all areas where grading or soil disturbance will occur, a reassessment of the quantity (depths) of soil A and/or organic ground cover would be made to ensure no net loss of this material.
Return slash and native organic litter to site, apply imported soil organic matter, and use soil fertility to restore site organic matter and nutrients.
Areas determined to have been compacted by construction activities may require mechanical subsoiling or scarification to the compacted depth to reduce bulk density and restore porosity.
When logging over the snow, conditions should allow for 1 foot of packed snow to be continuous (i.e., not patchy) and competent enough so that wheeled or tracked vehicles do not break through. When logging over frozen ground, a minimum of 3 inches of continuous frozen ground should be present.
Ground cover, as a combination of revegetation, organic amendments and mulch applications, will restore depths of soil A and/or organic ground cover.
Maintain a no net disturbance through offsets and reclamation projects.
Prior to approved construction activities on NFS lands, ASC would prepare the following plans for Forest Service approval: <ul style="list-style-type: none"> • Grading • Erosion control • Pre-construction erosion control/drainage management plans • Post-construction revegetation and rehabilitation plans
Prior to implementation of the <i>Elk Camp Lower Bypass</i> trail, final geotechnical and grading specifications must be provided by a licensed professional engineer to the WRNF for review and approval by the Forest Service soils scientist and/or engineer.
Do not encroach fills or introduce soil into streams, swales, lakes, or wetlands. Install sediment waddles, sediment fencing, retention basins, or other applications before ground-disturbing activities begin. Favor applications that maintain functionality without maintenance, such as sediment retaining wattles. Service sediment retention applications before leaving the site and remove non-natural and non-biodegradable materials. Favor applications that use natural or biodegradable materials that can be left on-site.
Biomass management strategies (chipping/mastication) should adhere to the following protocol: <ul style="list-style-type: none"> • Based on literature review and the best available science, wood chip depth shall not exceed a maximum depth of 3 inches (7.5 cm) and should be applied at a relatively uniform thickness. Rake by hand as necessary to achieve uniform application. • Incorporate needles and/or leaves into chipped biomass to balance nutrient content of wood chips and to mimic the carbon to nitrogen (C:N) ratio of the native forest floor. Ideally, the C:N of applied biomass material should be less than 30:1. • Avoid operations with chipping/mastication equipment during periods of excess soil moisture. Use broad, sweeping turns with equipment, as practicable, to avoid rutting and displacement of soil. • Monitor for invasive weeds following operations with chipping/mastication equipment, particularly Canada thistle (<i>Cirsium avense</i>).
WATERSHED AND WETLANDS
Prior to final approval for constructing the proposed snowmaking infrastructure, the USFS will initiate a review of the Sheer Bliss snowmaking pond to ensure that engineering and design guidelines are met. This will include an evaluation of the adequacy of the existing overflow outlet works. If needed, additional design criteria will be specified to meet design guidelines and to ensure that the overflow drain can operate safely without causing gully erosion or landslides below the overflow discharge.

**Table 2-3:
Project Design Criteria and Best Management Practices**

For grading projects greater than 1 acre, ensure that grading and erosion control plans meet the basic requirements for stormwater permitting through the State of Colorado Stormwater Management Program. Portray nearby wetlands and streams on grading plans. Also, show any BMPs or erosion control measures that would be used to protect streams and wetlands.
For projects that involve grading, define grading limits on the ground before construction by placing wattles, sediment fence, construction fence, or other physical barrier along the perimeter of the area to be graded. Ensure that all grading is confined within the specified grading limits.
For ground-disturbing activities near perennial and intermittent streams, and ephemeral draws, minimize Connected Disturbed Area by ensuring that graded areas, roads, road ditches, and other disturbed areas drain to undisturbed soils rather than directly to streams and ephemeral draws. Manipulate drainage from disturbed areas as necessary using natural topography, rolling dips, waterbars, ditch-relief culverts, etc., to disconnect disturbed areas from streams.
For the lower terminal of the High Alpine lift, which would be located within the WIZ and adjacent to a wetland, construct a retaining wall on the west side of the lift terminal to minimize the footprint of the development within the WIZ and to protect the wetland from unintended disturbance. Grade the lift terminal site to drain away from the stream to prevent direct discharge of sediment from the disturbed area into the stream. Stockpile and re-use topsoil and/or amend soil as needed to maintain pre-disturbance levels of soil organic matter within the WIZ and to promote successful revegetation.
For the installation of snowmaking pipelines within the WIZ, including along the Spring Pitch trail, minimize the disturbance width, install sediment wattles to protect perennial and intermittent streams and stockpile trench spoils on the opposite side of the trench from the stream. Rehabilitate disturbance within the WIZ using soil amendments and biodegradable erosion control fabric to ensure successful revegetation.
Tree removal within the WIZ (Castle Glade, Level 3 Trail, Freefall/Glissade Glade): Fell trees into the inter-trail islands to improve Large Woody Debris density; however, fell trees in a way that protects vegetation in the WIZ from damage.
For logging operations, retain live and dead trees within 100 feet of perennial and intermittent streams, except within designated stream crossings. Locate all landings and skid trails at least 100 feet away from perennial and intermittent streams. Do not skid logs on sustained slopes steeper than 40%. Obliterate skid trails after operations are complete by pulling slash on skid trails; building waterbars where needed; placing barriers within skid trails to prohibit mechanized and motorized use; and seeding skid trails with approved seed mix, where necessary, to establish vegetation. A detailed plan for logging practices and methods (including disposal methods, any temporary roads, log decking locations, etc.) will be established prior to implementation in the summer construction plan.
Keep heavy equipment out of streams, swales, and lakes, except to cross at designated points, build crossings, or do restoration work, or if protected by at least 1 foot of packed snow or 2 inches of frozen soil.
Size culverts to easily pass sediment and debris transported by the stream to be crossed. Do not use culverts less than 18" in diameter to cross any stream channel.
Add or remove rocks, wood, or other material in streams or lakes only if such actions maintains or improves stream health. Avoid altering the stream bed and banks and maintain the natural character of the stream.
Clearly mark all wetlands within the vicinity of any ground disturbing activities or tree felling and ensure that all equipment operators are aware of their presence. Keep ground vehicles out of wetlands unless protected by at least 1 foot of packed snow or 2 inches of frozen soil.
For the installation of snowmaking lines, protect wetlands by locating lines to avoid crossing wetlands, cross with above-ground pipelines, or prepare a wetlands mitigation plan and obtain a 404 permit if wetlands cannot be avoided.
Within areas proposed for glading, tree cutting within wetlands is prohibited. Prior to implementation of glading areas, wetlands should be delineated and flagged.

**Table 2-3:
Project Design Criteria and Best Management Practices**

Do not impact the soil surface of delineated wetlands due to the removal/hauling/dragging of timber from glading areas.
Outslope low standard roads to shed water rather than concentrating water on the road surface or in ditches.
Do not install culverts or conduct ground-disturbing activities near streams during spring runoff, or during periods of heavy precipitation.
Do not locate roads, trails, or other disturbed areas on slopes that show signs of instability, such as slope failure, mass movement, or slumps.
For projects that would increase road traffic, or require road use by heavy construction equipment, apply road surfacing near stream crossings as needed to harden the road surface and minimize sediment delivery to streams.
Do not encroach fills or introduce soil into streams, swales, lakes, or wetlands. Install sediment wattles, sediment fencing, retention basins, or other applications before ground-disturbing activities begin. Favor applications that maintain functionality without maintenance, such as sediment retaining wattles. Service sediment retention applications before leaving the site and remove non-natural and non-biodegradable materials. Favor applications that use natural or biodegradable materials that can be left on-site.
Keep all debris generated by project activities out of ditches, swales, and drainage channels.
Halt construction activities during periods of heavy precipitation or when soils are muddy and prone to rutting and compaction.
FISH AND AQUATIC SPECIES
Provide ecological conditions to sustain viable populations of native and desired non-native species and to achieve objectives for MIS.
Keep vehicles and equipment out of streams, lakes, and wetlands except to cross at designated points or where protected by 1 foot of snowpack or frozen soil. Build crossings and do restoration work, where necessary.
Maintain long-term ground cover, soil structure, water budgets, and flow patterns of wetlands to sustain their ecological function.
Manage stream flows under appropriate authorities to minimize damage to fish and wildlife habitat.

Chapter 3

Affected Environment and Environmental Consequences

3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

CEQ regulations direct agencies to succinctly describe the environment that may be affected by the alternatives under consideration.⁸ As such, Chapter 3 describes the existing environment for resources across the human and biological environments that have the potential to be affected by implementing either of the alternatives. Each Affected Environment description is followed by an Environmental Consequences discussion that provides an analysis of the potential effects of implementation the alternatives.

ORGANIZATION OF CHAPTER 3

Chapter 3 is organized by resource area in the following order:

SCOPE OF ANALYSIS

The Scope of Analysis briefly describes the geographic and/or regulatory as well as temporal bounds of analysis for each resource. The Scope of Analysis varies according to resource area and may be different for direct, indirect and cumulative effects.

AFFECTED ENVIRONMENT

The Affected Environment section provides a description of the existing condition of the environment potentially affected.

DIRECT AND INDIRECT ENVIRONMENTAL CONSEQUENCES

This section provides an analysis of direct and indirect environmental effects of implementing each of the alternatives, according to the issues and indicators identified in Chapter 1.

- Direct effects are caused by the action and occur at the same time and place.
- Indirect effects are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable (i.e., likely to occur within the duration of the project).

CUMULATIVE EFFECTS

Cumulative effects are the result of the incremental direct and indirect effects of any action when added to other past, present, and reasonably foreseeable future actions, and can result from individually minor but collectively significant actions taking place over a period of time.

⁸ 40 CFR 1502.15

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Any irreversible or irretrievable commitment of resources are identified here. An *irreversible* commitment is a permanent or essentially permanent use or loss of resources; it cannot be reversed, except in the extreme long term. Examples include minerals that have been extracted or soil productivity that has been lost. An *irretrievable* commitment is a loss of production or use of resources for a lesser period of time. One example is the use of timber land for a logging road. Timber growth on the land is irretrievably lost while the land is a road, but the timber resource is not irreversibly lost because the land could grow trees in the near future.

DESCRIPTION OF ANALYSIS

This chapter provides detail on both the biological and human environment as based on the issues identified in Chapter 1. Based on an understanding of the proposal, familiarity of the project area and analysis of the issues raised during scoping, the line officer approved the following issues to be considered in detail in this analysis: recreation, scenery resources, vegetation, wildlife, soils and geology, and watershed and wetlands.

The ID Team considered the potential impacts on traffic, air quality, environmental justice, social and economic resources, noise, cultural and heritage resources, and special designations such as wilderness; however, it was determined that there would be no measurable effects to these resources from construction and operation of any of the alternatives or measurable difference between the alternatives. Therefore, these resources were eliminated from further analysis in the EA. Rationale for eliminating these resources is outlined in the following paragraphs.

TRAFFIC

Currently, the approved number of skiers at one time (SAOT) at Snowmass is 13,500 guests, which was approved in the 1994 ROD. Daily visitation is consistently below the approved SAOT, with average day visitation just under 8,000 guests and peak days reaching just over 10,000 guests. The projects described in Alternative 2 would not measurably increase the SAOT of the ski area.

AIR QUALITY

Impacts to air quality from ski area projects are typically tied to increases in traffic, including both construction and visitation. As discussed above, the projects contained in Alternative 2 are not expected to result in measurable increased visitation and associated traffic. Therefore, negligible additional vehicular emissions are anticipated due to visitation. While Alternative 2 would require some construction traffic, the volume would be expected to be minimal, and generally of a similar scale to existing maintenance traffic throughout the Snowmass SUP area. While it is highly unlikely that the proposed projects would result in measurable impacts to regional air quality, it is conceivable that small increases in traffic could result in minor, temporary impacts to local air quality.

ENVIRONMENTAL JUSTICE

Environmental justice speaks to concerns that federal decisions could disproportionately impact people of a particular ethnic or cultural heritage group, or people with low incomes. Environmental Justice is an executive order (EO 12898) that requires, in brief, that each federal agency make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations.

Neither alternative analyzed in this EA is expected to directly or indirectly create disproportionately high and adverse human health or environmental effects on minority and low-income populations. No minority populations were identified in Pitkin County where either: (a) the minority population of the affected area exceeds 50 percent or (b) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis. Likewise, no low-income populations were identified in the affected area.

SOCIAL AND ECONOMIC RESOURCES

As discussed above, the proposed projects are not expected to result in an increase in daily visitation. The projects would not result in job creation at Snowmass, and would not otherwise impact social and economic resources in the area.

NOISE

None of the proposed projects are anticipated to result in noticeable increases in noise within the Snowmass SUP area or adjacent lands. The construction of proposed projects could result in some temporary noise within the Snowmass SUP area. Operational noise of the additional snowmaking would add incrementally to existing noise levels within the Snowmass SUP area, but this additional noise is not anticipated to have an adverse effect.

CULTURAL AND HERITAGE RESOURCES

Cultural and heritage resources were initially considered for analysis because ground disturbance related to construction of the proposed ski trail enhancements and lift replacement/realignment has the potential to impact archeological sites. After a search of previous archaeological inventories and an investigation of new archaeological sites, it was determined that no cultural resources exist within the project area.

SPECIAL DESIGNATIONS INCLUDING WILDERNESS

All proposed projects are located within the Snowmass SUP area, which is managed by the WRNF as Management Area 8.25: Ski Areas – Existing and Potential. There are no specially designated lands within the Snowmass SUP area and no impacts to adjacent Wilderness or Roadless Areas are anticipated. Additional discussion of nearby Wilderness areas is contained in Chapter 3, Section A – Recreation.

A. RECREATION

SCOPE OF ANALYSIS

The spatial scope of the recreation analysis includes the Snowmass SUP area and adjacent public and private lands. The temporal scope of this analysis spans from the ski area's inception in 1965 into the foreseeable future during which Snowmass can be expected to operate. The general timeframe considered is defined by the winter operating season, which typically extends between the end of November and mid-April. No summer recreational use is analyzed here, although summer construction and maintenance is included in the Proposed Action. For a more detailed discussion of existing summer and winter recreational opportunities, refer to the Existing Conditions section of the 2003 Master Plan, as amended and subsequent environmental review documents (located in the project file for this document).

Forest Service Direction

WRNF Forest Plan

The projects analyzed in this document are bound by the 2002 Forest Plan. The project area is located in MA 8.25: Ski Areas – Existing and Potential. The desired condition in MA 8.25 calls for recreational uses to be “intensively managed during the summer and winter seasons.”

Recreation guidelines within MA 8.25 include:

- Resource management activities should minimize impacts to recreational resources within existing permitted sites and areas planned for future development.
- Uses and activities are considered appropriate on National Forest System lands if they enhance natural resource-based recreation opportunities. Facilities are considered appropriate if the preponderance of revenues generated from those facilities is by skiers and snowboarders during the winter season.
- Ski area boundaries may be amended to improve skier safety, avoid physical hazards, manage known avalanche zones, or remain in compliance with Forest Service regional boundary management policies.⁹

AFFECTED ENVIRONMENT

Snowmass offers a variety of skiable terrain suitable for all ability levels and interests. The 4,997-acre SUP area consists of developed, undeveloped (hike-to and off-piste) terrain. Backcountry terrain that exists beyond the SUP area is accessed through designated resort exit points. The SUP area defines the current and potential extent of Snowmass' operations on public lands managed by the WRNF.

⁹ USDA Forest Service, 2002a

Terrain Classification

Snowmass offers a variety of terrain for its guests. The current terrain breakdown by ability level, including gladed terrain, is shown in Table 3A-1.

**Table 3A-1:
Existing Terrain Classification by Ability Level**

Ability Level	Developed Ski Trails (acres)	Gladed Ski Terrain (acres)
Beginner	200	0
Intermediate	1,499	67
Advanced	340	226
Expert	895	105
Total	2,934	398

Intermediate terrain accounts for approximately 47 percent of Snowmass' existing skiable terrain, advanced and expert terrain together account for another 47 percent, and the remaining 6 percent is beginner terrain. Approximately 57 percent of gladed terrain is rated as advanced ability level, with 26 percent rated as expert ability level, and 17 percent rated as intermediate ability level.

Beginner terrain is generally found in the Assay Hill, Fanny Hill, and Elk Camp Meadows areas, along with lower portions of Sam's Knob. Intermediate terrain is spread throughout the ski area, and can be accessed from any lift aside from the Campground lift. Advanced and expert terrain is mainly located in higher-elevation portions of the ski area, as well as in the Campground area.

Skier Circulation

Skier circulation at Snowmass is generally more efficient from east to west, due to topography and existing lift alignments. Existing lift alignments and convergence zones in high-traffic areas make west-to-east skier travel time-consuming from the *Cirque* to Elk Camp, and for skiers making round-trips in the *Hanging Valley Wall* area.

In its current alignment, the High Alpine lift is not accessible from the *Cirque* and *Upper Green Cabin*. Skiers traveling between the *Cirque* and *Hanging Valley Wall* areas currently need to descend to the Alpine Springs lift which is long and inefficient. Similarly, skiers traveling to Elk Camp from the *Cirque* and *Upper Green Cabin* must descend to the base village and ride the Elk Camp Gondola.

Skiers wishing to round-trip ski *Hanging Valley Wall* must travel through the Elk Camp area to access *Adam's Avenue* and the Alpine Springs lift. This creates additional traffic in the Elk Camp area that is heavily utilized both by beginners and by more advanced guests skiing terrain associated with the Elk Camp and Two Creeks lifts.

Level 1 and 2 ski school classes use the Elk Camp Meadows learning area to develop skills before progressing to Level 3 terrain on Assay Hill. Level 2 skiers who are ready to progress to Assay Hill currently download to the mid-station of the Elk Camp Gondola to access Assay Hill because the steep portions of *Funnel* are too challenging for beginner skiers.

Ski Area Boundary Management

Snowmass' operational boundary is identified on official trail maps, and is roped and signed as closed on the ground. The roped closure is enforced by Snowmass Ski Patrol. Skiers wishing to access areas outside of the operational boundary must use resort exit points, which are situated at various locations along the operational boundary. Areas outside of the operational boundary are not managed, maintained, or patrolled by Snowmass Ski Patrol.

DIRECT AND INDIRECT ENVIRONMENTAL CONSEQUENCES

Alternative 1 – No Action

Under the No Action Alternative, the recreation experience would remain unchanged within the Snowmass SUP area. Terrain classification would not change, and skier circulation and ski area boundary management would continue under existing conditions.

Alternative 2 – Proposed Action

Terrain Classification

The Proposed Action would result in an increase in intermediate, advanced, and expert ability level terrain, specifically gladed terrain. While the proposed glading projects would total approximately 84 acres, approximately 21 acres of these improvements would occur within existing glades and would not add to the total acreage of gladed ski terrain at Snowmass. The proposed glading within this 21 acres would be an overall improvement to the skiing experience. Intermediate gladed terrain would increase by approximately 26 acres, from 67 acres to 93 acres. Advanced gladed terrain would increase by approximately 28 acres, from 226 acres to 254 acres. Expert gladed terrain would increase by approximately 9 acres, from 105 acres to 114 acres. Increases in gladed terrain, particularly for intermediate ability level skiers, would provide a wider range of skiing options for Snowmass guests. While the thinning of glades would diversify the types of gladed terrain offered at Snowmass, it could affect the current skiing experience offered to upper ability level skiers, and they may seek more challenging terrain elsewhere.

The Proposed Action also includes two developed ski trails. The proposed *Elk Camp Lower Bypass* trail would add approximately 2 acres of intermediate terrain and the *Level 3* trail would add approximately 1 acre of beginner terrain.

Table 3A-2 shows proposed terrain classification and acreage by ability level.

**Table 3A-2:
Proposed Terrain Classification by Ability Level**

Ability Level	Developed Ski Trails (acres)	Gladed Ski Terrain (acres)
Beginner	201	0
Intermediate	1,501	93
Advanced	340	254
Expert	895	114
Total	2,937	461

Skier Circulation

The Proposed Action would improve skier circulation in the High Alpine, Elk Camp, and Alpine Springs areas, thus enhancing natural resource-based recreation opportunities. The realigned High Alpine lift would enable advanced ability level skiers descending *Upper Green Cabin* or the *Cirque* to access the *Hanging Valley Wall*, Elk Camp, and Burnt Mountain in a more efficient manner. The new lift would result in a shorter lift ride time, thereby facilitating skier movement in this area and improving the overall guest experience. Intermediate skiers would still need to descend to either the Alpine Springs lift or Elk Camp Gondola, as all terrain east of the top terminal of the High Alpine lift is rated as advanced or expert. Because the capacity of the proposed lift would remain at 1,200 pph, skier utilization of adjacent terrain would not increase on peak visitor days. However, the more efficient lift alignment could result in increased utilization of the lift, potentially leading to longer lift lines on peak days (approximately five days per year) and increased skier utilization of adjacent terrain on non-peak days. Access to *Hanging Valley Wall* would not change with the new lift alignment; skiers would still need to hike a short distance to reach this terrain.

The realigned High Alpine lift would allow skiers to round-trip ski *Upper Green Cabin*, which is one of the most popular intermediate trails at Snowmass. This could increase intermediate ability level skier utilization of this portion of the SUP area, particularly with the addition of the proposed *Upper Green Cabin Glade*. The proposed snowmaking projects on *Green Cabin* and *Trestle* would improve the reliability of snow conditions in this area to maintain the quality of the recreational experience and meet the demands of increased utilization.

The *Elk Camp Lower Bypass* trail would enable skiers to avoid the busy Elk Camp area, thus eliminating some of the skier congestion that currently occurs there. This trail could reduce conflicts between advanced skiers and beginner skiers in the Elk Camp area. Because the *Elk Camp Lower Bypass* trail would reduce the distance from the *Hanging Valley Wall* to the Alpine Springs lift by 0.3 mile, it would allow for more efficient round-trip skiing of the *Hanging Valley Wall*.

The *Level 3* trail would facilitate movement of Level 3 ski school students from Elk Camp Meadows to the base area. This trail would allow ski school students who are not skilled enough to descend steeper pitches on *Funnel* to continue their descent to the base area and Assay Hill via the lower portions of *Naked Lady* and *Funnel Bypass*. Ski school students would be able to ski to the base area rather than downloading on the Elk Camp Gondola to the midway unloading station to access Level 3 terrain on Assay Hill. This would improve the recreational experience for beginner skiers at Snowmass.

Ski Area Boundary Management

The additional thinning of gladed areas adjacent to the existing Snowmass operational boundary, specifically *Sneaky's Glade*, could potentially increase skier interaction with the ski area operational boundary. Although boundaries are roped and signed as closed, any increase in skier activity adjacent to a boundary would have the potential to increase trespasses into closed areas, resulting in a need for additional management activities for Snowmass Ski Patrol along operational boundaries.

Immediately to the west of *Sneaky's Glade*, the terrain drops steeply approximately 1,000 feet through a mix of forested and open slopes to East Snowmass Creek. A majority of the area between *Sneaky's Glade* and East Snowmass Creek is within the Maroon Bells-Snowmass Wilderness, designated as MA 1.12 – Primitive Wilderness in the 2002 Forest Plan. In addition to its wilderness designation, a portion of the area is also designated MA 5.42 – Bighorn Sheep Habitat. Thus, in addition to providing a moderately high degree of solitude for recreationists, the area provides escape, forage, and solitude for bighorn sheep herds.¹⁰ An increased skier presence in this area would affect each of these qualities.

However, the steep and rugged nature of the terrain west of *Sneaky's Glade* would likely discourage skiers from exiting the operational boundary at this location. *Sneaky's Glade* is an intermediate level glade, thus it is unlikely that skiers would feel inclined to exit the ski area. If intermediate skiers did cross the ski area boundary they would access terrain above their ability level. This would result in potential exposure to avalanche danger and increased search and rescue efforts on the part of local agencies. The area's wilderness designation would curtail certain rescue efforts, and rescue efforts would affect wilderness character.

CUMULATIVE EFFECTS

Scope of Analysis

Temporal Bounds

The temporal bounds for this cumulative effects analysis extend from 2002, with the allocation of the project area as MA 8.25 in the Forest Plan, through the foreseeable future in which Snowmass can be

¹⁰ Ibid.

expected to operate. (The Snowmass 40-year SUP expires December 31, 2034; however, this analysis assumes the SUP would be reissued after the 2034 date.)

Spatial Bounds

The spatial bounds for this cumulative effects analysis includes NFS lands within the Snowmass SUP area.

Past, Present, and Reasonably Foreseeable Future Actions

- 1994 Environmental Impact Statement
- 2002 Forest Plan
- 2003 Snowmass Mountain Master Plan, as amended
- 2006 Ski Area Improvements EA
- 2006 Burnt Mountain EA
- 2013 Burnt Mountain Egress Trail EA
- 2014 Categorical Exclusions
- Snowmass Mountain Master Plan 2014 Addendum

1994 Environmental Impact Statement

Development of glades and ski trails in the Burnt Mountain portion of the Snowmass SUP area was proposed in the 1994 *Snowmass Ski Area Environmental Impact Statement* (1994 EIS).¹¹ Among other projects identified in the 1994 EIS, the *Long Shot* trail and the Two Creeks lift and trails were developed in the Burnt Mountain area. The approval of this project resulted in increased skier utilization of eastern portions of the ski area. The implementation of Alternative 2 could further increase skier utilization of the *Hanging Valley Wall*, Elk Camp, and Two Creeks areas.

2002 Forest Plan

The Snowmass SUP is within the 8.25 Management Area (Ski Areas – Existing and Potential), which directs intensive use for a variety of seasonal recreational demands. When the 2002 Forest Plan was approved, approximately 2 percent of the WRNF was assigned this management designation for developed skiing. There has been considerable development across the Forest within areas designated as MA 8.25. However, the Proposed Action and other cumulative actions are a relatively small portion of the WRNF, and other portions of the Forest would continue to be managed to provide and protect other uses such as habitat, dispersed recreation, and forest goods.

¹¹ USDA Forest Service, 1994a

2003 Snowmass Mountain Master Plan, as amended

Snowmass has constructed new ski lifts and trails from the 2003 Master Plan that have increased the number of skiers at the ski area. In the future, as identified in the 2003 Master Plan, the terrain on the eastern flank of Burnt Mountain could be cleared minimally as necessary to provide gladed skiing from top to bottom, along with the installation of a detachable quad lift serving Burnt Mountain. Glading was also identified around the *Hanging Valley Wall*. Additional projects included in the 2003 Master Plan would be subject to Forest Service authorization if not previously authorized via the NEPA process. All projects contained in the Snowmass Master Plan, including those in the Proposed Action, have been designed to improve the quality of the recreational experience at Snowmass.

2006 Ski Area Improvements EA

In 2006 the Ski Area Improvements Environmental Assessment (2006 EA) analyzed and approved improvements to beginner/teaching terrain, guest services, and snowmaking in the Elk Camp area. Snowmaking was approved along *Funnel* and *Adam's Avenue*. Additionally, summer use trails were approved as a part of the 2006 EA. The implementation of this project increased skier utilization in and around the Elk Camp area. The Proposed Action would improve the recreational experience in the Elk Camp area and the *Level 3* trail would further improve the experience for beginner skiers.

2006 Burnt Mountain EA and 2013 Burnt Mountain Egress Trail EA

The 2006 and 2013 Burnt Mountain EAs developed gladed skiing and an egress trail in the Burnt Mountain portion of the Snowmass SUP area. These projects resulted in increased skier utilization of the Burnt Mountain area. The Proposed Action would add further to the variety of gladed skiing available at Snowmass.

2014 Categorical Exclusions

In May 2014 two Categorical Exclusions were authorized at Snowmass. Approved projects included an expansion of the mountain bike trail network at Snowmass and winter evening activities (including tubing) in the Elk Camp Area. Because these projects would impact the summer and evening recreational experience, there would be no cumulative effects when considered in relation to the Proposed Action.

Snowmass Mountain Master Plan 2014 Addendum

In 2014 the Forest Service accepted an addendum to the Snowmass Mountain Master Plan which contained the projects analyzed in this EA. There are no additional projects proposed in this Master Plan Addendum, and therefore no further reasonably foreseeable future actions to be considered.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

No irreversible or irretrievable commitment of resources with respect to recreation has been identified in association with any of the alternatives analyzed in this document.

B. SCENERY

SCOPE OF ANALYSIS

The spatial scope of the scenery analysis includes the Snowmass SUP area, and areas from which the SUP area is visible. The temporal scope of this analysis spans from the ski area's inception in 1965 into the foreseeable future during which Snowmass can be expected to operate.

Analysis of the visual environment requires an evaluation of the project area and its ability to absorb the effects of historic and ongoing modification to the landscape (both natural and human-caused). Thus, slope, natural vegetation types and patterns, topography, and viewing distance are important factors in this analysis.

The impacts to scenery resources of the proposed projects are considered in relation to the overall existing development, recreational, and residential theme of Snowmass and the Town of Snowmass Village. Due to the popularity of Snowmass as a destination ski area, it can reasonably be assumed that the majority of visitors expect to encounter developed lift and trail systems within the viewshed. However, the importance of providing a natural-appearing, scenic landscape is clearly noted in the 2002 Forest Plan FEIS.¹²

MANAGEMENT OF THE SCENIC ENVIRONMENT ON NATIONAL FOREST SYSTEM LANDS

The Scenery Management System (SMS) was adopted in 1995 as the primary scenery management direction by the Forest Service. In brief, the SMS is a systematic approach for assessing scenic resources in a project area and then using the assessment findings to help make management decisions on the project.

Scenic Integrity Objectives and Landscape Character

An action can cause changes to scenic resources that can be objectively measured. By assessing the existing scenic character of an area in terms of pattern elements (form, line, color and texture) and pattern character (dominance, scale diversity and continuity), it is possible to identify the extent to which the scenic character would exhibit scenic contrast with the landscape, or its converse, scenery compatibility.

¹² USDA Forest Service, 2002b p. 3-503

The 2002 Forest Plan establishes acceptable limits of change for Scenic Resources.¹³ The acceptable limits of change of a particular area (e.g., Management Area, as defined in the 2002 Forest Plan) are the documented SIO, which serve as management goals for scenic resources. SIOs provide a measure of visible disruption of landscape character, ranging from “*Very High*” to “*Unacceptably Low*.” In order of least-to-most altered, SIOs are:

- **Very High** (unaltered)
- **High** (appears unaltered)
- **Moderate** (slightly altered)
- **Low** (moderately altered)
- **Very Low** (heavily altered)
- **Unacceptably Low** (extremely altered)

For reference, *Very High* SIOs are typically found in designated wilderness areas and special interest areas. While there is no standard for SIOs in relation to ski area special use permit areas on National Forest System lands, in most cases, they fall somewhere between *Very Low* and *Moderate*. This is in recognition of the developed nature of ski areas, which tend to operate in scenic environments (i.e., assigning an artificially high SIO at a developed ski area would be unachievable, just as assigning an artificially low SIO would not incentivize the ski area to strive to minimize visual impacts).

As indicated in the 2002 Forest Plan, the majority of the Snowmass SUP area is designated as *Very Low*, with the Burnt Mountain area of the SUP area designated as *Low*.¹⁴ All of the projects being analyzed in this EA are located within the *Very Low* SIO.

The *Very Low* SIO is defined as:¹⁵

The valued landscape character appears heavily altered. Deviations may strongly dominate the valued landscape character. They may borrow from valued attributes such as size, shape, edge effect, pattern of natural openings, changes in vegetation types, or architectural styles within or outside the landscape being viewed. However, deviations must be shaped by and blend with the natural terrain so that elements such as unnatural edges, roads, landings and structures do not dominate the composition.

¹³ USDA Forest Service, 2002a

¹⁴ SIO designations within the Snowmass SUP are depicted graphically in the project file.

¹⁵ USDA Forest Service, 1995

However, the 2002 Forest Plan states that all NFS lands shall be managed to attain the highest possible scenic quality commensurate with other appropriate public uses, costs, and benefits.¹⁶

Scenery Management System Distance Zones

Viewing distance is important in determining how change is perceived across a landscape. Distance zones are divisions of a particular landscape being viewed, and are used to describe the part of a characteristic landscape that is being inventoried or evaluated.

- Immediate Foreground: This zone begins at the viewer and extends to about 300 feet. Individual leaves, flowers, twigs, bark texture, and other details dominate this view.
- Foreground: This zone is usually limited to areas within 300 feet to 0.5 mile (not to exceed 0.5 mile) of the observer, but it must be determined on a case-by-case basis, as should any distance zoning. Generally, detail of landforms is more pronounced when viewed from within the foreground zone.
- Middleground: Alterations in the middleground (0.5 to 4 miles from the observer) are less distinctive. Texture is normally characterized by the masses of trees in stands or uniform tree cover.
- Background: This zone extends from middleground (minimum of 4 miles between the observer and the area being viewed) to infinity. Shape may remain evident beyond 10 miles, especially if it is inconsistent with other landscape forms. Beyond 10 miles, alteration in landscape character becomes obscure.

Forest Plan Standards and Guidelines

In addition to the SMS, the 2002 Forest Plan contains forest-wide standards and guidelines which apply to resources across the WRNF.¹⁷ While the 2002 Forest Plan contains no forest-wide standards for scenery management, it offers the following guidelines that are applicable to this project:¹⁸

- Management activities should be designed and implemented to achieve, at minimum, the level of scenic integrity shown on the Scenic Integrity Objective Map.
- Plan, design and locate vegetation manipulation on a scale that retains the color and texture of the landscape character, borrowing directional emphasis of form and line from natural features.
- Choose facility and structure design, scale, color of materials, location and orientation to meet the scenic integrity objective on the Scenic Integrity Objective Map.

¹⁶ USDA Forest Service, 2002a

¹⁷ A *standard* is a course of action which must be followed; adherence is mandatory. A *guideline* is a preferred course of action designed to achieve a goal, respond to variable site conditions, or respond to an overall condition.

¹⁸ USDA Forest Service, 2002a

- Facilities, structures and towers with exteriors consisting of galvanized metal or other reflective surfaces will be treated or painted dark non-reflective colors that blend with the forest background to meet an average neutral value of 4.5 or less as measured on the Munsell neutral scale.

The 2002 Forest Plan further states that it is a regional goal to “provide for scenic quality and a range of recreational opportunities that respond to the needs of the forest customers and local communities.”¹⁹

Built Environment Image Guide

The BEIG was prepared by the Forest Service for the “thoughtful design and management” of the built environment contained within the National Forests. The Forest Service defines the built environment as “the administrative and recreation buildings, landscape structures, site furnishings, structures on roads and trails, and signs installed or operated by the Forest Service, its cooperators, and permittees.” The BEIG divides the United States into eight provinces which combine common elements from the ecological and cultural contexts over large geographical areas; Snowmass and adjacent NFS lands are within the Rocky Mountain Province. Site development, sustainability, and architectural character should conform to BEIG guidelines described for this Province.²⁰

AFFECTED ENVIRONMENT

Scenic Characteristics of the Snowmass SUP

Since Snowmass’ inception as a ski area in 1965, the development of lifts, trails, infrastructure, and skier facilities has occurred on private and NFS lands. Since the original base area was established at Fanny Hill, a variety of skiable terrain has been developed on NFS lands within the Snowmass 4,997-acre SUP area. In total, Snowmass includes 3,332 acres of skiable terrain serviced by 21 lifts. Skiable terrain lies mainly below treeline, though terrain and ski-related facilities do exist above treeline. Developed ski trails total 150 miles.

Vegetation cover within the SUP area varies due to the diversity of elevation, slope aspect, and gradient that exists. Vegetation types include quaking aspen, lodgepole pine, Douglas fir, subalpine fir, and Engelmann spruce, along with mixed shrubs on the forest floor. An assortment of high-alpine grasses and plants exist in above-treeline portions of the SUP area. The vegetation patterns typical of cut ski trails distinguish the scenic character of the ski area.

¹⁹ USDA Forest Service, 2002a p. 1-1

²⁰ USDA Forest Service, 2001

A number of facilities, including lifts, restaurants, service buildings, and snowmaking infrastructure also exist across the SUP area. Several of these facilities are visible from the ski area, the Town of Snowmass Village, and Brush Creek Road.

Existing conditions within the Snowmass SUP area are consistent with the Forest Plan SIO designation of *Very Low* and *Low*. The combination of trails, lifts, and facilities that exist at Snowmass results in a heavily-altered scenic character. Ski area-related facilities dominate the landscape, with certain trails exhibiting sharply-defined edges and uniform widths.

DIRECT AND INDIRECT ENVIRONMENTAL CONSEQUENCES

Alternative 1 – No Action

Under the No Action Alternative, no changes would occur within the Snowmass SUP area that would affect the scenic character of the ski area. Snowmass would continue to be consistent with the SIO of *Very Low* and *Low*. Under the No Action Alternative, previously-approved projects on NFS lands may be implemented in the future (refer to the Cumulative Effects analysis, below).

Alternative 2 – Proposed Action

Scenic Characteristics of the Snowmass SUP Area

Changes to the scenic character of the Snowmass SUP area would occur under the Proposed Action. Installation of the realigned High Alpine lift would require vegetation clearing that would be visible in the immediate foreground, foreground, and middleground distance zones from portions of the SUP area. The relocated lift could also be visible in the middleground distance zone from the Town of Snowmass Village and locations adjacent to the southern edge of the SUP boundary.²¹ Ground disturbance associated with the lift would be revegetated, but overstory vegetation removal within the lift corridor would remain visible. To reduce visual impacts of the proposed lift line, vegetation removal along the lift corridor would be feathered to create natural edges that blend with the landscape. The existing lift line would be removed and grading around terminals would be restored to former conditions.

The addition of gladed terrain across the SUP area would involve vegetation removal of approximately 30 to 40 percent of tree basal area. Areas of proposed glading would be located throughout the SUP area and could be visible from surrounding locations to varying degrees. The amount of vegetation removal proposed would have limited effects on existing scenic character. The visual impact of the proposed glades would be similar to the areas of existing glades, which are generally considered to be minimal. Glading techniques would retain the age and species class diversity of existing tree stands, which would limit the visual impacts of proposed vegetation clearing.

²¹ A viewshed analysis was completed for the top terminal of the relocated High Alpine lift and is documented in the project file.

The proposed *Elk Camp Lower Bypass* and *Level 3* trails would require vegetation removal and grading, which would also result in changes to scenic character within the Snowmass SUP area. Construction of the *Elk Camp Lower Bypass* trail would require cut-and-fill grading, which would be visible in the immediate foreground. The *Level 3* trail would also require grading, to a lesser extent. Both areas of grading would be revegetated. For both trails, overstory vegetation removal would be feathered to mimic natural edges, thus limiting their visibility from areas outside of the immediate vicinity.

Compliance with Forest Plan Direction for Scenery Management

The projects included in the Proposed Action would alter the appearance of the Snowmass SUP area and add incrementally to the developed character of the landscape. However, with the implementation of associated PDCs, Snowmass would continue to be consistent with the SIOs of *Very Low* and *Low*.

Vegetation manipulation would retain the texture of the landscape and borrow directional emphasis of form and line from natural features, per Forest Plan guidelines. Borrowing attributes such as size, shape, edge effect, and pattern of natural openings in construction of the High Alpine lift, gladed areas, and developed ski trails could result in a higher level of compatibility with the surrounding landscape, thus meeting and exceeding the existing SIO for the area.

Compliance with Built Environment Image Guide

Because the top terminal of the High Alpine lift and associated lift building would be above treeline, it could be visible from the Town of Snowmass Village and Brush Creek Road. Prior to construction, all proposed facilities, including lift infrastructure, would undergo Forest Service review to ensure compliance with the BEIG. This includes the use of materials that meet reflectivity guidelines, remain in context with the landscape, and are colored appropriately. This review is part of the White River Design Review Process for all new or remodeled structures built on the forest.

CUMULATIVE EFFECTS

Historic development on NFS and adjacent private lands at Snowmass has involved clearing of trails, grading, and construction of lifts, roads, and buildings. Changes in vegetative patterns and developed facilities are visible from NFS and private lands within the SUP area, the Town of Snowmass Village, Brush Creek Road, and viewpoints in surrounding areas.

While the Proposed Action would not result in direct or indirect visual effects on NFS lands in the Snowmass SUP area, previously approved, unimplemented projects within the SUP area, along with Base Village development, other private land development, and continued build-out within the Town of Snowmass Village would contribute to a more developed scenic character at Snowmass.

Scope of Analysis

Temporal Bounds

The temporal bounds for this cumulative effects analysis extend from Snowmass' inception as a developed ski area in 1965, through the foreseeable future in which Snowmass can be expected to operate. (The Snowmass 40-year SUP expires December 31, 2034; however, this analysis assumes the SUP would be reissued after the 2034 date.)

Spatial Bounds

The spatial scope for this cumulative effects analysis includes public and private lands in the immediate vicinity of the Snowmass SUP area, including Snowmass and the Town of Snowmass Village and other visible lands within the viewshed.

Past, Present, and Reasonably Foreseeable Future Actions

- Ski area development, including trail construction, vegetation removal, and grading
- 2002 Forest Plan
- 2003 Snowmass Mountain Master Plan, as amended
- 2011 Forest Health Project
- 2014 Categorical Exclusions
- Snowmass Base Village and other private land development

Ski area development, including trail construction, vegetation removal, and grading

Development of ski area trails and related facilities on private and NFS lands has occurred since 1965. These projects include those analyzed in the 1994 EIS; 2006 Ski Area Improvements EA; 2006 Burnt Mountain EA; and 2013 Burnt Mountain Egress Trail EA. When considered cumulatively with the projects analyzed in this EA, these previously-implemented projects have the potential to affect the scenic integrity of the Snowmass SUP area. Changes in vegetative pattern and the construction of developed facilities are visible from private and NFS lands within the SUP area, from the Town of Snowmass Village, and from viewpoints in surrounding areas.

2002 Forest Plan

The Snowmass SUP is within MA 8.25 – Ski Areas (Existing and Potential), which directs intensive use for a variety of seasonal recreational demands. When the 2002 Forest Plan was approved, approximately 2 percent of the WRNF was assigned the management designation for developed skiing. There has been considerable development across the Forest within areas designated as MA 8.25. However, the proposed project and other cumulative actions are a relatively small portion of the WRNF, and other portions of the Forest would continue to be managed to provide and protect other uses such as habitat, dispersed

recreation, and forest goods. The 2002 Forest Plan emphasizes the protection of scenic values in MA 8.25 and also establishes Forest-wide guidelines for scenery management, including achievement of SIO levels and use of non-reflective materials on all facilities.

2003 Snowmass Mountain Master Plan, as amended

In the future, as identified in the 2003 Master Plan, the terrain on the eastern flank of Burnt Mountain could be cleared minimally as necessary to provide gladed skiing from top to bottom, along with the installation of a detachable quad lift serving Burnt Mountain. Glading was also identified in the vicinity of the *Hanging Valley Wall*. These projects, if approved, have the potential to further impact scenic character within the Snowmass SUP area.

2011 Forest Health Project

The 2011 Forest Health Project (FHP) addresses forest health issues across 2,625 acres of the Snowmass SUP area. The focus of the plan is to improve forest health by reducing the number of dead, dying, and hazard trees that exist within the ski area while still retaining enough forest cover to maintain a positive guest experience. The removal of vegetation associated with the 2011 FHP has the potential to cumulatively affect scenery resources in the Snowmass SUP area.

2014 Categorical Exclusions

In May 2014, two Categorical Exclusions were authorized at Snowmass. Approved projects included an expansion of the mountain bike trail network at Snowmass and winter evening activities (including tubing) in the Elk Camp Area. When considered in relation to the Proposed Action, these projects would add cumulatively to the developed nature of the Snowmass SUP area.

Snowmass Base Village and other private land development

The development of private land surrounding the Snowmass SUP area has been ongoing since the Brush Creek Valley was settled in the 19th century. When combined with the proposed projects, private land development could cumulatively contribute to a more developed character at Snowmass, and could potentially affect the scenic integrity of the area.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

The alteration of scenic character associated with vegetation removal, grading, and facility development would represent irretrievable effects to scenic resources at Snowmass. However, this commitment of the scenic resource is not irreversible because facilities could be removed and, in time, areas could be reclaimed and revegetated, restoring their natural appearance.

C. VEGETATION

SCOPE OF ANALYSIS

This analysis of vegetation and botanical resources is tiered to the WRNF Forest Plan FEIS, and incorporates by reference the 2002 Forest Plan, as amended.²² Species included in this analysis were identified as listed proposed, threatened, endangered, or sensitive species. The 2014 Biological Assessment (BA) and 2014 Biological Evaluation (BE) are summarized herein.²³ The spatial scope of the vegetation analysis includes the Snowmass SUP area.

AFFECTED ENVIRONMENT

Vegetative Communities

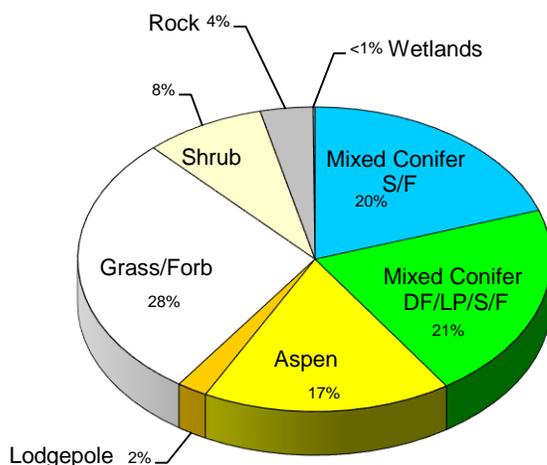
Vegetative communities currently occupying sites within the Snowmass SUP area are a product of many influences, including among others, elevation, slope, aspect, plant community succession, wildfire, forest pathogens, and damaging agents. These elements function together over time and space to produce a continually changing mosaic of plant communities and cover types.

The southernmost (upper) portion of the Snowmass SUP area is characterized by alpine shrublands and forblands. Shrublands are generally dominated by barren-ground willow. Herbaceous vegetation in shrublands and grasslands is generally dominated by alpine bluegrass, arctic bluegrass, Sandberg bluegrass, alpine timothy, alpine avens, and kobresia. Other plants found include Thurber fescue, arctic rush, *Carex scopulorum*, rock jasmine, mountain dryad, Siberian gentian, alpine forget-me-not, and alp lily. Below the alpine zone, open grass- and forb-dominated ski trails and subalpine forest dominate. Four distinct forest cover types are found within the Snowmass SUP area: 1) pure stands of aspen, 2) pure stands of lodgepole pine, 3) mixed conifer stands composed of Douglas fir, lodgepole pine, spruce, and fir, and 4) mixed conifer stands dominated by subalpine fir and Engelmann spruce.

²² USDA Forest Service, 2002a

²³ Colfer, 2014a and 2014b

Chart 3C-1:
Relative acreage of Vegetation Cover Types on the Snowmass Ski Area



Threatened and Endangered Species

Federal threatened, endangered, and proposed plant species for the WRNF are displayed in Table 3C-1. A literature review informed the list of threatened, endangered, and proposed plant species included in this analysis. A pre-field review was conducted of available information to assemble occurrence records, describe habitat needs and ecological requirements, and determine whether field reconnaissance was needed to complete the analysis. Sources of information included Forest Service records and files, the Colorado Natural Heritage Program database, Colorado Parks and Wildlife information, and published research.

**Table 3C-1:
Threatened, Endangered, and Proposed Plant Species**

TEP Species	Habitat Classification*					
	Alpine	Non Forest	Forest	Riparian and Aquatic	Species Excluded in Current Assessment?	Reason for Exclusion
1 <i>Eutrema edwardsii</i> ssp. <i>penlandii</i>	P			S	Y	No alpine habitat over 12,150'
2 <i>Phacelia scopulina</i> var. <i>submutica</i>		P	S		Y	No Utah juniper habitat, no Atwell Gulch or Shire formation, beyond elevation range (4,921–7,089')
3 <i>Sclerocactus glaucus</i>		P			Y	No desert scrub habitat, beyond elevation range (3,900–6,000')
4 <i>Spiranthes diluvialis</i>				P	Y	Beyond elevation range (5,330–6,240')

*P= Primary habitat, S= Secondary habitat

None of the species in Table 3C-1 are known to exist on the Aspen-Sopris Ranger District. While these species are known to occur elsewhere on the WRNF or in Colorado, they have been eliminated from detailed analysis in this EA because their habitats do not occur on the Aspen-Sopris Ranger District, they have no affinities to project area habitats, and/or the project area is outside of the species' range. No portion of the project area or vicinity has been designated critical habitat by the Secretary of the Interior.

Region 2 Sensitive Species

Based on documented habitat affinities, the species highlighted in green in Table 3C-2 were determined to have potential habitat in the project areas. Sensitive species for which there is no habitat in the project area were eliminated from further analysis. These species are displayed in strikethrough text in the table. The plants highlighted in green in the table were determined to have potential habitat in the project areas.

Table 3C-2:
Region 2 Sensitive Plant Species

Species	Suitable Habitat w/in Area of Influence/Project Site	Species Documented w/in or near Area of Influence/Project Site	Basic Habitat Description
<i>Armeria maritima</i> ssp. <i>sibirica</i> , Sea Pink	No	No	Grassy tundra slopes in wet, sandy or spongy organic soils. Elev. 11,900–12,000' (Johnston 2007).
<i>Astragalus leptaleus</i> , Park Milkvetch	Yes	No	Sedge grass meadows, swales, and hummocks, wet aspen and streamside willows 6,000–9,000' (Ladyman 2006a).
<i>Botrychium ascendens</i> , Trianglelobe Moonwort	Yes	No	Montane short and tall riparian willow communities with high moss, gravel, and cobble ground cover, on volcanic or granitic alluvium between 8,000–9,000' (Beatty et al. 2003)
<i>Botrychium lineare</i> , Slender Moonwort	Yes	No	Medium height grass along streamside forest edge among aspen. Also, old disturbances; clearings, fires, dams, mines, roadsides. Colorado elevations range from 7,900–11,000' (Beatty et al. 2003).
<i>Braya glabella</i> smooth rockcress	No	No	On sparsely vegetated, gravelly slopes of calcareous substrates above timberline; on disturbed sites related to inactive mines (Moore et al. 2006).
<i>Carex diandra</i> , Lesser panieled sedge	No	No	In fen on peat or on mossy floating logs in spring fed ponds 6,100–8,800' (Gage and Cooper 2006a).
<i>Carex livida</i> , Livid sedge	No	No	In fen on floating peat mats at elevations greater than 6,398'. Colorado occurrences are often found in calcareous or rich fens (Gage and Cooper 2006b).
<i>Cypripedium parviflorum</i> , Yellow Lady's Slipper	No	No	Riparian and Riparian transition to Cottonwood, Aspen, Ponderosa, Douglas fir, Spruce fir and Lode pole pine 7,400–8,500' (Mergen 2006).
<i>Draba exunguiculata</i> , Clawless Draba	No	No	Alpine fell fields, 12,000–14,000' (Ladyman 2004a).
<i>Draba grayana</i> , Gray's Peak Draba	Yes	No	Gravelly alpine slopes and fell fields. Elev. 11,500–14,000' (Ladyman 2004b).
<i>Draba Weberi</i> , Weber's draba	Yes	No	Willow carr along Monte Cristo Creek below the upper Blue Lake Reservoir dam, 11,500–11,600' (Decker 2006a).

Table 3C-2:
Region 2 Sensitive Plant Species

Species	Suitable Habitat w/in Area of Influence/Project Site	Species Documented w/in or near Area of Influence/Project Site	Basic Habitat Description
<i>Drosera rotundifolia</i> , Round Leaf Sundew	No	No	Poor and intermediate poor fens on floating mats, also in iron fens. Elev. 9100–9800' (Wolf et al. 2006).
<i>Epipactis gigantea</i> Giant Helleborine	No	No	Seeps, streambanks, and hanging gardens between 4,800 and 6,500 ft. Geothermal springs from 6,500–8,800' (Tocchio et al. 2006).
<i>Eriophorum altaicum</i> var. <i>Neogaeum</i> , Altai cottongrass	No	No	Open grown or partially shaded in fen and other water saturated soils at elevations ranging between 9,500–14,000' (Ladyman 2004e).
<i>Eriophorum chamissonis</i> , Chamisso's cottongrass	Yes	No	Subalpine wet meadows and fens with saturated peat soils, where graminoids and forbs dominate the vegetation from 10,400–12,000' in CO (Decker et al. 2006b).
<i>Eriophorum gracile</i> , Slender cottongrass	No	No	Montane and subalpine fens on floating mats of peat. Occurrences are limited to specific microhabitats of relief, hydrologic and/or chemical gradients within fen habitat (Decker et al. 2006e).
<i>Kobresia simpliciuscula</i> Simple bog sedge	Yes	No	Fens, marshes, mesic to wet tundra, gravels, rocky slopes, usually on calcareous substrates (Decker et al. 2006).
<i>Machaeranthera coloradoensis</i> , Colorado Tansy-Aster	Yes	No	Sunny mountain parks, slopes, rock outcrops, and dry tundra from 8,500–12,940', usually on open or barren sites with little competing vegetation. In CO, it is found from montane to alpine environments up to 12,940' (Beatty et al. 2004)
<i>Parnassia kotzebuei</i> , Kotzebue's grass of Parnassus	Yes	No	Open wet rocky areas, especially along small streams and amongst moss mats in the alpine and subalpine zones. Habitat in CO is subalpine and alpine wet, rocky ledges, in streamlets and moss mats at elevations of 10,000–12,000' (Panjabi and Anderson 2007a).

Table 3C-2:
Region 2 Sensitive Plant Species

Species	Suitable Habitat w/in Area of Influence/Project Site	Species Documented w/in or near Area of Influence/Project Site	Basic Habitat Description
<i>Penstemon harringtonii</i> , Harrington beardtongue	No	No	Open sagebrush slopes or, less commonly in pinyon juniper habitats. Elev. 6,400 to over 9,400'. Often where sagebrush is mixed with mountain mahogany) and Utah serviceberry. Soils are typically rocky loams and rocky clay loams derived from coarse calcareous parent materials (Panjabi and Anderson 2006b).
<i>Ptilagrostis porteri</i> , Porter's feathergrass	No	No	Hummocks of fens and willow carrs between 9,200' and 12,000'. Complex of wetland patch types, organic or mostly organic soil but some with mineral or mostly mineral (Johnston 2006).
<i>Ranunculus karelinii</i> , Arctic buttercup	Yes	No	Among rocks and scree on exposed summits, slopes. Elev. 12,000–14,100' (Panjabi and Anderson 2006c).
<i>Rubus arcticus</i> ssp. <i>acaulis</i> , Dwarf raspberry	Yes	No	Wetland species in willow carrs and mossy stream-sides. Elev. 8,600–9,700' or wet partially shaded habitats under spruce (Ladyman 2006b).
<i>Salix candida</i> , Hoary Willow	No	No	Calcareous fens and willow thickets on histice soils. Elev. 6,600–9,200' (Decker 2006d).
<i>Salix serissima</i> , Autumn Willow	No	No	Fens. Elev. 7,800–9,720'. High mineral content and alkaline pH calcareous or rich fens (Decker 2006e).
<i>Sphagnum angustifolium</i> , Peat moss	No	No	Nutrient poor fens including iron fens and intermediate poor fens. Elev. 9,600–11,483'. Found in depressions between hummocks or on large hummocks or "carpets" of peat mosses (USDA Forest Service 2007).
<i>Sphagnum balticum</i> , Baltic bog moss	No	No	Wet portions of acidic peatlands (iron fens). Iron fens, strongly acidic yet high calcium content. Hollows of fens or bogs rather than hummocks (USDA Forest Service 2009).
<i>Thalictrum heliophilum</i> , Sun-loving meadowrue	No	No	Endemic to the Green River Formation in the arid basins and mesas of western CO. Found on steep talus slopes on open, sunny sites 6,300–8,800' (Panjabi and Anderson 2007b).

**Table 3C-2:
Region 2 Sensitive Plant Species**

Species	Suitable Habitat w/in Area of Influence/Project Site	Species Documented w/in or near Area of Influence/Project Site	Basic Habitat Description
<i>Utricularia minor</i> , Lesser bladderwort	No	No	Basin fens in shallow water open grown or partially shaded subalpine ponds at 5,500–9,000' (Neid 2006).
<i>Viburnum opulus</i> var. <i>americanum</i> , American cranberrybush	Yes	No	Mesic bottomlands and lower to mid-mesic slopes (Nellessen 2006).

DIRECT AND INDIRECT ENVIRONMENTAL CONSEQUENCES

Alternative 1 – No Action

Under the No Action Alternative, no vegetation would be disturbed. Over the short term, plant communities would remain similar to that described in the affected environment. Species composition, stand structure and configuration would remain similar to existing conditions. Barring a natural disturbance such as a wildfire, plant communities would gradually change through natural succession to later seral stages.

Under the No Action Alternative, ASC and the Forest Service would continue existing management practices without changes, additions, or upgrades. Specifically, no changes to the High Alpine lift, snowmaking infrastructure, gladed terrain, or developed ski trails would be approved under the No Action Alternative. Implementation of Alternative 1 would have **no impact** on any of the sensitive species on the Regional Forester's list.

Alternative 2 – Proposed Action

Threatened and Endangered Species

Since no habitat exists in the project area for these plant species, no further analysis is necessary and no surveys are required for threatened or endangered plant species. The proposed projects would have **no effect** on threatened, endangered, or proposed plants.

Region 2 Sensitive Species

Other than possible impacts to unidentified sensitive Botrychium populations, there would be no impact to any R2 sensitive plant species as a result of the Proposed Action. The two sensitive Botrychium species may exist undetected, despite surveys in the project area. These impacts are summarized in the table below.

**Table 3C-3:
 Determination Summary for Region 2 Sensitive Plant Species**

Species	Determination	Rationale
<i>Botrychium ascendens</i> , trianglelobe moonwort	MI	It is possible that populations of this genus may exist yet go undetected during survey efforts.
<i>Botrychium lineare</i> , slender moonwort	MI	It is possible that populations of this genus may exist yet go undetected during survey efforts.

MI = May Impact Individuals, but is not likely to cause a trend towards Federal listing or result in loss of viability in the planning area

Noxious Weeds

Noxious weed invasions often occur where habitats are disturbed. If a noxious weed invasion occurs within occupied habitat, individuals or whole populations of moonwort species could be lost as a result of the change in plant community and resulting competition. Project Design Criteria that require machinery cleaning before use on NFS lands would eliminate the transport of weed/invasive species seeds from off-site.

CUMULATIVE EFFECTS

Temporal Bounds

The temporal bounds of the cumulative effects analysis extend from the initial development of Snowmass as a winter recreational area through the life of the Forest Plan and for the foreseeable future during which recreation-related activities may affect species.

Spatial Bounds

The physical extent of this cumulative effects analysis differs by species but comprises the Snowmass SUP area and adjacent public and private land to the extent they would be potentially impacted.

Past, Present and Reasonably Foreseeable Future Actions

Past and current activities have altered and continue to alter sensitive plant species occurrences and their habitats. Such activities have the potential to cumulatively affect sensitive plant species in the vicinity of the Snowmass project area resulting in current conditions. Assuming presence, past actions including livestock grazing, ski trail clearing, timber harvest, thinning, motorized and non-motorized recreational use, road and trail building and maintenance, insect and disease outbreaks, fire suppression, prescribed fire, mining, road construction, land exchanges, urban development (sub-dividing and development of private land), noxious weed infestation, and ditch construction are likely to have had the greatest past negative impacts on Region 2 sensitive plant species and their habitats. Past actions (timber harvest, road construction, ski trails, mountain bike trails, fuels reduction, fire use, and prescribed fire) that cleared

forest canopy while minimizing ground disturbance or soil sterilization and avoided the introduction of noxious weeds would likely have been beneficial actions for many of the species.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Ground disturbance related to proposed projects would represent an irretrievable effect to botanical resources within the Snowmass SUP area. However, this is not considered an irreversible commitment because vegetation is a renewable resource. Should ground disturbance occur to the point where potential habitat is removed entirely, an irreversible commitment of this resource could occur. However, as stated in the analysis, threatened and endangered species were not identified in the project area and only one Region 2 sensitive species was potentially located, but this species' habitat is disturbed sites.

D. WILDLIFE

SCOPE OF ANALYSIS

This wildlife analysis is tiered to the 2002 WRNF Forest Plan FEIS, and incorporates by reference the 2002 Forest Plan, as amended, as well as the 2008 Southern Rockies Lynx Amendment.²⁴ Species analyzed were identified as listed proposed, TES or MIS. A 2014 Biological Assessment and 2014 Biological Evaluation and Management Indicator Species Evaluation has been prepared and is in the project file.²⁵ All of these documents are hereby incorporated by reference and summarized below. The spatial scope of the wildlife analysis includes the Snowmass SUP area.

AFFECTED ENVIRONMENT

Threatened and Endangered Species

Federal threatened and endangered species for the WRNF are displayed in Table 3D-1. Other listed and proposed species known to occur elsewhere on the WRNF or in Colorado were considered but dropped from detailed analysis because their habitats do not occur on the Aspen-Sopris Ranger District, they have no affinities to project area habitats, and/or the project area is outside of the species' range.

A pre-field review was conducted of available information to assemble occurrence records, describe habitat needs and ecological requirements, and determine whether field reconnaissance was needed to complete the analysis. Sources of information included Forest Service records and files, the Colorado Natural Heritage Program database, Colorado Parks and Wildlife information, and published research.

No further analysis is needed for species that are not known or suspected to occur in the project area, and for which no suitable habitat is present. The following table documents the rationale for excluding a species. If suitable but unoccupied habitat is present, additional survey is required, unless presence is assumed and potential effects evaluated.

²⁴ USDA Forest Service, 2002a and 2008

²⁵ Colfer, 2014a and 2014b

**Table 3D-1:
Threatened, Endangered, and Proposed Wildlife Species**

Species	Status ^a	Typical Habitat ^b	Suitable Habitat Present or Affected?	Rationale if not carried forward for analysis
MAMMALS				
Canada lynx (<i>Lynx canadensis</i>)	T	A, C, D, E, G	Yes	
BIRDS				
Mexican Spotted Owl (<i>Strix occidentalis lucida</i>)	T	B, D	No	No potential habitat in project area.
FISH				
Colorado pikeminnow (<i>Ptychocheilus lucius</i>)	E	J	Yes	
Razorback Sucker (<i>Xyrauchen texanus</i>)	E	J	Yes	
Humpback Chub (<i>Gila cypha</i>)	E	J	Yes	
Bonytail Chub (<i>Gila elegans</i>)	E	J	Yes	

^a Status: S=Sensitive; T=Threatened; E=Endangered; P=Proposed

^b Habitat Key: A=Aspen; B=Cliff/Rock/Scree; C=Cottonwood/Riparian; D=Conifer Forest; E=Headwaters/Willow Riparian; F=Lakes/Rivers; G=Marsh/Wetlands/Beaver Complexes/Fens; H=Rangelands/Sage; I=Creek w/Limestone drips; J=Colorado River; Green River, Lower Yampa & White Rivers; K=Above timberline; L=Mountain parks; M=Piñon Juniper; N=Soils derived from Pierre, Niobrara, and Troublesome formations; O=High elevations with deep, persistent, and reliable spring snow cover.

The landscape within and surrounding the project area was surveyed for the existence of habitat for federally listed wildlife species during site visits conducted during the summer of 2013.

Mexican spotted owl was dropped from detailed analysis because its range does not include the analysis area, and habitat required during its life history is not found within the project area. The effects of the proposed projects on Canada lynx and the four big river fish will be analyzed in detail.

Region 2 Sensitive Wildlife Species

Based on documented habitat affinities, the species highlighted in green in Table 3D-2 below were determined to have potential habitat in the project areas. Sensitive species for which there is no habitat in the project area were eliminated from further analysis. These species are displayed in strikethrough text in Table 3D-2.

The Region 2 Species Conservation Program has produced species conservation assessment reports for the majority of the sensitive species included in Table 3D-2.

**Table 3D-2:
Region 2 Sensitive Wildlife Species**

Species	Occurrence	Habitat Association	Detailed Analysis?
Spotted bat (<i>Euderma maculatum</i>)	Rifle District (one record south rim of Glenwood Canyon)	Montane forests, P-J open semidesert shrublands; rocky cliffs for roosts (Luce and Keinath 2007).	N
Wolverine (<i>Gulo gulo luscus</i>)	One known individual on Colorado Front Range in Rocky Mtn Natl Park	High elevations with deep, persistent, and reliable spring snow cover (Federal Register 2013a, 2013b).	N
River otter (<i>Lontra canadensis</i>)	Rare occurrence of recent transplants, Summit and Eagle Co.	Riparian habitats that traverse a variety of other habitats. Mainly larger river systems (Boyle 2006).	N
Marten (<i>Martes americana</i>)	Widespread in spruce/fir and lodgepole pine	Mesic, dense coniferous forests with complex physical structure. During winter, prefer mature conifer. Stand structure may be more imp.than species composition (Buskirk and Ruggiero 1994).	Y
Fringed myotis (<i>Myotis thysanodes</i>)	Western portions of WRNF up to 7,500'	Low elevation conifer, oakbrush, shrublands; caves, mines, building roosts (Keinath 2004).	N
Hoary Bat (<i>Lasiurus cinereus</i>)	Statewide from the plains to timberline	Solitary tree roosting bat using mixed conifer, lodgepole pine, ponderosa pine, piñon-juniper, cottonwood, and willow (Snider 2011).	Y
Townsend's Big-eared bat (<i>Plecotus townsendii townsendii</i>)	Documented on WRNF in several cave locations	Semidesert shrublands, P-J, open montane forests; caves and abandoned mine roosts (Gruver and Keinath 2006).	N
Rocky Mountain bighorn sheep <i>Ovis canadensis canadensis</i>	Upper reaches of the Elk Mountains from Taylor Pass to McClure Pass.	Rocky, steep, or rugged terrain for escape cover with open grass-dominated habitats nearby for foraging. Summer range at high elevation and winter range in valley bottoms or where snow depth is minimal (Beecham et al. 2007)	N
Pygmy shrew (<i>Sorex hoyi</i>)	Southern Rocky Mountains of Colorado, have not been documented on WRNF, but have been found both north and south of Forest.	Mesic boreal environments; wide range of habitats, s-f forests, clear-cuts, boggy meadows, willow thickets, aspen and subalpine parklands. All captures in Colorado above 9,600' elevation (Beauvais and McCumber 2006)	Y
Northern goshawk (<i>Accipiter gentilis</i>)	Widespread	Open forests, mainly mixed conifer and aspen, above 7,500' elevation (Kennedy 2003).	Y
Boreal owl (<i>Aegolius funereus</i>)	Widespread	Mature S-F or S-F/lodgepole pine interspersed with meadows (Hayward 1994).	Y

**Table 3D-2:
Region 2 Sensitive Wildlife Species**

Species	Occurrence	Habitat Association	Detailed Analysis?
Sage sparrow (<i>Amphispiza belli</i>)	Not documented on WRNF, found adjacent to SW Rifle District and in western Eagle Co.	Sagebrush shrublands (Holmes and Johnson 2005a).	N
Ferruginous hawk (<i>Buteo regalis</i>)	Migrant on WRNF on large grassland areas	Grasslands and semi-desert shrublands (Collins and Reynolds 2005)	N
Greater sage grouse (<i>Centrocercus urophasianus</i>)	Widespread historic records on forest; Currently in N. Summit Co. and adjacent to Eagle and HX Dist in Routt & northern Eagle Co, Extirpated south of I-70 on Eagle District	Large sagebrush shrublands (Stiver et al. 2006)	N
Northern harrier (<i>Circus cyaneus</i>)	Migrant	Marshes, wetlands, alpine tundra in fall migr, shrublands (Slater and Rock 2005).	N
Olive-sided flycatcher (<i>Contopus borealis</i>)	Widespread	Breeds in mature spruce/fir and Douglas fir, esp. on steep slopes; ponderosa pine at Derby Mesa (Kotliar 2007).	Y
Black swift (<i>Cypseloides niger</i>)	Several documented nesting areas on WRNF	Nests behind waterfalls; forage at high elevations over montane and lowland habitats (Wiggins 2004).	N
American peregrine falcon (<i>Falco peregrinus anatum</i>)	Several documented nesting aeries on WRNF	Nest on cliffs, forage over forests and shrublands (Andrews and Righter 1992).	N
Bald Eagle (<i>Haliaeetus leucocephalus</i>)	Documented nest site off forest near Carbondale on Roaring Fork. No known nest sites on WRNF.	In Central Colorado, primarily uses low elevation riparian habitat along the Colorado, Eagle, and White River drainages and their major tributaries. Roosts and nests in trees near open water (Andrews and Righter 1992).	N
White-tailed ptarmigan (<i>Lagopus leucurus</i>)	Widespread in alpine	Alpine tundra, high-elevation willow thickets, krummholz, spruce-fir (winter) (Hoffman 2006).	Y
Loggerhead shrike (<i>Lanius ludovicianus</i>)	Primary WRNF records from western portions of Flat tops; seen above Sylvan Lake (Eagle Dist.) along sagebrush edges during migration	Open riparian areas, grasslands & shrublands, esp. semidesert shrublands, and sometimes P-J. Below 9,000' (Wiggins 2005).	N
Lewis' woodpecker (<i>Melanerpes lewis</i>)	Not documented on WRNF, found adjacent to Forest	Lowland and foothill riparian forests, mature cottonwood groves (Abele et al. 2004).	N
Flammulated owl (<i>Otus flammeolus</i>)	Scattered records across WRNF	Aspen-mixed conifer forests, P-J woodlands, ponderosa pine; to 10,000' elevation (McCallum 1994).	Y
Purple martin (<i>Progne subis</i>)	Western half of WRNF	Breeds in mature aspen near water and parks (Wiggins 2005).	Y

**Table 3D-2:
Region 2 Sensitive Wildlife Species**

Species	Occurrence	Habitat Association	Detailed Analysis?
Brewer's sparrow (<i>Spizella breweri</i>)	Widespread	Sagebrush shrublands, mountain parks; may be found in alpine willow stands. Not known from Pitkin County (Holmes and Johnson 2005b).	N
Columbian sharp-tailed grouse (<i>Tympanachus phasianellus columbianus</i>)	NW corner of Blanco District, NE Eagle County and very north end of Summit Co. – population adjacent to forest in southern Routt Co.	Mid elevation mountain sagebrush/grassland habitat usually adjacent to forested areas (Hoffman and Thomas 2007).	N
Boreal toad (<i>Bufo boreas boreas</i>)	Small disjunct populations across the WRNF	Subalpine forest habitats with marshes, wet meadows, streams, beaver ponds, and lakes (Keinath and McGee 2005).	Y
Northern leopard frog (<i>Rana pipiens</i>)	Two known populations on Rifle and Blanco Districts. Widespread on Routt NF to the north.	Wet meadows, marshes, ponds, beaver ponds, streams (Smith and Keinath 2007).	Y
Bluehead sucker (<i>Catostomus discobolus</i>)	Colorado River to Granby, Milk, Piceance, Rifle, Alkali, and Divide Creeks	Larger rivers of western slope of Colorado (Ptacek et al. 2005).	N
Flannelmouth sucker (<i>Catostomus latipinnis</i>)	Colorado River to Granby, Milk, Piceance, and Divide Creeks	Larger rivers of western slope of Colorado (Rees et al. 2005a).	N
Mountain sucker (<i>Catostomus platyrhynchus</i>)	Numerous small to medium streams below 8600' elevation draining into the White River, Deep Creek	Throughout west on both sides of Continental Divide- clear cold creeks & small- medium rivers with rubble, gravel, or sand substrate (Belica and Nibbelink 2006)	N
Roundtail chub (<i>Gila robusta</i>)	Colorado River through Glenwood Canyon, downstream on White River, Milk and Divide Creeks	Larger rivers of Colorado River basin (Rees et al. 2005b).	N
Colorado River cutthroat trout (<i>Oncorhynchus clarki pleuriticus</i>)	Widespread localized reaches	Headwater streams and lakes (Young 2008).	N
Great Basin silverspot (<i>Speyeria nokomis nokomis</i>)	Confirmed in Moffat and Mesa Co., but not on WRNF	Dependent on wetlands fed by springs or seeps; hosts on <i>Viola nephrophylla</i> (<i>V. sororia ssp affinis</i>) (Selby 2007).	N
Hudsonian emerald (<i>Somatochlora hudsonica</i>)	Confirmed only in Boulder, Teller, and Park Co.-not reported west of Continental Divide in CO	Boggy ponds (Packauskas 2005).	N

MII = May impact individuals, but not likely to result in a lack of viability in the planning area, nor cause a trend towards Federal listing or a loss of species viability rangewide.

Management Indicator Species

MIS are selected to determine how management actions are affecting wildlife resources (refer to Table 3D-3). Each species was chosen to answer specific questions about how these species use habitat and how habitat alterations through management decisions could affect the species. Species were selected based on the species reaction to changes in habitat and the ability to monitor the changes in the species populations or habitat use.

**Table 3D-3:
Management Indicator Species**

MIS Species	Monitoring Question Identified in 2002 Forest Plan Revision	Habitat Occupied by Species; Are species and habitat present in the project area?	Will Proposed Action affect (direct, indirect, or cumulative) the species, its habitat, or its management question?	Will Proposed Actions affect Forest-wide Population or Habitat Trends?	Is species addressed in other project documents?
Cave Bats	Are caves being managed so that bat species will continue to use the caves, and maintain populations in the areas adjacent to the caves?"	Caves, abandoned mines; Species Presence: No Habitat Presence: No	Species: No Habitat: No Is monitoring question Applicable to Project? No, project will not affect any cave resources.	Population trends: No Habitat trends: No	Yes, fringed myotis, spotted bat, hoary bat, and Townsend's big-eared bat are considered but eliminated from further discussion in the BE.
Elk	Does Forest motorized and non-motorized travel and recreation management result in effective use of habitat by large ungulates?"	Wide range of forest and non-forest habitats; Species Presence: Yes Habitat Presence: Yes	Species: No Habitat: No Is monitoring question applicable to project? Yes, but the loss of vegetation will not impact capability of elk habitat.	Population trends: No Habitat trends: No	No
Brewer's Sparrow	"Is sagebrush habitat being managed adequately to provide the quality and quantity of habitat for species dependent or strongly associated with sagebrush?"	Sagebrush; Species Presence: No Habitat Presence: No	Species: No Habitat: No Is monitoring question applicable to project? No, the project will not affect sagebrush habitats.	Population trends: No Habitat trends: No	Yes, considered but eliminated from further discussion in the BE.
American Pipit	"Is the alpine grassland habitat being managed to provide habitat for those species dependent or strongly associated	Alpine Grassland; Species Presence: Unknown Habitat Presence: No	Species: No Habitat: No Is monitoring question applicable to project? Yes, the High Alpine lift realignment and access road will be	Population trends: No Habitat trends: No	No

**Table 3D-3:
Management Indicator Species**

MIS Species	Monitoring Question Identified in 2002 Forest Plan Revision	Habitat Occupied by Species; Are species and habitat present in the project area?	Will Proposed Action affect (direct, indirect, or cumulative) the species, its habitat, or its management question?	Will Proposed Actions affect Forest-wide Population or Habitat Trends?	Is species addressed in other project documents?
	with alpine grassland habitat?"		implemented in alpine grassland habitat.		
Virginia's Warbler	"Does forest management maintain populations of species dependent on dense shrub habitat dispersed throughout the shrub cover types?"	Dense Shrub Habitats; Species Presence: No Habitat Presence: No	Species: No Habitat: No Is monitoring question applicable to project? No, the project will not affect shrub habitat within the elevation range of this bird.	Population trends: No Habitat trends: No	No
All Trout	"Does forest management maintain or improve the physical habitat quality for salmonids in mountain streams?"	Perennial streams and lakes; Species Presence: No Habitat Presence: No	Species: No Habitat: No Is monitoring question applicable to project? No, the project will have no impact on perennial stream habitat and will not affect lake habitats.	Population trends: No Habitat trends: No	Colorado River Cutthroat trout are considered but eliminated from further discussion in the BE. None of the other species are discussed.
Macro-invertebrate Communities	"Does forest management maintain or improve water quality (including chemical aspects as well as sediment) such that aquatic faunal communities are similar between managed and reference sites?"	Perennial streams, intermittent streams, lakes and reservoirs; Species Presence: Yes Habitat Presence: Yes	Species: No Habitat: No Is monitoring question applicable to project? Yes	Population trends: No Habitat trends: No	No

Migratory Birds

In 2008 the Forest Service Chief signed a Memorandum of Understanding (MOU) (#08-MU-1113-2400-264) with the USFWS to promote the conservation of migratory birds. This MOU was pursuant to Executive Order 131866, Responsibilities of Federal Agencies to Protect Migratory Birds. The Executive Order directs agencies to take certain actions to further comply with the migratory bird conventions, the Migratory Bird Treaty Act (MBTA), the Bald and Golden Eagle Protection Act (BGEPA) and other

pertinent statutes. Migratory birds could be present within the study area, and potential impacts to individual species are analyzed in this section.

DIRECT AND INDIRECT ENVIRONMENTAL CONSEQUENCES

Alternative 1 – No Action

Over the short term (<50 years), vegetation within the project areas would remain much the same as described in the environmental baseline. The project areas would continue to provide habitat for species present within the project area. Potential disturbance to these species would remain at current levels. Implementation of Alternative 1 would have no impact on threatened, endangered, Region 2 sensitive species or MIS.

Alternative 2 – Proposed Action

Threatened and Endangered Species

The High Alpine lift replacement, *Elk Camp Lower Bypass* trail, and some of the glading projects would be implemented in lynx habitat. These components would impact approximately 50 acres of lynx habitat and would therefore have an effect on lynx. The snowmaking project and *Level 3* trail would be implemented in lynx “non-habitat” and would therefore have no effect on the Canada lynx. Skiing and riding within gladed areas has the potential to indirectly affect lynx habitat. Skiing and riding in gladed stands leads to snow compaction within otherwise suitable habitat. The stands that would be gladed are all currently skied, potentially providing compacted snow to facilitate lynx competitors’ access to habitat to which lynx otherwise have non-competitive access. Glading would not add new areas of snow compaction. Regardless of the nature of the area in which impacts would occur, the project would result in a loss of lynx winter foraging habitat. Consequently, the project may affect, but is not likely to adversely affect the Canada lynx. The proposed projects would be consistent with all applicable Southern Rockies Lynx Amendment (SRLA) management direction.

The proposed 26 acres of new snowmaking coverage would account for 19.9 acre feet of additional water diversions per ski season. Water lost to evaporation is equivalent to a 26 percent consumptive use factor. As a consequence, the proposed snowmaking would result in 5.17 acre feet of depletions to the Upper Colorado River Basin. The U.S. Fish and Wildlife Service (USFWS) has determined that water depletions are among the current activities with the greatest impact on all of the endangered Colorado River fish. The USFWS has further determined that activities resulting in water depletion in the Upper Colorado River Basin may jeopardize the continued existence of the four endangered fish. The USFWS has determined that water depletions and regulated flows are the current activities with the greatest impact on the Colorado pikeminnow, razorback sucker, humpback chub, and bonytail chub. On February 10, 1995, the USFWS released a Biological Opinion that approved up to 84.2 acre feet (14 historic and 70.2 new) of depletions for snowmaking and on-hill facilities at Snowmass. Current depletions for snowmaking and on-hill facilities at Snowmass account for 26.7 acre feet of Forest Service permitted depletions.

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Implementation of the proposed snowmaking (5.17 acre feet) would increase this depletion to 32.9 acre feet. This is well below the 84.2-acre foot depletion which has undergone previous USFWS consultation and has been authorized. Consequently, since the proposed project has already been submitted for formal consultation and its depletions from the Upper Colorado River Basin approved, and since ASC paid into the endangered fish recovery program to offset the impacts of those depletions, the proposed project would have no effect on these fish.

Region 2 Sensitive Species

Table 3D-4 summarizes the Region 2 Sensitive wildlife species impact determination.

**Table 3D-4:
Region 2 Sensitive Wildlife Species and Determination Summary**

Species	Determination/Criteria
Spotted bat (<i>Euderma maculatum</i>)	No Impact. No habitat present
Wolverine (<i>Gulo gulo luscus</i>)	No Impact. No habitat present.
River otter (<i>Lontra canadensis</i>)	No Impact. No habitat present.
Marten (<i>Martes americana</i>)	MII. The combined effect of clearing plus glading may reduce the carrying capacity of the area for martens.
Fringed myotis (<i>Myotis thysanodes</i>)	No Impact. No habitat.
Hoary Bat (<i>Lasiurus cinereus</i>)	MII. The combined effect of clearing plus glading may reduce or eliminate habitat.
Townsend's Big-eared bat (<i>Plecotus townsendii townsendii</i>)	No Impact. No habitat.
Rocky Mountain bighorn sheep (<i>Ovis canadensis Canadensis</i>)	No Impact. No habitat present.
Pygmy shrew (<i>Sorex hoyi</i>)	MII*. Individuals could be crushed during project implementation.
Northern goshawk (<i>Accipiter gentilis</i>)	NO IMPACT. PDC allow for breeding during the year of implementation and the species is capable of finding suitable habitat over the long-term following construction
Boreal owl (<i>Aegolius funereus</i>)	NO IMPACT. PDC allow for breeding during the year of implementation and the species is capable of finding suitable habitat over the long-term following construction
Sage sparrow (<i>Amphispiza belli</i>)	No Impact. No sagebrush habitat.
Ferruginous hawk (<i>Buteo regalis</i>)	No Impact. No grassland habitat.
Greater sage grouse (<i>Centrocercus urophasianus</i>)	No Impact. No sagebrush habitat.
Northern harrier (<i>Circus cyaneus</i>)	No Impact. No habitat present.
Olive-sided flycatcher (<i>Contopus borealis</i>)	MII* – Implementation of the project may lead to disruption of breeding and potential nest abandonment.
Black swift (<i>Cypseloides niger</i>)	No Impact. No waterfall habitat.
American peregrine falcon (<i>Falco peregrinus anatum</i>)	No Impact. No habitat present.
Bald Eagle (<i>Haliaeetus leucocephalus</i>)	No Impact. No habitat present.
White-tailed ptarmigan (<i>Lagopus leucurus</i>)	No Impact on fecundity or natality.

**Table 3D-4:
Region 2 Sensitive Wildlife Species and Determination Summary**

Species	Determination/Criteria
Loggerhead shrike (<i>Lanius ludovicianus</i>)	No Impact. No shrubland or grassland riparian habitat.
Lewis' woodpecker (<i>Melanerpes lewis</i>)	No Impact. No riparian forested habitat.
Flammulated owl (<i>Otus flammeolus</i>)	NO IMPACT. PDC allow for breeding during the year of implementation and the species is capable of finding suitable habitat over the long-term following construction
Purple martin (<i>Progne subis</i>)	NO IMPACT. PDC allow for breeding during the year of implementation and the species is capable of finding suitable habitat over the long-term following construction
Brewer's sparrow (<i>Spizella breweri</i>)	No Impact. No habitat present in project area as described in column 3.
Columbian sharp-tailed grouse (<i>Tympanachus phasianellus columbianus</i>)	No Impact. No sagebrush/mtn shrub/grassland habitat.
Boreal toad (<i>Bufo boreas boreas</i>)	MII*. Individuals could be crushed by heavy equipment during construction.
Northern leopard frog (<i>Rana pipiens</i>)	MII*. Individuals could be crushed by heavy equipment during construction.
Bluehead sucker (<i>Catostomus discobolus</i>)	No Impact. No large, western slope rivers impacted by project.
Flannelmouth sucker (<i>Catostomus latipinnis</i>)	No Impact. No large, western slope rivers impacted by project.
Mountain sucker (<i>Catostomus platyrhynchus</i>)	No Impact. No wetland or stream habitat disturbance in project area.
Roundtail chub (<i>Gila robusta</i>)	No Impact. No large, western slope rivers impacted by project.
Colorado River cutthroat trout (<i>Oncorhynchus clarki pleuriticus</i>)	No Impact. No wetland or stream habitat disturbance in project area.
Great Basin silverspot (<i>Speyeria nokomis nokomis</i>)	No Impact. No habitat.
Hudsonian emerald (<i>Somatochlora hudsonica</i>)	No Impact. No habitat

MII = May impact individuals, but not likely to result in a lack of viability in the planning area, nor cause a trend towards Federal listing or a loss of species viability rangewide.

Management Indicator Species

As indicated in Table 3D-3, the Proposed Action would not result in impacts to MIS species, habitat, population trends, or habitat trends. Based on the absence of direct, indirect, or cumulative impacts to MIS from the proposed projects, impacts to MIS are negligible across their habitat and range on WRNF. Implementation of this project would have no impact on the ability of the Forest to meet the objective of improving habitat conditions for elk or aquatic MIS within the 15-year life of the Revised Forest Plan. MIS will continue to be monitored using protocols developed under the Forest Plan Revision.

Migratory Birds

Migratory birds could be present within the study area, and potential impacts to individual bird species are discussed above. Impacts to migratory bird species during construction would be avoided to the extent practicable.

CUMULATIVE EFFECTS

Temporal Bounds

The temporal bounds of the cumulative effects analysis extend from the initial development of Snowmass as a winter recreational area through the life of the Forest Plan and for the foreseeable future during which recreation-related activities may affect species.

Spatial Bounds

The physical extent of this cumulative effects analysis differs by species but comprises the Snowmass SUP area and adjacent public and private land to the extent they would be potentially impacted.

Past, Present and Reasonably Foreseeable Future Actions

Urban expansion and development has fragmented a naturally patchy distribution of general wildlife habitat in Colorado, including in Pitkin County. Valley floor development continually erodes the amount of non-forest habitats adjacent to lynx forested habitat. The expansion of homes and some municipal facilities up mountain slopes, into forests of aspen, lodgepole pine, and to a lesser degree spruce-fir, adds to the fragmentation of a naturally fragmented landscape. The cumulative effect of private land development and expansion of recreational facilities in and adjacent to wildlife habitat, and lynx habitat in particular, may reduce the ability of lynx to move throughout their home range, or interact with other individuals in the larger subpopulation.

Across the Snowmass LAU, development will continue to take place outside of the Maroon Bells/Snowmass Wilderness. However, a significant portion of the mapped lynx habitat in this LAU occurs within the designated wilderness boundary, where development will not occur. Regardless, the lower portions of the Elk Range, beyond the limits of the Snowmass LAU, are located on private land. Development that includes 35 acre ranchettes, residential subdivision, and resort base area complexes will be likely to continue on private lands located directly adjacent to the Snowmass LAU for the foreseeable future. Such development may adversely affect the ability of lynx to move between LAU's beyond the limits of the Elk Mountains.

Development of the Town of Snowmass Village (TOSV) has been ongoing for 40 years. Most of this development has occurred in aspen and mountain shrub vegetative communities that do not provide high quality lynx habitat in most cases. However, Brush Creek and its tributaries may have provided a corridor for lynx through otherwise unfavorable habitat. That opportunity has been largely decreased as a result of the development of TOSV. The Snowmass Base Village improvements project is ongoing. It will include condos, townhomes, hotels, a 232-unit Westin Conference Hotel, new shops and restaurants, and an open-air gondola. All projects would be implemented on private land outside of any potential sites that currently provide lynx habitat.

The currently proposed projects would occur within the bounds of the existing Snowmass SUP area, where habitat has been previously fragmented as a result of ski area development and previous fires (Big Burn area and Burnt Mountain area). The project would not add significantly to the cumulative effects of snowshoe hare winter habitat loss that has occurred throughout the Snowmass LAU, Pitkin County, and the mountainous regions of Colorado. The effect of the project on the local snowshoe hare population, and thus on lynx foraging energetics, would not be detectable at the scale of the LAU and/or the permit area. The cumulative effects of this and other incremental losses in hare habitat have undoubtedly had an incremental effect on lynx energy expenditures while hunting. With each loss of habitat for a single hare, there is an immeasurable cost to the energetics of foraging lynx. Cumulatively, these incremental losses become measurable, but have not been documented.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Tree removal related to the developed ski trails would represent an irretrievable effect to some habitat for some threatened and endangered, Region 2 species and MIS within the SUP area. However, this is not considered an irreversible commitment because the habitat (vegetation) is a renewable resource.

E. SOILS AND GEOLOGY

SCOPE OF ANALYSIS

The analysis area for soils resource includes areas proposed for direct ground disturbance within the Woody Creek/Roaring Fork River watershed within the Snowmass SUP area. This analysis is based on a review of the Holy Cross Area Soil Survey. A site-specific field survey was performed at the location of the proposed *Elk Camp Lower Bypass* trail. No other site-specific field surveys were completed for this soils analysis, but would be required prior to implementation of any approved projects.

FOREST PLAN DIRECTION

Both the 2002 Forest Plan and the WCPH provide soil management measures to guide land treatments within the WRNF. The following direction applies to the proposed projects analyzed in this EA.

WRNF 2002 Forest Plan

8.25 Ski Areas – Existing and Potential

Soils Standard 1. Effective ground cover (mulch) upon completion of ground disturbing activities will meet minimum levels of pre-treatment habitat type (Aspen 95 percent, Lodgepole Pine 90 percent, Spruce-Fir 95 percent).

Soils Guideline 1. Ground cover as a combination of revegetation and mulch applications, should meet the requirements in Table 3E-1, one and two years following completion of ground disturbing activities.

**Table 3E-1:
Soils Guideline 1 – Ground Cover Requirements**

Erosion Hazard Class	Year 1 Minimum Effective Ground Cover (%)	Year 2 Minimum Effective Ground Cover (%)
Low	20–30	30–40
Moderate	30–45	40–60
High	45–60	60–75
Very High/Severe	60–90	75–90

Soils

Guideline 1. Conduct an onsite slope stability exam in areas identified as potentially unstable. Potentially unstable land is described as having a “high” or “very high” instability ranking. Limit intensive ground-disturbing activities on unstable slopes identified during examinations.

Forest Service Watershed Conservation Practices Handbook (WCPH)

Table 2-3 contains PDCs outlined in the WCPH that would ensure compliance with this guidance.

Hydrologic Function

- 11.2 Manage land treatments to maintain enough organic ground cover in each activity area to prevent harmful increased runoff.

Riparian Areas and Wetlands

- 12.4 Maintain long-term ground cover, soil structure, water budgets, and flow patterns of wetlands to sustain their ecological function.

Sediment Control

- 13.1 Limit roads and other disturbed sites to the minimum feasible number, width, and total length consistent with the purpose of specific operations, local topography, and climate.
- 13.2 Construct all roads and other disturbed sites to minimize sediment discharge into streams, lakes, and wetlands.
- 13.3 Stabilize and maintain roads and other disturbed sites during and after construction to control erosion.
- 13.4 Reclaim roads and other disturbed sites when use ends, as needed, to prevent resource damage.

Soil Quality

- 14.2 Maintain or improve long-term levels of organic matter and nutrients on all lands.

AFFECTED ENVIRONMENT

The analysis area is between the elevation of 9,000 feet and 12,000 feet above mean sea level (amsl). Much of the precipitation at Snowmass falls in the form of snow. Precipitation ranges from approximately 1.5 to 2 inches of water per month (19.4 inches annually), with precipitation falling as snow in the winter and rain in the spring.²⁶ The climate and elevation of the analysis area limit the rate of soil formation.

Geology of Snowmass Ski Area

For a thorough description of the geologic characteristics of the Snowmass Ski Area vicinity, including detailed geologic mapping, refer to the affected environment section of the 1994 Snowmass FEIS, which is incorporated within this document by reference.²⁷ The bedrock geology of the Snowmass area is dominated by sedimentary units of Jurassic to Late Cretaceous age, including the siltstones and claystones of the Morrison Formation, the sandstone conglomerates of the Burro Canyon Formation, as well as the

²⁶ Western Regional Climate Center, 2014

²⁷ USDA Forest Service, 1994a

Dakota sandstone and the Mancos shale. Unconsolidated overlying units dating from the Pleistocene to Holocene ages are primarily comprised of poorly sorted glacial, landslide, talus, and colluvial deposits.

The analysis area was compared with the WRNF Stability Model (refer to the WRNF Stability Model and Soil Map figure under Alternative 2). Slope stability ratings were developed through an evaluation of area geology, slopes and landslide risk (based on past landslide mapping). The susceptibility of soils within the SUP area to irreversible damage to soil productivity from timber harvest ranges from “slight” to “severe” (although primarily the susceptibility is “slight” to “moderately low”). Approximately 70 acres of terrain currently accessible from the High Alpine lift is characterized as having “severe” susceptibility to irreversible damage to soil productivity. The risk to stability in these areas should be minimized by ensuring drainage is properly managed to reduce potential impacts to soils (also refer to bare ground assessment in the soils section). Additionally damage to soil resources can be further reduced by maintaining and improving levels of soil organic matter which contributes to retaining soil moisture and attenuating runoff.

Soils of Snowmass Ski Area

Seventeen soil units were mapped in the Woody Creek/Roaring Fork Watershed within the Snowmass SUP area. These soils can be grouped into Leadville, Scout, Hechtman, Wetopa, Doughspon, Echemoor, Callings, Skylick, Handran, Eyre, Jerry and Millerlake. Mapped miscellaneous land types include cirque, rubble and standing water. Table 3E-2 summarizes the general soil characteristics. Refer to the Forest Service Stability Model and Soil Map Units figure in this section for more information.

**Table 3E-2:
 General Characteristics of Mapped Soil Units**

Map Unit/ Name	Area in SUP (acres)	Drainage Class	Available Water Capacity^a	Runoff^b	Effective Rooting Depth	kw
220 B	716					
Leadville		Well	Moderate	Moderate	> 60”	.24
285D	72					
Scout		SE	Low	Moderate	> 20”	0.08
Hechtman		SE	Low	Rapid	< 20”	0.20
338B	524					
Wetopa		Well	High	Moderate	> 60”	0.24
Doughspon		Moderate or Well	High	Moderate	> 60”	0.22
Echemoor		Well	High	Moderate	> 60”	0.32
347B	88					
Callings		Well		Medium to rapid	> 20”	0.20
Skylick		Well Drained	High	Medium	> 20”	0.20

**Table 3E-2:
General Characteristics of Mapped Soil Units**

Map Unit/ Name	Area in SUP (acres)	Drainage Class	Available Water Capacity ^a	Runoff ^b	Effective Rooting Depth	kw
360C	397					
Leadville, sandstone substratum		Well	Moderate	Moderate	> 20"	0.24
367 B	1,133					
Scout		SE	Low	Moderate	> 20"	0.08
Leadville		Well	Moderate	Moderate	> 20"	0.24
376C	84					
Callings		Well		Medium to rapid	> 20"	0.20
380B	552					
Seitz		Well	High	Moderate	> 60"	0.15
383B	41					
Wetopa		Well	High	Medium to rapid	> 60"	0.24
385 D	60					
Scout		SE	Low	Moderate	> 60"	0.08
Hechtman		SE	Low	Rapid	< 20"	0.20
446 C	4					
Handran		SE	Low	Moderate	> 20"	0.10
Eyre		Well	Low	Moderate	< 20"	0.15
932B	392					
Handran		SE	Low	Moderate	> 20"	0.10
Eyre		Well	Low	Rapid	< 20"	0.15
932D	6					
Handran		SE	Low	Moderate	> 20"	0.10
Eyre		Well	Low	Moderate	< 20"	0.15
Rubble Land		NA	Low	Slow	N/A	
AG66	1					
Jerry Loam		Well		Medium to Rapid	> 20"	0.20
Millerlake Loam		Well		Medium to Rapid	> 20"	0.20
CQ	199					
Cirque land					N/A	
RL	220					
Rubble Land		NA	Low	Slow	N/A	
W	2					
Water		N/A	N/A	N/A	N/A	

Source: USDA Forest Service, 1998

^a Available Water Capacity refers to the volume of water that should be available to plants if the soil, inclusive of rock fragments, were at field capacity.

^b Runoff refers to the degree to/rate at which precipitation, once interfaced with the soil, flows as a result of gravitational forces. Greater rates of runoff are generally consistent with greater erosion risk.

SE = somewhat excessively; N/A = not applicable

Drainage class ratings for these soils range from moderately to somewhat excessively drained. The soils have variable runoff potential (slow to rapid) and low to moderate available water capacity. Limitations to revegetation potential range from slight, where mulch applications would improve success by conserving soils moisture and protecting seedling establishment, to severe where slope, short growing season, low water capacity, high erosion hazard and shallow soils to bedrock characteristics hamper revegetation success. Road and trail limitations include moderate load bearing strength, seasonal mud, surface rutting, compaction, steep slopes and high erosion hazard.²⁸

Surface and subsurface soil erodibility is generally moderate within the analysis area with some areas with low and high erodibility potential. K-factor (K_w) values of surface soil horizons range from 0.08 at the low end up to 0.32.²⁹ Higher erosion risk ratings result from steep slopes, shallow depth to bedrock, and fine-grained material.³⁰ The whole soil K-factor (with the w subscript) best reflects natural soil conditions in the field because the whole soil factor considers rock fragments which serve to “armor” soil and make them less erodible overall.³¹ Soil organic matter can also be related to soil erodibility as organic horizons allow infiltration and provide productive soils for stabilizing vegetation.³² Maintenance of soil organic matter and surface O- and A-horizon integrity minimizes erosion, compaction, and hydrologic problems within the ski area.

The Woody Creek watershed covers most of the Snowmass SUP. Previous disturbance in the watershed includes tree removal and grading associated with ski area infrastructure such as ski trails, hiking/biking trails, lift installation, roads, and facilities. The SUP area covers approximately 4,997 acres; in total nearly 2,000 acres of the SUP area has been cleared for ski area development (an additional 450 acres occur above treeline).³³ Generally, much of that area has been revegetated with herbaceous ground cover, however, a bare ground assessment revealed approximately 230 acres of the analysis area could benefit from receiving additional rehabilitation by amending those areas that have not recovered with carbonaceous soil amendments. For the bare ground assessment, WRNF specialists identified areas within the analysis area as having significant bare ground and low vegetative cover, i.e., generally containing 1 to 25 percent vegetation cover and 30 to 70 percent rock cover. In these areas pedestals, rills and water flow patterns may be common indicating surface runoff; these soil conditions may be improved through soil rehabilitation and drainage management. Included in this 230 acres is approximately 70 acres of terrain classified as having “severe” stability risk according to the Forest Service Stability model. Field surveys and project implementation teams would watch for and consider visible indicators of landscape

²⁸ USDA Forest Service, 1998

²⁹ The K-factor represents the soil’s susceptibility to erosion in their plot condition based on soil texture. Soils that are resistant to erosion have low K values (0.02 to 0.15); soils that display moderate erosion potential are in the middle of the range (0.16 to 0.27); and highly erodible soils tend to have values greater than 0.28. National Resource Conservation Service, 2008

³⁰ USDA Forest Service, 1998

³¹ McCormick et al., 1982

³² Franzluebbbers, 2002; McMullen, 2011

³³ SUP (4,996)-Veg (2,608) = 2,384 non veg (450 above treeline terrain)

instability such as tension cracks and rill/gully erosion. Appropriate erosion control and drainage management should be employed to maintain soil productivity and watershed condition under ongoing ski area management and operations.

DIRECT AND INDIRECT ENVIRONMENTAL CONSEQUENCES

Alternative 1 – No Action

No new grading is included in Alternative 1. However, on-going ski area operations and maintenance would continue to require management to reduce erosion and loss of soil organic material within the Snowmass SUP area.

Alternative 2 – The Proposed Action

Geology

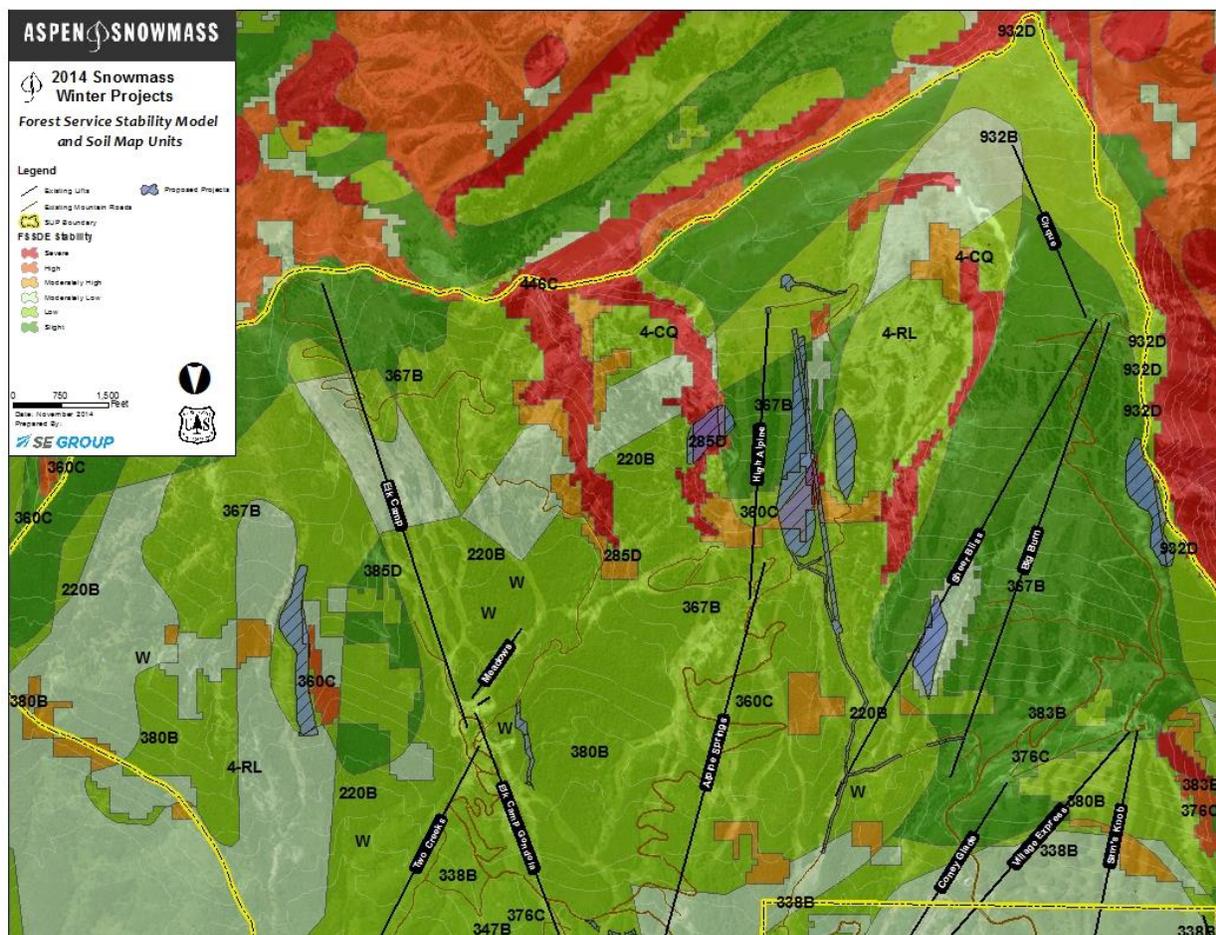
Projects included in the Proposed Action were compared with the White River National Forest Stability Model. Proposed projects were found to overlap areas with a range of mass movement potential, from “slight” to “severe.” Most of the proposed project locations overlap areas of “slight” to “moderately low” mass movement potential, including all of the grading that would occur (refer to the Stability Model figure below). Some glading and portions of the High Alpine lift corridor tree removal would occur within areas mapped as having “high” or “severe” mass movement potential (impacts to soils resource by disturbance types is discussed more under Soils, below).

The risk to stability has potential to impact project design; therefore, PDC may be required to ensure drainage is properly managed to minimize potential impacts from the projects to soils, and from stability issues on the project elements. These stability rankings are not limiting to the proposed projects, as these rankings are derived from a model rather than strictly empirical data. Field surveys and project implementation would watch for and consider visible indicators of landscape instability such as tension cracks and rill/gully erosion and appropriate erosion control and drainage management would be employed to maintain soil productivity and watershed condition.

A site-specific survey was completed in October 2014 for the proposed *Elk Camp Lower Bypass* trail. Approximately 2.4 acres of tree removal and 1.2 acres of grading would be required to construct this trail. The terrain would require a layer of material approximately 12 feet deep to be excavated from the top portion of the trail to be deposited at a depth of approximately 10 feet along the lower portion of the trail to flatten the existing slope. The final slope would be approximately 22 to 30 percent. A Geotechnical Consultation Report was prepared documenting the existing geologic condition and potential impacts resulting from the project. The survey and report did not identify any slope stability issues related to this project, and concludes that the project would, in fact, increase the stability of the slope when compared with existing conditions. The Geotechnical Consultation Report is contained in the project file. Additionally, the Forest Service Stability Model shows this project area has a “slight” susceptibility to

irreversible damage to soil productivity. The Forest Service anticipates that a comprehensive drainage management plan and maintenance of soil organic matter would minimize impacts to soil resources.

Forest Service Stability Model and Soil Map Units



Soils

The proposed projects would result in approximately 81 acres of glading, 8.5 acres of tree removal, and 10 acres of grading (including 1.4 acres of tree removal and grading).³⁴ Each of these types of disturbance has potential to affect soils resources and impair soil productivity. Only soils where lift components are installed (approximately 1 acre) would be considered permanently lost within these soil map units.

³⁴ As indicated in Chapter 2, there is a total of 84 acres of grading projects included in the Proposed Action. However, approximately 3 acres of glading in the *Reidar's Glade* area overlap with proposed tree clearing for the High Alpine lift replacement. Those 3 acres are captured here as tree removal rather than glading.

**Table 3E-3
Project Disturbance by Soil Map Unit**

Soil Map Unit/Project/ Disturbance Type	Acres	Kw
220B	7.7	Moderate
Elk Camp Lower Bypass Trail	0.1	
<i>Tree removal/Grading</i>	<i>0.1</i>	
High Alpine Lift Replacement	2.8	
<i>Grading</i>	<i>0.9</i>	
<i>Tree removal</i>	<i>1.8</i>	
Snowmaking	4.9	
<i>Grading</i>	<i>4.9</i>	
338B	0.6	Moderate
Level 3 Trail	0.6	
<i>Tree removal</i>	<i>0.4</i>	
<i>Tree removal/Grading</i>	<i>0.2</i>	
360C	0.9	Moderate
High Alpine Lift Replacement	0.9	
<i>Tree removal</i>	<i>0.9</i>	
367B	3.9	Low-Moderate
High Alpine Lift Replacement	3.0	
<i>Grading</i>	<i>0.1</i>	
<i>Tree removal</i>	<i>2.9</i>	
Snowmaking	0.9	
<i>Grading</i>	<i>0.9</i>	
380B	2.5	Low
Elk Camp Lower Bypass Trail	2.3	
<i>Tree removal</i>	<i>1.2</i>	
<i>Tree removal/Grading</i>	<i>1.1</i>	
Level 3 Trail	0.2	
<i>Tree removal</i>	<i>0.1</i>	
<i>Tree removal/Grading</i>	<i>0.1</i>	
4-RL	0.9	N/A
High Alpine Lift Replacement	0.9	
<i>Grading</i>	<i>0.2</i>	
<i>Tree removal</i>	<i>0.7</i>	
932B	1.5	Low
High Alpine Lift Replacement	1.5	
<i>Grading</i>	<i>1.5</i>	
<i>Tree removal</i>	<i>0.0</i>	
Total	18.0	

Under the Proposed Action, tree removal for clearing and glading would occur in one of the following ways (as identified as appropriate by the ski area and FS specialists): aerial processes, skidding over the snow, skidding over the ground, stacking bucked smaller trees and transported off site, chipped or burned. Impacts to soil resources from tree removal can occur from access to the area, skidding timber for removal and/or prescribed burns, reduced moisture uptake and exposure of soils from the loss of overstory vegetation.

All of these tree removal techniques may result in some level of compaction, loss of ground cover and/or soil organic matter. Aerial removal would likely have the least impacts, and over ground skidding would likely result in the greatest extent of surface disturbance (both loss of ground cover and soil organic matter), as well as compaction. Concentrating disturbance and minimizing the distance trees are skidded would maintain natural vegetative cover and depths of soil organic matter (soil O- and/or A-horizons) in some areas. Additionally, skidding over the snow would result in less impacts to the soil resource (loss of A-horizon, vegetation, etc.) and would be utilized where practicable. Data collected from site specific inventories, and characterization of soil organic matter quantities prior to implementation of any approved projects, would serve as a baseline for the existing condition regarding soil organic matter.

In areas where grading is proposed, topsoil would be removed and soils would be temporarily compacted. However, with the exception of top and bottom lift terminals and tower footers, soils would be mechanically de-compacted and stockpiled topsoil would be re-spread to facilitate revegetation success.

Reassessment of the quantity (depths) of soil in the A-horizon and/or organic ground cover would be made to ensure no net loss of this material, consistent with the WCPH. To ensure organic ground cover is maintained, post-treatment slash would be returned to the site. If and when loss of soil organic matter is documented, these losses will be mitigated by amending soils with carbonaceous soil amendments in coordination with the White River National Forest Soil Scientist. Where needed, carbon-rich soil amendments such as compost, composted biosolids, biochar, or a combination of these materials will be added to restore site organic matter and nutrients if post-implementation surveys show a net loss of soil organic material. Seed mixtures and mulches would be free of noxious weeds and persistent/invasive exotic plants.

For all of the proposed projects under Alternative 2, implementation of the soil management requirements and Project Design Criteria (PDC) would minimize erosion and impacts to soil organic material in the analysis area (refer to Table 2-3).

CUMULATIVE EFFECTS

Temporal and Spatial Extent of Analysis

The spatial extent of the soils cumulative effects analysis is the Snowmass SUP area. The temporal bounds for this cumulative effects analysis extends from Snowmass' inception as a ski area, through the foreseeable future in which the ski area can be expected to operate.

Past, Present and Reasonably Foreseeable Future Actions

The development of trails, lifts, infrastructure, and skier facilities on NFS lands in the SUP area has occurred since the 1960s. Over five decades of resort development, there has been a loss soil organic content (organic O- and mineral A-horizons) and increased impermeable surfaces within these soil map units. These past ski area activities have resulted in approximately 230 acres of bare ground within the analysis area.³⁵ Recent approvals such as the New/Realigned Mountain Bike Trails Decision Memo and the Winter Evening Activities Project Decision Memo approved approximately 10 acres of new ground disturbance in the area surrounding Elk Camp. The mountain bike trails constitute a loss in soil organic matter, as those trails are graded and become compacted for the long-term. This loss requires identification of soil rehabilitation sites from the bare ground analysis to ensure consistency with Forest Plan standards. The approved tubing facility required approximately 3.7 acres of grading to create tubing lanes and 0.25 acre of disturbance for light towers and a power line. The majority of this disturbance has been revegetated; however, these sites require ongoing rehabilitation and management in order to address the impacts of vegetation removal and grading, return soil organic matter, and facilitate successful revegetation to the area.

Snowmass currently implements drainage management and erosion control such as water bars and revegetation (as required by the Forest Service). The effectiveness of these management activities at stabilizing soils within the analysis area would be assessed during the site-specific field surveys. Approximately 90 acres of tree removal and 10 acres of grading are included in the Proposed Action; however, most disturbance (aside from lift installation) would be temporary and would be rehabilitated after construction. A PDC contained in Table 2-3 requires that there would be no net loss of soil organic material. ASC and the Forest Service will use the results of the bare ground analysis to coordinate and implement future soil reclamation and rehabilitation projects (including soil amendments) to address past impacts. When considered cumulatively, if the Proposed Action is carefully managed with effective erosion control, considering the low to moderate erodibility of soil management units these projects could be implemented without further impacts to the soils resource, and would not affect the soil management unit as a whole.

³⁵ This acreage of existing bare ground within the analysis area is based on a bare ground soils analysis that is not finalized. This acreage is subject to change.

Other regional projects have had a range of impacts on soils resources in the area including forest health projects and private land development. Forest health projects are generally designed to reduce overland flow and erosion and minimize removal or disturbance of the organic layer, so often they have minimal impacts to soils resources. However, community and residential development have resulted in a loss of soils in the area due to increases in roads, buildings and increase soil compaction and impermeable surfaces. Generally, on-going developments would continue these impacts into the future.

When considered cumulatively with the proposed projects, other past, present and future projects affect soils by reducing soil organic matter and increase exposure and compaction resulting in increased erosion within the analysis area. However, with implementation of project PDCs, cumulative effects of these issues when considered with Alternative 2 within the analysis area could be minimized. Current and future conditions of soils within the analysis area are anticipated to maintain compliance with the 2002 Forest Plan and the WCHP. Innovative uses of newly available soil amendments that increase soil moisture, nutrient, and carbon storage could serve to not only offset impacts to soil resources from the Proposed Action, but also to improve baseline soil conditions at Snowmass.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Under Alternative 2, approximately 1 acre of soils would be lost due to installation of lift infrastructure. Although these losses would represent a minimal acreage within the soil map unit as a whole, soil is a very slowly renewable resource, as estimates for rates of soil formation range from 0.0056 cm to 0.00078 cm per year.³⁶ Globally, rates of soil formation are not keeping pace with erosion, leading to widespread soil loss that in part owes to grading activities such as those associated with ski area development.³⁷ In this sense, soil loss from development for projects at Snowmass is an irreversible and irretrievable commitment of resources.

³⁶ Alexander, 2006

³⁷ Wakatsuki and Rasyidin, 1992

F. WATERSHED, WETLANDS AND AQUATIC RESOURCES

SCOPE OF ANALYSIS

The scope of the analysis for watershed resources focuses on riparian and wetlands resources contained by drainage areas (the study watersheds) potentially affected by the proposed projects. The surface area comprised by the study watersheds totals approximately 4,850 acres. Surface runoff within these watersheds generally flows in a south-to-north direction and is tributary to Brush Creek in the Roaring Fork River basin. The study watersheds are described in more detail in the Affected Environment paragraphs, below.

The scope of the analysis for wetland resources includes identified wetlands within or in close proximity to the proposed project areas.

FOREST PLAN DIRECTION

Pursuant to the 2002 Forest Plan, as amended, stream health management measures and design criteria are provided in the Region 2 WCPH to ensure applicable Federal and State laws are met on NFS lands in Region 2.³⁸ The Forest Plan and the WCPH direct how snowmaking and land treatments are to be managed on the White River National Forest. Forest Plan Standards for ski areas specifically state:

2. Snowmaking and other water depletions will be conducted in a manner that conserves stream pattern, geometry, substrate composition, and aquatic habitat in affected perennial streams.
3. Snow management, including snowmaking and snow-farming, will be conducted in a manner that prevents slope failures and gully erosion, as well as bank erosion and sediment damage in receiving channels.

The WCPH contains several Management Measures (MM) which are environmental goals to protect aquatic and riparian systems. MM of relevance regarding watershed resources are outlined below:

Applicable WCPH Management Measures

- MM-1. Manage land treatments to conserve site moisture and to protect long-term stream health from damage by increased runoff.
- MM-2. Manage land treatments to maintain enough organic ground cover in each activity area to prevent harmful increased runoff.
- MM-3. In the water influence zone (WIZ) next to perennial and intermittent streams, lakes, and wetlands, allow only those actions that maintain or improve long-term stream health and riparian ecosystem condition.

³⁸ USDA Forest Service, 2005

- MM-5. Conduct actions so that stream pattern, geometry, and habitats maintain or improve long-term stream health.
- MM-6. Maintain long-term ground cover, soil structure, water budgets, and flow patterns of wetlands to sustain their ecological function.
- MM-8. Manage water use facilities to prevent gully erosion of slopes and to prevent sediment and bank damage to streams.
- MM-9. Limit roads and other disturbed sites to the minimum feasible number, width, and total length consistent with the purpose of specific operations, local topography, and climate.
- MM-10. Construct roads and other disturbed sites to minimize sediment discharge into streams, lakes, and wetlands.
- MM-11. Stabilize and maintain roads and other disturbed sites during and after construction to control erosion.
- MM-16. Apply runoff controls to disconnect new pollutant sources from surface and groundwater.

Relevant WCPH Definitions

Additionally, the WCPH provides definitions for some terms that are important to conveying information in this report:

- Concentrated-Use Site: Areas designed and managed for high density of people or livestock, such as developed recreation sites and livestock watering areas.
- Connected Disturbed Areas (CDAs): High runoff areas like roads and other disturbed sites that have a continuous surface flow path into a stream or lake. Hydrologic connection exists where overland flow, sediment or pollutants have a direct route to the channel network. CDAs include roads, ditches, compacted soils, bare soils, and areas of high burn severity that are directly connected to the channel system. Ground disturbing activities located within the water influence zone should be considered connected unless site-specific actions are taken to disconnect them from streams.
- Ephemeral Stream: A stream that flows only in direct response to precipitation in the immediate locality (watershed or catchment basin), and whose channel is at all times above the zone of saturation.
- Hydrologic Function: The ability of a watershed to infiltrate precipitation and naturally regulate runoff so streams are in dynamic equilibrium with their channels and floodplains.
- Intermittent Stream: A stream or reach of stream channel that flows, in its natural conditions, only during certain times of the year or in several years. It is characterized by interspersed, permanent

surface water areas containing aquatic flora and fauna adapted to the relatively harsh environmental conditions found in these types of environments.

- Gully: An erosion channel greater than 1 foot deep.
- Permanent Stream: A stream or reach of a channel that flows continuously or nearly so throughout the year and whose upper surface is generally lower than the top of the zone of saturation in the areas adjacent to the stream.
- Rill: An erosion channel less than 1 foot deep.
- Stream Health: The condition of a stream versus reference conditions for the stream type and geology, using metrics such as channel geometry, large woody debris, substrate, bank stability, flow regime, water chemistry, and aquatic biota.
- Stream Health Class: A category of stream health. Three classes are recognized in the Rocky Mountain Region: robust, at-risk and diminished. These classes are recommended to be used for assessing long-term stream health and impacts from management activities.
- Stream Order: A method of numbering streams as part of a drainage basin network. The smallest unbranched mapped tributary is called first order, the stream receiving the tributary is called second order and so on.³⁹
- Swale: A landform feature lower in elevation than adjacent hill slopes, usually present in headwater areas of limited areal extent, generally without display of a defined watercourse or channel that may or may not flow water in response to snowmelt or rainfall. Swales exhibit little evidence of surface runoff and may be underlain by porous soils and bedrock that readily accepts infiltrating water.
- Water Influence Zone: The land next to water bodies where vegetation plays a major role in sustaining long-term integrity of aquatic systems. It includes the geomorphic floodplain (valley bottom), riparian ecosystem, and inner gorge. Its minimum horizontal width (from top of each bank) is 100 feet or the mean height of mature dominant late-seral vegetation, whichever is most.

AFFECTED ENVIRONMENT

Project Area Description

Snowmass is situated at elevations ranging from 8,200 to 12,300 feet, receiving a significant portion of its annual precipitation as snow during the winter months. Annual precipitation at Snowmass averages 28 inches, with approximately 19 inches (or 68 percent of the annual precipitation) occurring between

³⁹ EPA, 1980

November and April. Monthly mean temperatures range between 17 and 26 degrees Fahrenheit and between 48 and 56 degrees Fahrenheit during the winter and summer months, respectively.⁴⁰

The study watersheds are those drainage areas where the proposed projects would be implemented. As stated above, the study watersheds are tributary to Brush Creek, which is tributary to the Roaring Fork River. A brief description of the four study watersheds follows:

- **East Fork of Brush Creek**, a third-order watershed, is the easternmost and the largest of the study watersheds, containing 2,112 acres. The Long Shot and Castle Glading Projects, and a portion of the Elk Camp Bypass Trail would be located in this watershed.
- **West Fork of Brush Creek**, also a third-order watershed, it is located at the western boundary of the study area and comprises 1,761 acres. Projects proposed for this watershed include glading (Sneaky's, Freefall/Glissade, Upper Green Cabin, and Reidar's), snowmaking, and replacement of the High Alpine chairlift.
- **Brush Creek Tributary 1**, a first-order watershed and extending for 342 acres is the smallest study watershed. No perennial/intermittent stream channels were identified in this watershed. Additional snowmaking is proposed for this watershed.
- **Brush Creek Tributary 2**, also a first-order watershed its drainage area contains 633 acres. The proposed Elk Camp Bypass Trail would be constructed in this watershed.

Watershed

Snowmaking System

Snowmass obtains its snowmaking water supply from the 215-acre foot Ziegler Reservoir (a.k.a. Lake Deborah), owned and operated by the Snowmass Water and Sanitation District (SWSD). Ziegler Reservoir is an integral part of the SWSD's water supply system which includes numerous water rights. Among these, the Snowmass Creek Pipeline is decreed for an amount of 6 cfs for snowmaking uses (Water Court Case Nos. 92CW0307, 02CW0024, and 09CW0038).

The Snowmass snowmaking system includes three on-mountain storage ponds: Sheer Bliss, Rayburn's, and Burlingame. These ponds start the snowmaking season at full capacity as a result of seasonal run-off and/or available streamflows. As a key part of the overall snowmaking infrastructure, these ponds are drained and filled several times during the course of the snowmaking season as necessary with system water from Ziegler Reservoir. Typically, refilling of the on-mountain storage ponds takes place during periods of warm temperatures when pumped water cannot be processed into snow.⁴¹

⁴⁰ PRISM Climate Group, 2013

⁴¹ Gerdin, 2014

Currently, Snowmass utilizes, on average, 243 acre feet of water per season for its snowmaking operations. Of this total, approximately 46 acre feet are dedicated to construction and maintenance of Snowmass’ terrain parks and half-pipes. The remaining 197 acre feet are utilized for snowmaking operations on regular ski trails. These averages are based upon data available for the last six ski seasons (see Table 3F-1). Records maintained by the Snowmass snowmaking personnel also indicate that during the snowmaking season (November 1st through December 31st), there are approximately 800 hours when temperatures are sufficient for snowmaking. On average, the Snowmass snowmaking crew complete their snowmaking operations in approximately 515 hours, or 65 percent of the total time typically available.⁴²

Man-made snow is currently applied on approximately 260 acres of ski trails. Thus, the average ratio of pumped water to acreage of ski trails with snowmaking is 0.76 acre feet/acre. A portion of the volume of water pumped during snowmaking operations is subject to losses due to evaporation, sublimation, and evapotranspiration (watershed losses). Mostly, these losses depend upon air temperatures during the snowmaking process, the volume of water pumped, and the type of year (dry, average, or wet). Calculations conducted for the study watersheds show that snowmaking water losses during average year conditions total approximately 26 percent.⁴³

**Table 3F-1:
Summary of Snowmaking Water Use for the Period 2009–2014
Regular Ski Trails only**

Ski Season	Snowmaking Water (acre feet)
2008/09	162.0
2009/10	178.9
2010/11	171.6
2011/12	226.5
2012/13	277.1
2013/14	166.0
Average	197.0
Minimum	162.0
Maximum	277.1

Snowmass Creek Instream Flows

Instream flows are non-consumptive, in-channel water rights owned by the CWCB and administered within the State of Colorado water right priority system with the purpose of preserving or improving the natural environment to a reasonable degree. Instream flows for Snowmass Creek were decreed in Water Court Case No. W-2943 and apply to various reaches of the Creek, from the outlet of Snowmass Lake to its confluence with the Roaring Fork River. The instream flow reach from where snowmaking water is diverted spans from the confluence of Snowmass Creek with West Snowmass Creek down to its

⁴² Ibid.

⁴³ Colorado Ski Country USA, 1986

confluence with Capitol Creek. In summary, instream flows for the period October 16 through March 31 are determined each year based upon a flow trigger defined as the average daily streamflow observed during the October 11 to October 16 period, and values shown in Table 3F-2. For example, if the average streamflow in this reach of Snowmass Creek from October 11 to October 15 is calculated to be 28 cfs, then the instream flow for the period October 16 through October 31 is 12 cfs which is reduced to 10 cfs for the November 1 to December 14 period.

**Table 3F-2:
Snowmass Creek Multi-Stage Wintertime Instream Flow Requirements**

			Multi-Stage Winter Instream Flow	
Instream Flow Trigger Average Daily Flow from 10/11 to 10/15	Percentile Water Year	Predicted Recurrence Interval	Time Period	Minimum Instream Flow
≥ 29.0 cfs	50th Percentile or greater	1 in 2 years	10/16–11/30	12 cfs
			12/1–3/30	10 cfs
27.0 cfs ≤ Avg Flow < 29.0 cfs	25th Percentile to 50th Percentile	1 in 4 years to 1 in 2 years	10/16–10/31	12 cfs
			11/1–12/14	10 cfs
			12/15–12/31	9 cfs
			1/1–3/31	10 cfs
19.0 cfs ≤ Avg Flow < 27.0 cfs	10th Percentile to 25th Percentile	1 in 10 years to 1 in 4 years	10/16–10/31	12 cfs
			11/1–11/14	10 cfs
			11/15–12/21	9 cfs
			12/22–12/28	8.5 cfs
			12/29–12/31	8 cfs
< 19.0 cfs	Less than 10th Percentile	1 in 10 years or greater	1/1–3/31	9 cfs
			10/16–10/21	9 cfs
			10/22–10/31	8 cfs
			11/1–12/31	7 cfs
			1/1–3/31	8 cfs

Source: Water Court Case No. W-2943

Case No. W-2943 also states that daily administration of instream flow for this particular reach of Snowmass Creek includes “a certain degree of flexibility between November 15 and December 21 of each year.” According to the Decree, administration of instream flows during this time is based on a 24-hour moving average. In addition, diversions junior to the CWCB instream flow right are allowed to reduce Snowmass Creek flows below the corresponding multi-stage flow by up to 2 cfs, provided that:

- Such reduction does not last more than 6 hours in any 24-hour period;
- At no time such junior diversions cause streamflows to fall below 7 cfs; and
- At no time such junior diversions cause the 24-hour moving average to fall below the corresponding multi-stage instream flow.

Following improvements constructed in 2011, Ziegler Reservoir became the primary water storage facility for the SWSD and for the Snowmass snowmaking system. Prior to the 2011 improvements to Ziegler Reservoir, snowmaking water was drawn directly from Snowmass Creek at varying rates, up to 6 cfs as needed by snowmaking operations and as allowed by Snowmass Creek instream flows. While Ziegler Reservoir still requires replenishment from Snowmass Creek during the snowmaking season, most of the snowmaking water is now drawn from Snowmass Creek into storage during periods of maximum streamflow availability, therefore reducing demand upon the stream system during low flow time periods. Because water needed for snowmaking operations is drawn from Ziegler Reservoir and/or from one or more of the on-mountain storage ponds (and not directly from the Snowmass Creek) impacts to the CWCB decreed instream flow water right on Snowmass Creek are minimized or avoided.

It is important to note that the CWCB protects its instream flow water rights by enforcing terms and conditions contained in decrees, stipulations and agreements. Instream flows are monitored to ensure that CWCB water rights are being met and administered according to the State's prior appropriation system. Snowmass Creek streamflows below Ziegler Reservoir (i.e., downstream of Snowmass' snowmaking diversions) are continuously monitored by the Snowmass Creek Gaging Station, operated by the Colorado Division of Water Resources (Station ID: SNOCRECO). This stream gaging station records streamflow information at 15-minute intervals; real-time streamflow data is available on-line at the Division of Water Resources website.⁴⁴ If streamflows fall below the wintertime instream flow requirements, the CWCB can place an administrative call on Snowmass Creek thereby curtailing upstream junior water rights, including snowmaking diversions into Ziegler Reservoir.

Water Yield

Runoff hydrographs for the study watersheds were developed following the methodologies presented in the WRENSS Procedural Handbook, as updated by Troendle, Nankervis, and Porth, 2003, and supplemented by the Colorado Ski Country USA (CSCUSA) Handbook.⁴⁵ In summary, the WRENSS Model generates a water balance using seasonal precipitation and vegetation type and density (distributed by watershed aspect). The Model then computes the amount of water potentially available for runoff. The water balance of the WRENSS Model is coupled with a snowmaking hydrology computation process developed through the CSCUSA study. Together, these calculations produce estimates of water yield typical of subalpine mountain watersheds. For each study watershed, the WRENSS Model distributes the calculated annual yield using simulated hydrographs based on hundreds of years of data recorded at several different gauging stations. The simulated hydrographs represent the normalized distributions of the annual yield in six-day intervals throughout the year. It is important to note that the computations do not include routing of runoff water through the watershed to the stream system. Thus, the water yield hydrographs do not represent streamflow per se, but rather basin-wide water yield to the receiving waters.

⁴⁴ <http://www.dwr.state.co.us/Surfacewater/data/division.aspx?div=5>

⁴⁵ EPA, 1980; Troendle et al., 2003; Colorado Ski Country USA, 1986

In other words, the WRENSS hydrologic model was developed to simulate expected changes in streamflow as the result of silvicultural activities, not streamflow itself.

Water yields and distribution hydrographs were modeled for alternatives 1 and 2 and for baseline conditions using monthly average precipitation and temperature data for each watershed. The purpose of this modeling effort is to estimate the effects of existing and proposed projects on the watersheds' yield and peak flow. The baseline hydrographs modeled conditions prior to any human impacts, such as ski trail development, taking place in these watersheds.

Under current conditions, the study watersheds' yields are affected by tree removal associated with ski area development (see Table 3F-3) and by the input of additional water in the form of snowmaking. Water yields and peak flows calculated using the WRENSS Model for each study watershed are summarized in Table 3F-4, for both baseline and current conditions assuming average precipitation and temperatures. Hydrograph plots that depict the temporal distribution of these water yields were also developed using the WRENSS Model. These modeled hydrographs reveal flow characteristics reflective of the current ski trail system and snowmaking applications. In general, snowmelt hydrographs influenced by vegetative clearing and snowmaking have higher intensity peak flows which occur earlier in the runoff season as compared to pre-development conditions. This is a consequence of the higher volume and rate of snowmelt due to decreased canopy interception and evapotranspiration, and increased solar radiation in cleared areas, and also due to the snowmaking water input (additional to natural precipitation) to the affected watersheds.

Table 3F-3:
Study Watersheds – Existing Conditions

Watershed	Surface Area (acres)			
	Total	Meadows	Forested	Clear-Cut
East Fork of Brush Creek	2,112	118	1,446	547
West Fork of Brush Creek	1,761	522	633	606
Brush Creek Tributary 1	342	0	203	139
Brush Creek Tributary 2	633	0	375	258

**Table 3F-4:
 WRENSS Model Output for Baseline and Existing Conditions – Average Year**

Watershed	Baseline Conditions		Existing Conditions	
	Water Yield (acre feet)	Peak Flow (cfs)	Water Yield (acre feet)	Peak Flow (cfs)
East Fork of Brush Creek	979	8.3	1,803	32.9
West Fork of Brush Creek	1,289	12.0	2,354	39.2
Brush Creek Tributary 1	112	1.1	281	5.4
Brush Creek Tributary 2	336	2.9	725	8.1

It is important to emphasize that Table 3F-4 depicts the modeled yield and peak flow values corresponding to average precipitation for the study watersheds. The watershed yield and peak flow can vary significantly from year to year due to natural variability of precipitation patterns. For example, modelling a typical wet year, such as 1995, with annual precipitation about 30 percent higher than the average year for the East Fork of Brush Creek watershed produced an estimated yield 57 percent higher and a peak runoff 32 percent higher than those corresponding to the average precipitation year. Similarly, a typical dry year, such as 1977, with annual precipitation equal to 70 percent of the average generated a watershed yield and peak flow approximately 50 percent and 71 percent of the average year amounts respectively. The modeled results for the typical dry and wet years are shown in Table 3F-5.

**Table 3F-5:
 WRENSS Model Output for Existing Conditions – Dry, Average, and Wet Years**

Watershed	Dry Year		Average Year		Wet Year	
	Water Yield (acre feet)	Peak Flow (cfs)	Water Yield (acre feet)	Peak Flow (cfs)	Water Yield (acre feet)	Peak Flow (cfs)
East Fork of Brush Creek	908	23.4	1,803	32.9	2,832	43.5
West Fork of Brush Creek	1,309	26.3	2,354	39.2	3,525	52.9
Brush Creek Tributary 1	138	3.7	281	5.4	446	7.1
Brush Creek Tributary 2	389	4.7	725	8.1	1,102	12.0

Stream Health

The WCPH defines stream health as the condition of a stream compared to the condition of a minimally disturbed reference stream of similar type and geology. Stream health is categorized as robust, at-risk, or diminished using numerical criteria for fine sediment loading, percentage of unstable banks, residual pool depths, and wood loading.

Stream Health Definitions

As described above, the Forest Plan adopted the WCPH for direction on projects that affect water resources. The WCPH mandates several Management Measures of relevance regarding stream health and water resources effects. To facilitate the evaluation of stream health compliance in the context of the

WCPH Management Measures, the WCPH outlines several key definitions relevant to the quantification of stream health. The definitions of Stream Health and Stream Health Class are provided in the Forest Plan Direction section above.

The stream health classification is obtained by comparing metrics surveyed in a study reach against those surveyed in its corresponding reference reach. Reference stream reaches are located in watersheds with little or no development and represent natural conditions that are attainable for a given channel type, climate, geology, aspect, and slope. Reference stream reaches provide an analytical control against which to compare the conditions found in study reaches. Study reaches are located downstream from areas impacted by natural events (e.g., forest fires) or activities such as logging and ski area development.

Stream health classes are used for assessing long-term stream health and impacts from management activities. In addition, Management Measure MM-3 included in the WCPH states that “only those actions that maintain or improve long-term stream health and riparian ecosystem condition” shall be allowed. Definitions of relevant stream health metrics are listed in the paragraphs below. Table 3F-6 summarizes the definitions of stream health classes.

**Table 3F-6:
Stream Health Classes for Attainment of Forest Plan Standards (WCPH)**

Stream Health Class	% of Reference	Habitat Condition
Robust	> 74 or < 126 ^a	Stream exhibits high geomorphic, hydrologic and/or biotic integrity relative to its natural potential condition. Physical, chemical and/or biologic conditions suggests that State assigned water quality (beneficial, designated or classified) uses are supported.
At-Risk	59 to 73 or 127 to 141 ^a	Stream exhibits moderate geomorphic, hydrologic and/or biotic integrity relative to its natural potential condition (as represented by a suitable reference condition). Physical, chemical and/or biologic conditions suggest that State assigned water quality (beneficial, designated or classified) uses are at risk and may be threatened.
Diminished	< 58 or > 141 ^a	Stream exhibits low geomorphic, hydrologic and/or biotic integrity relative to its natural potential conditions (as represented by a suitable reference condition). Physical, chemical and/or biologic conditions suggest that State assigned water quality (beneficial, designated or classified) uses may not be supported.

^a For metrics that increase with decreasing stream health, such as fine sediment and unstable stream banks.

Potential Management Effects to Stream Health

Metric:

Unstable Banks: A streambank showing evidence of the following: breakdown (clumps of bank are broken away and banks are exposed); slumping (banks have slipped down); tension cracking or fracture (a crack visible on the bank); or vertical and eroding (bank is mostly uncovered, less than 50 percent covered by perennial vegetation, roots, rocks of cobble size or larger, logs of 0.1 meter in diameter or larger, and the bank angle is steeper than 80 degrees from the horizontal). Undercut banks are considered stable unless tension fractures show on the ground surface at the back of the undercut.⁴⁶

Causal Mechanism(s):

Increased Runoff: The WCPH lists increased runoff as one the major sources of stream impacts. Several investigators have demonstrated that increases in peak discharge and annual volume of runoff can negatively impact the stability of streambanks.⁴⁷

Impacts to Riparian Vegetation: Many land use activities can lead to accelerated bank erosion. Riparian vegetation provides internal bank strength. Removal of native riparian vegetation may lead to weakened internal bank strength and subsequent decrease in bank stability.⁴⁸

Channel Network Extension: Roadside drainages frequently connect directly to the stream channel and result in a net increase in the length of the existing channel network within the watershed. This increases the efficiency of flow routing within the watershed, increasing peak flows and subsequent erosion and sediment transport. The WCPH outlines the following Design Criterion under MM-1: “In each 3rd order and larger watershed, limit connected disturbed areas so that the total stream network is not expanded by more than 10 percent. Progress toward zero connected disturbed area as much as feasible.” Roads are usually a primary source of channelized connection between disturbed soils and the stream channel. Because roadside drainage ditches provide an efficient mechanism for capturing runoff and frequently drain to a stream system, a direct link between the road-generated sediment source and the stream system is easily created. A second potential source of connected disturbance could be sparsely vegetated ski trails with drainage water bars that connect directly to the stream system.

Connected Graded Terrain: In terms of the effect of proposed management activities upon bank stability conditions in affected stream reaches, ultimately the area of disturbance and/or snowmaking that is directly connected to the stream system is the variable of management concern. The WCPH clearly documents the relationship between CDAs and effects to peak flows in the associated stream system.

⁴⁶ Overton et al., 1997

⁴⁷ David, 2008

⁴⁸ Rosgen, 2006

Likewise, the effect of channel network extension and the increased efficiency of hydraulic routing have been well documented by several investigations, including references in the Zero Code of the WCPH.⁴⁹

Metric:

Percent Surface Fines: The effect of land disturbances such as roads, roadside ditches, ski trails, and utility corridors within forested watersheds tend to cause an increase in exposed and compacted surface soils and therefore increase erosion and sediment transport. An increase of sediment load input to the stream network of a watershed is often indicated by higher percentages of fine-grained particles on the channel bed. Fine sediment deposition can diminish habitat by aggradation, or filling in, of pool systems. Pools are important components of habitat for many fish species and other aquatic organisms. Filling by fines affects pool habitat by reducing volume, particularly during low flow conditions, and obliterating substrate cover.

Causal Mechanism(s):

Connected Disturbed Area (CDAs): High-runoff areas, like roads and other disturbed sites, having a continuous surface flow path into a stream or lake. Hydrologic connection exists where overland flow, sediment, or pollutants have a direct route to the channel network. CDAs include roads, ditches, compacted soils, bare soils, and areas of high burn severity that are connected to the channel system. Ground disturbing activities located within the WIZ should be considered connected unless site-specific actions are taken to disconnect them from the streams. CDAs provide a measure of the extent to which a stream reach is influenced by direct, channelized connections between disturbed soils and the stream network itself.

Metric:

Wood Frequency: Sustainable woody debris recruitment is recognized as an important riparian function in mountain channels. Standing dead trees provide habitat for nesting species in the riparian zone and contribute detritus and insects to streams. Once in streams, coarse woody debris helps maintain channel structure by storing sediment and encouraging pool scour. Large woody debris (LWD) reduces stream energy by interrupting the continuous slope of channel beds and creating turbulence. In streams supporting fisheries, LWD also helps provide stable fish habitat by retaining spawning gravel and by serving as rearing cover.

Causal Mechanism(s):

Vegetation Removal in WIZ: Recruitment of LWD is dependent upon maintenance of riparian vegetation structure and function. Removal of vegetation within the WIZ has been demonstrated to have a negative impact upon maintenance of adequate wood frequency.

⁴⁹ Burroughs and King, 1989; Troendle and Olsen, 1994

Existing Stream Health

The White River National Forest evaluates stream health using a standard Forest Service physical habitat survey protocol.⁵⁰ Under this protocol streams that may be affected by proposed management activities are surveyed and compared to reference streams with similar morphology and geology. Reference streams represent natural conditions that are considered the best conditions attainable. For streams that are third-order and larger, stream health surveys are typically conducted downstream from proposed management activities in reaches that are considered to have the potential to respond to altered flow conditions or sediment loading upstream.⁵¹ Quantitative stream health surveys are not routinely conducted on second order and smaller streams due to high natural variability in bed and bank characteristics; however, these smaller streams are often evaluated using qualitative observations of bed and bank characteristics which may indicate localized erosion or sediment storage.

As mentioned in the Potential Management Effects to Stream Health Section, disturbance of the WIZ has a direct effect on stream health metrics, such as LWD, and fine sediments. The WCPH states the importance of the WIZ in the protection of interacting aquatic, riparian, and upland functions. Furthermore, Management Measure MM-3 includes design criteria requiring that new concentrated-use sites be located outside the WIZ if practicable. Table 3F-7 compares the extent of the WIZ estimated for pre-development, or baseline, against existing conditions. Relative to baseline conditions, most of the tree removal within the WIZ has occurred in the West Fork Brush Creek watershed.

**Table 3F-7:
 Impacts to the WIZ within Snowmass' Watersheds – Existing Conditions**

Watershed	Baseline (acres)	Existing (acres)	Existing (% of Baseline)
East Fork Brush Creek	124.7	109.1	87%
West Fork Brush Creek	88.2	41.6	47%
Brush Creek (Trib. 1) ^a	NA	NA	NA
Brush Creek (Trib. 2)	12.4	8.7	70%

^a No perennial/intermittent stream channels identified in this watershed.

At the Snowmass Ski Area stream health was evaluated in two third-order stream reaches (West Fork Brush Creek and East Fork Brush Creek). Additionally, a qualitative assessment of bed and bank characteristics was conducted in two second-order tributaries to West Fork Brush Creek that would receive additional runoff generated from snowmaking under the proposed action. The stream health reach on East Fork Brush Creek is on National Forest System lands; however West Fork Brush Creek is second-order on National Forest System lands just downstream from the proposed activities. Consequently, the stream health survey on West Fork Brush Creek was conducted on private land within the ski area

⁵⁰ Overton et al., 1997

⁵¹ Montgomery and Buffington, 1998

boundary downstream from the National Forest boundary in a location where the stream is third-order. Stream health surveys were conducted on September 14, 2014 and additional assessments of conditions in tributaries to West Fork Brush Creek were conducted on September 16, September 19 and October 9, 2014. Four reference streams, surveyed in previous years, were used to characterize reference conditions for the evaluation of West Fork Brush and East Fork Brush Creeks.

Both West Fork Brush Creek and East Fork Brush Creek are rated as “Robust” for fine sediment loading, residual pool depths and wood frequency, whereas both are rated “Diminished” for bank stability.⁵² The exact cause of bank instability in West Fork Brush and East Fork Brush Creeks is not known. Increased streamflow associated with tree clearing, road construction, snowmaking and grading at ski areas can increase bank failures in streams.⁵³ However, bank instability can also be associated with natural sediment transport processes, particularly on alluvial fans where there is a transition from high sediment transport capacity upstream to low sediment transport capacity downstream.⁵⁴ Breaks in channel confinement and gradient breaks also affect the transport capacity within different stream segments or reaches, and this affects the way different stream reaches respond to sediment inputs.⁵⁵

It is likely that bank stability within the stream health survey reaches on West Fork Brush and East Fork Brush Creeks is affected both by natural factors relating to gradient, confinement and geology, as well as past ski area development. The Stream Health survey reach in West Fork Brush Creek lies in an area of transition from high gradient to lower gradient and just downstream of a break in bedrock geology from the more-stable Dakota Sandstone formation upstream to the less-stable Mancos Shale formation downstream. A qualitative assessment of second-order tributaries of West Fork Brush Creek revealed that bank stability concerns are isolated. Of approximately 2,915 meters of tributaries of West Brush Creek that were hiked, unstable banks were observed only in one location where a shallow landslide originating at the overflow outlet from the Sheer Bliss pond affected approximately 40 meters of stream bank. Although bank instability remains a concern in isolated portions of West Fork Brush Creek and East Fork Brush Creek, the bank stability concerns are not widespread throughout the stream network.

Existing Connected Disturbed Area

A field investigation completed during the late summer and early fall of 2014 in the study watersheds provides important information regarding existing conditions related to stream health. Data collected during the field investigation, such as location and characteristics of roads, road-side ditches, culverts, etc., was incorporated into a Geographic Information System (GIS) database in order to estimate the spatial extent of CDAs. In particular, the field investigation focused on the condition of roads and other disturbed areas within the SUP area and in the vicinity of stream channels to determine if such areas route

⁵² Anderson, 2014

⁵³ David, 2008

⁵⁴ USDA Forest Service, 1992

⁵⁵ Montgomery and Buffington, 1998

flows directly to the stream system (i.e., are connected to the stream) within each watershed. Disturbed areas where clear evidence of direct hydrologic connection to the stream system was observed were classified as CDAs. Generally, mountain roads in Snowmass were found to be in good condition. However, there exist sections of roads which are steep and/or located in close proximity to stream channels. Ruts, rill erosion, and evidence of road drainage flowing into the creek were observed in these sections and as a result were classified as connected. Results from this investigation that are relevant to the CDAs analysis are displayed in Table 3F-8 and Table 3F-9.

**Table 3F-8:
Connected Roads within the Study Watersheds – Existing Conditions**

Watershed	Natural Stream Channel Length ^a (ft)	Road Drainage Connected Length ^b (ft)	Percent Increase of Channel Length
East Fork Brush Creek	31,843	2,565	8%
West Fork Brush Creek	25,598	1,268	5%
Brush Creek (Trib. 1) ^c	NA	NA	NA
Brush Creek (Trib. 2)	5,090	454	9%

^a Derived from GIS and field data analysis. Includes stream channels of Order 1 and higher.

^b Within NFS Lands.

^c No perennial/intermittent stream channels identified in this watershed.

**Table 3F-9:
Connected Disturbed Areas within the Study Watersheds – Existing Conditions**

Watershed	Existing Disturbed Areas ^a (acres)	Connected Disturbed Areas ^a (acres)	Percent Disturbed Areas that are Connected
East Fork Brush Creek	8.9	1.07	12%
West Fork Brush Creek	11.4	0.45	4%
Brush Creek (Trib. 1) ^b	3.6	NA	NA
Brush Creek (Trib. 2)	7.5	0.17	2%

^a Includes roads within NFS lands.

^b No perennial/intermittent stream channels identified in this watershed

The WCPH provides management measures and design criteria to protect the hydrologic function of watersheds. Design Criteria for MM-1 states that “In each watershed containing a 3rd-order and larger stream, limit connected disturbed areas so the total stream network is not expanded by more than 10 percent.” Direct connection of disturbances to the stream channel, such as roads via roadside ditches, results in a net increase in the length of the existing channel network within the watershed. Although some of the study watersheds are of first order, the concept of minimizing the length of connected roads still applies. Connected disturbed areas capture surface runoff and concentrate flows within the watershed, increasing both volume and peak streamflows. This, in turn, creates a direct link between the

sediment generated in disturbed areas and the stream system. Thus, CDAs have a direct, negative impact in stream health metrics such as unstable banks and channel sedimentation.

As shown in Table 3F-8, the percent increase of channel length (due to connected roads) is relatively low as compared to the total length of the channel network. In fact, the percent increase of channel length is less than the 10 percent limit established in MM-1. In addition, the acreage of disturbed areas that is connected to the stream system is also small relative to the spatial extent of disturbed areas in the study watersheds (Table 3F-9). The overall good condition of the ski area roads and the relatively small acreage of CDAs has contributed to maintain the “Robust” classification of percent of fine sediments and residual pool depth metrics determined for the East and West Forks of Brush Creek.

Wetlands

The wetland delineation identified wetlands located within or in close proximity to some of the proposed project areas. Wetland sample plots revealed the boundary between sites which exhibited all three wetland parameters (hydric soil, wetland hydrology, hydrophytic vegetation) and sites which were lacking one or more of the parameters. Based on the presence or absence of wetland parameters, wetland boundaries were designated. These federally jurisdictional sites are a mixture of palustrine herbaceous emergent and palustrine shrub wetlands.⁵⁶

The ecological characteristics of all delineated wetlands are consistent with parameters set forth in the 1987 Wetland Delineation Manual and 2010 Supplement. In other words, they are considered to be federally jurisdictional and subject to the regulations implementing Section 404 of the Clean Water Act. These wetland areas include the following:

- 1) The West Fork Brush Creek headwaters and associated riparian fringe is located adjacent to the bottom terminal of the proposed High Alpine Lift. This reach contains both emergent herbaceous and palustrine shrub wetlands.
- 2) The West Fork Brush Creek headwaters and associated riparian fringe is located adjacent to the lower Green Cabin proposed snowmaking area. This location is dominated by palustrine shrub wetland.
- 3) A different headwater reach of West Fork Brush Creek, and associated riparian fringe, is located adjacent to the proposed Elk Camp Bypass Trail. This is also a palustrine shrub wetland.
- 4) The same headwater as (3) above would be crossed by the Level III trail. At the location that would be crossed, palustrine shrub wetland is present.

The following subsections present the results of the field examinations with respect to soil parameters, vegetation composition, and hydrological indicators.

⁵⁶ Cowardin et al., 1979

Soils

Hydric soils were present in all areas delineated as wetland. Depleted matrices or redox dark surface clay and silt loams were indicated at all sample plots located in wetland areas. Upland soil plots typically indicated very shallow soils devoid of hydric indicators, typical of Colorado mountain sites.

Vegetation

Within the boundaries of the assessment area, hydrophytic vegetation was dominant within delineated wetlands. Hydrophytic vegetation was not observed to be dominant outside of mapped wetland areas. The dominant plant associations include mixed conifer uplands, alpine krummholz and willow communities, aspen uplands, willow/riparian palustrine wetlands, emergent herbaceous riparian wetlands, and forb/grassland ski trails.

Hydrology

Waters of the United States that are found in the project areas are associated with the East and West Forks of Brush Creek. Both are tributary to Brush Creek, tributary to the Roaring Fork River. The 100-year floodplain at the location of the project area has not been mapped by the Federal Emergency Management Agency (FEMA).

Saturation within the root zone, inundation of the sample site, presence of one primary or two or more secondary hydrological indicators was confirmed in all sample plots located in areas mapped as wetland.

DIRECT AND INDIRECT ENVIRONMENTAL CONSEQUENCES

Alternative 1 – No Action

Under the No Action Alternative, Snowmass would continue its current summer and winter seasonal operations. Creation of additional skiing terrain and/or implementation of additional snowmaking would not occur with selection of this alternative. This alternative would have no direct or indirect effects on the riparian and wetland resources.

Alternative 2 – Proposed Action

The Proposed Action involves clearing a total of 9.6 acres of existing forested areas associated with creation of the new *Elk Camp Lower Bypass* and *Level 3* trails (3.2 acres) and with construction of the new High Alpine lift corridor. Approximately 3.9 acres of terrain grading would also be necessary for implementation of these projects. The proposed projects include thinning an additional 81.8 acres in order to expand the overall glade skiing opportunities in Snowmass, and the installation of new snowmaking infrastructure needed to increase snowmaking coverage by 26.2 acres. Table 3F-10 summarizes the proposed projects for the study watersheds. Table 3F-11 provides a comparison between pre-development, existing, and proposed forest acreage. The proposed snowmaking addition would entail an

increase in the annual snowmaking water demand of approximately 19.8 acre feet (12.7 percent relative to existing amounts), as displayed in Table 3F-12.

**Table 3F-10:
Proposed Projects per Watershed**

Watershed	Proposed Projects Summary	Proposed Activity (acres)			
		Tree Clearing	Tree Thinning	Terrain Grading	Snowmaking
East Fork Brush Creek	Elk Camp Bypass Trail; Long Shot and Castle glading projects.	0.4	24.2	0.4	0
West Fork Brush Creek	High Alpine lift replacement; Upper Green Cabin, Reidar's, Freefall/Glissade, and Sneaky's glading projects; proposed snowmaking.	6.4	57.6	2.4	24.55
Brush Creek (Trib. 1)	Proposed snowmaking.	0	0	0	1.65
Brush Creek (Trib. 2)	Level 3 and Elk Camp Bypass trails.	2.8	0	1.1	0
TOTAL		9.6	81.8	3.9	26.2

Note:

These acreages differ slightly from the numbers presented in Chapter 2 of this document due to the presence of some overlapping projects and rounding.

**Table 3F-11:
Comparison of Existing and Proposed Impacts to Forests**

Watershed	Baseline Forested Areas (acres)	Existing Clear-Cut		Proposed Clear-Cut (Cumulative)	
		Surface Area (acres)	Percent of Baseline Forest	Surface Area (acres)	Percent of Baseline Forest
East Fork Brush Creek	1,994	547.8	27.5%	548.2	27.5%
West Fork Brush Creek	1,239	605.6	48.9%	612.1	49.4%
Brush Creek (Trib. 1)	342	139.3	40.7%	139.3	40.7%
Brush Creek (Trib. 2)	633	257.9	40.7%	260.7	41.0%

**Table 3F-12:
Snowmaking Coverage and Associated Water Demands**

Watershed	Snowmaking Coverage (acres)		Snowmaking Water (acre feet)	
	Existing	Proposed	Existing	Proposed
East Fork Brush Creek	15.85	15.85	12.05	12.05
West Fork Brush Creek	108.73	133.28	82.64	101.29
Brush Creek (Trib. 1)	24.39	26.04	18.53	19.79
Brush Creek (Trib. 2)	59.5	59.5	43.69	43.69

Instream Flows

Snowmaking diversions from Snowmass Creek into Ziegler Reservoir are currently, and will continue to be, subject to instream flow requirements as decreed in Case No. W-2943. However, the proposed 26.2 acres of additional snowmaking coverage would not involve an increase in the instantaneous demand of water; instead, the proposed snowmaking would require, on average, an additional 55 hours of snowmaking production. As described under the Affected Environment section of this report, current snowmaking operations are completed, on average, in 515 hours of the 800 hours when temperatures are typically suitable for snowmaking during the November 1st through December 31st snowmaking season. Therefore, the increased number of 570 hours (515 + 55 = 570) needed for the proposed snowmaking operations is well within the total 800 hours typically available for the production of man-made snow.

Because the instantaneous demand of snowmaking water would not increase as a result of the proposed snowmaking, impacts to the Snowmass Creek instream flows are not anticipated to occur under the Proposed Action. Snowmass would continue to comply with the CWCB instream flows by utilizing water stored in-priority in Ziegler Reservoir and in its on-mountain storage ponds.

Water Yield

Hydrologic computations performed using the WRENS hydrologic model show that water yields and peak runoff flow rates originating from the study watersheds would increase up to 2 and 1 percent relative to existing condition. These potential changes in water yields and peak flow rates are a consequence of the proposed tree removal and additional snowmaking coverage. Within each watershed, tree removal reduces the amount of water intercepted, stored, and transpired by the vegetation; therefore an increase in water yield may be expected as a result of tree removal. Introduction of snowmaking water into the watersheds would also result in an increase of the water yield. Tables 3F-13 and 3F-14 summarize the increases in annual water yield and peak runoff flow rates modeled for the Proposed Action under average climatic conditions.

**Table 3F-13:
Estimated Changes to Annual Yield – Alternative 2**

Watershed	Water Yield (acre feet)			Change Relative to Existing Yield	Cumulative Change Relative to Baseline Yield
	Baseline	Existing	Proposed		
East Fork Brush Creek	979	1,803	1,818	1%	86%
West Fork Brush Creek	1,289	2,354	2,400	2%	86%
Brush Creek (Trib. 1)	112	281	282	0%	152%
Brush Creek (Trib. 2)	336	725	729	1%	117%

The modeled increases in yield and runoff peak flow are relatively minor as compared to the natural variability of the study watersheds hydrology. As stated before in this report, during a typical wet year the study watersheds may produce an annual yield approximately 57 percent higher than the average. Also during a typical wet year, peak flows may increase more than 32 percent due to larger snowpacks. The reader is referred to Table 3F-5 for detailed information on expected yields and peak flows during typical dry, average, and wet years.

**Table 3F-14:
 Estimated Changes to Peak Runoff – Alternative 2**

Watershed	Peak Runoff Flow (cfs)			Change Relative to Existing Rate	Cumulative Change Relative to Baseline Rate
	Baseline	Existing	Proposed		
East Fork Brush Creek	8.3	32.9	33.0	0%	298%
West Fork Brush Creek	12.0	39.2	39.4	1%	229%
Brush Creek (Trib. 1)	1.1	5.4	5.4	0%	373%
Brush Creek (Trib. 2)	2.9	8.1	8.1	0%	176%

Stream Health

The Proposed Action would involve tree removal within areas of the study watersheds, including the WIZ. In order to estimate the potential impacts to stream health that would result from implementation of the Proposed Action, the proposed tree removal was evaluated against stream health conditions measured on the East and West Forks of Brush Creek.

MM-3 included in the WCPH states that only those projects that maintain or improve long-term stream health should be allowed in the WIZ next to perennial and intermittent streams. As previously discussed, tree removal within the WIZ can negatively affect the LWD stream health metric while terrain grading may impact stream health in metrics such as unstable banks and channel sedimentation. In order to evaluate the potential additional CDA resulting from the Proposed Action, the proposed vegetation clearing and terrain grading were mapped and quantified. Only 0.1 acre of tree clearing would occur within the WIZ under the Proposed Action (in the Brush Creek Tributary 2 watershed). In addition, about 1.8 acres of glading would take place in the WIZ of East Fork Brush Creek watershed. No other impacts to the WIZ would occur with implementation of the Proposed Action. Table 3F-15 shows the WIZ under baseline, existing, and proposed conditions. The paragraphs below discuss potential impact to stream health within each study watershed.

**Table 3F-15:
 Proposed Tree Clearing within the WIZ of Study Watersheds**

Watershed	Baseline Vegetated WIZ (acres)	Existing Vegetated WIZ		Proposed Vegetated WIZ	
		(acres)	Percent of Baseline	(acres)	Percent of Baseline
East Fork Brush Creek	124.7	109.1	87%	109.1	87%
West Fork Brush Creek	88.2	41.6	47%	41.6	47%
Brush Creek (Trib. 1) ^a	NA	NA	NA	NA	NA
Brush Creek (Trib. 2)	12.4	8.7	70%	8.6	69%

^a No perennial/intermittent stream channels identified in this watershed.

East Fork Brush Creek Watershed

Implementation of Alternative 2 projects in the East Fork Brush Creek watershed would involve clearing trees on approximately 0.4 acre and thinning an additional 24.2 acres (1.8 acres within the WIZ). No additional snowmaking is proposed for this watershed. The 0.4 acre of tree clearing are associated with construction of the *Elk Camp Lower Bypass* trail and would also require terrain grading. Although the bank stability metric was determined to be “Diminished” for this watershed, the stream health analysis concluded that bank stability problems were localized and not widespread throughout the watershed. In addition, the watershed was classified as “Robust” for the other three metrics. The relatively small areas of tree removal proposed for the East Fork Brush Creek watershed would not have a negative impact on the existing stream health of this watershed if implemented with the PDC outlined below.

West Fork Brush Creek Watershed

Projects proposed to be implemented in the West Fork Brush Creek watershed include construction of the High Alpine lift replacement, glading projects, and installation of snowmaking infrastructure. These projects entail tree clearing on 6.4 acres, terrain grading on 2.4 acres, and 57.6 acres of tree thinning. The proposed bottom terminal of the High Alpine lift would result in approximately 0.3 acre of grading with the WIZ. Table 2-3 contains PDC specifically designed to minimize impacts from this disturbance. Approximately 1.5 acres of temporary disturbance associated with installation of snowmaking pipelines would occur within the WIZ. These 1.5 acres of temporary disturbance would involve trenching but would not require tree removal. An additional 4.4 acres of temporary disturbance needed for installation of snowmaking infrastructure would occur outside of the WIZ. Replacement of the High Alpine lift would involve construction of a new road spur of approximately 800 feet and improvement of an abandoned road down *Green Cabin* trail. PDC to avoid or minimize impacts to the watershed are outlined in Table 2-3 of this document.

The stream health analysis conducted for the West Fork Brush Creek also determined a “Robust” classification for wood frequency, residual pool depth, and percent of fine sediments; and classified the bank stability as “Diminished”. Similar to the East Fork Brush Creek, it was concluded that the bank

stability concerns were not widespread but localized, in part due to changes in slope and geology. The WRENS model computations predicted changes in watershed yield and peak streamflow of only 2 percent and 1 percent respectively, well within the natural variability of these parameters. Therefore, the Proposed Action is not expected to negatively impact the stream health condition of West Fork Brush Creek if implemented with the PDC listed in Table 2-3.

Brush Creek Tributary 1

The only project proposed for this watershed is the implementation of new snowmaking coverage in areas adjacent to the West Fork Brush Creek Watershed. This project does not involve tree removal or ground disturbance in this watershed and would result in a negligible increase of watershed yield and peak runoff.

Brush Creek Tributary 2

The proposed *Level 3* trail and most of the proposed *Elk Camp Lower Bypass* trail would be located in this watershed, resulting in 2.8 acres of tree clearing and 1.1 acres of terrain grading. A small increase of 1 percent in watershed yield, relative to existing conditions, is estimated to occur as a result of the proposed tree removal.

Consistency with Forest Plan and Watershed Conservation Practices Handbook

As shown in Table 3F-13 and Table 3F-14 the Proposed Action would result in very small increases of watershed yield and peak rate of runoff. In order to “maintain or improve” stream health as directed by the WCPH’s MM-3 and MM-5, the proposed projects would require appropriate PDC. Table 2-3 includes PDC to “maintain or improve” stream health; those PDC are described under the Watershed and Wetlands and Geology and Soils headings in Table 2-3. Construction and implementation of the Proposed Action following the PDC outlined in Table 2-3 would be consistent with direction provided by the Forest Plan and the WCPH and would not adversely impact the health of the study watersheds.

Wetlands

Implementation of the Proposed Action would result in impacts to wetlands. The direct physical impact to wetlands within the proposed project areas would be limited to the following:

- Clearing of woody vegetation within and adjacent to 281 square feet of wetlands in the *Level 3* trail alignment
- Clearing of woody vegetation within and adjacent to 5,955 square feet of wetlands in the *Elk Camp Lower Bypass* trail alignment.
- Temporary impact to 170 square feet of wetland for installation of the *Green Cabin* snowmaking infrastructure.

Clean Water Act

In addition to compliance with Forest Plan Standards and Guidelines, the proposed projects would fully comply with the requirements of Section 404 of the Clean Water Act (CWA). The CWA requires wetland avoidance where practicable. If impacts are unavoidable, they must be minimized, then mitigated, in that order.

Temporary wetland impacts during installation of the *Green Cabin* snowmaking infrastructure should be avoided; if impacts are unavoidable, a pre-construction notification would be sent to US Army Corps of Engineers, and no work shall proceed in wetlands until a Nationwide Permit Verification letter has been received.

CUMULATIVE EFFECTS

The following sections discuss how the Proposed Action may cumulatively affect watershed resources in combination with other past, present, and reasonable foreseeable actions.

Temporal Bounds

The temporal extent of the analysis commences with conditions before the development of Snowmass, extending through the history of the resort to the present, and includes the lifespan of current proposed projects as well as those that are reasonably foreseeable future actions, in general ten-to-twenty years into the future.

Spatial Bounds

The stream health effects of increased watershed yield are most evident in the directly affected on-mountain streams. As discussed in the Affected Environment Section, the study watersheds are directly tributary to Brush Creek which is tributary to the Roaring Fork River. The Brush Creek Watershed (HUC 12 Code: 140100040602), from its headwaters to its confluence with the Roaring Fork River, totals 23,301 acres. In other words, the study watersheds are relatively small in surface area as compared to the much larger Brush Creek Watershed.

Past, Present, and Reasonably Foreseeable Future Actions

Past, present, and proposed activities that may have a cumulative effect on watershed resources are listed below:

- 1994 Environmental Impact Statement
- 2002 Forest Plan
- 2003 Snowmass Master Plan, as amended
- 2006 Ski Area Improvements EA

- 2006 Burnt Mountain EA
- 2011 Forest Health Project
- 2013 Burnt Mountain Egress Trail EA
- Snowmass Base Village Development
- Private Land Development

Cumulative Effects Analysis

The WRNF has completed an assessment of its watersheds per the Forest Service’s Watershed Condition Framework Implementation Guide.⁵⁷ The assessment rated the Brush Creek Watershed as “Functioning Properly”. Twelve indicators of watershed condition were rated by the WRNF for the assessment. Table 3F-16 summarizes the ratings corresponding to the different indicators.

Table 3F-16:
Watershed Condition Indicators

Indicator	Brush Creek Watershed Functioning Properly
Aquatic Biota	Good
Riparian/Wetland Vegetation	Good
Water Quality	Good
Water Quantity	Poor
Aquatic Habitat	Good
Roads and Trails	Poor
Soils	Fair
Fire Regime or Wildfire	Good
Forest Cover	Good
Forest Health	Good
Terrestrial Invasive Species	Good
Rangeland Vegetation	Fair

Watersheds subjected to activities associated with ski area management, including trail construction and snowmaking, tend to exhibit cumulative changes to channel conditions as compared to watersheds in undeveloped conditions. These changes are caused by increases in watershed yield and peak runoff magnitude and duration due to the effects of tree removal, terrain grading, and snowmaking. Affected channel reaches typically exhibit long-term, continuing adjustments to their dynamic equilibria due to changes in magnitude, timing, and duration of their corresponding hydrographs. Table 3F-13 in the Direct and Indirect Environmental Consequences section of this report, compares the water yield calculated for baseline, existing, and proposed conditions.

⁵⁷ USDA Forest Service, 2011

Additional lift, trail and infrastructure projects (not currently proposed) are considered reasonably foreseeable future actions. However, such projects would require site specific NEPA analysis/approval prior to implementation and it is anticipated that said projects would include PDC and mitigation measures to offset potential impacts to watershed health.

As discussed earlier in this report, connected roads increase the intensity of surface runoff and constitute a source of sediment input into the stream system. Although a study of road connectedness at the spatial extent of the cumulative effects analysis was not completed, the Proposed Actions includes PDC to maintain the extent of connected roads within the Resort. Thus, the Proposed Action would not have an adverse, cumulative effect on road connectedness.

In addition, ASC and the Forest Service will continue to collaboratively work in order to decrease the extent of connected roads within the SUP area. For example, Table 3F-9 indicates that certain sections of existing mountain roads within the study watersheds were determined to be connected to the stream network (a total of 1.69 acres). This acreage of CDA could be reduced with adequate design, implementation, and maintenance of BMPs for erosion and sediment control.

Residential and urban development may occur within the spatial extent of the cumulative effects analysis. Residential and urban development and the associated land use changes would have a cumulative effect on the stream health and water quality Brush Creek Watershed. However, it is anticipated that such development would be subject to local, State, and Federal regulations requiring water quality protection measures.

When considered with the effects of past development and future potential development, Alternative 1 would not cumulatively affect watershed resources. Considering the project effects in addition to past, present, and reasonably foreseeable future actions, implementation of the Proposed Action would maintain stream health through successful implementation of PDC described previously. By maintaining the health of the streams, the Proposed Action would not exhibit any negative influence upon watershed conditions in a cumulative context.

As discussed above, the Proposed Action would result in minimal, temporary impacts to wetlands within the study area. Since there are no permanent impacts, these projects would not contribute cumulatively to permanent wetland impacts. Past projects at Snowmass including ski area development and nearby residential development have resulted in wetland impacts. Present and future ski area projects could result in wetland impacts.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Long-term impacts to watershed resources, including stream health and wetlands, are not expected to occur as a consequence of implementation of any of the Proposed Action analyzed in this report. The Proposed Action includes PDC that would maintain or improve stream health. In summary, no irreversible or irretrievable commitments of watershed resources associated with any of the alternatives have been identified.

Chapter 4

Consultation and Coordination

4. CONSULTATION AND COORDINATION

A. LIST OF PREPARERS

FOREST SERVICE TEAM

The following people participated in the initial scoping, were members of the ID Team, and/or provided direction and assistance during the preparation of this EA.

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**B. AGENCIES, ORGANIZATIONS, TRIBAL GOVERNMENTS AND
PERSONS CONTACTED**

FEDERAL GOVERNMENT

U.S. Fish and Wildlife Service

TRIBAL GOVERNMENT

Southern Ute Indian Tribe

Ute Indian Tribe

Ute Mountain Ute Tribe

STATE GOVERNMENT

Colorado Parks and Wildlife

State Historic Preservation Office

LOCAL GOVERNMENT

Pitkin County

Town of Snowmass Village

LOCAL MEDIA

Aspen Times

Glenwood Post Independent

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Chapter 5

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Chapter 6

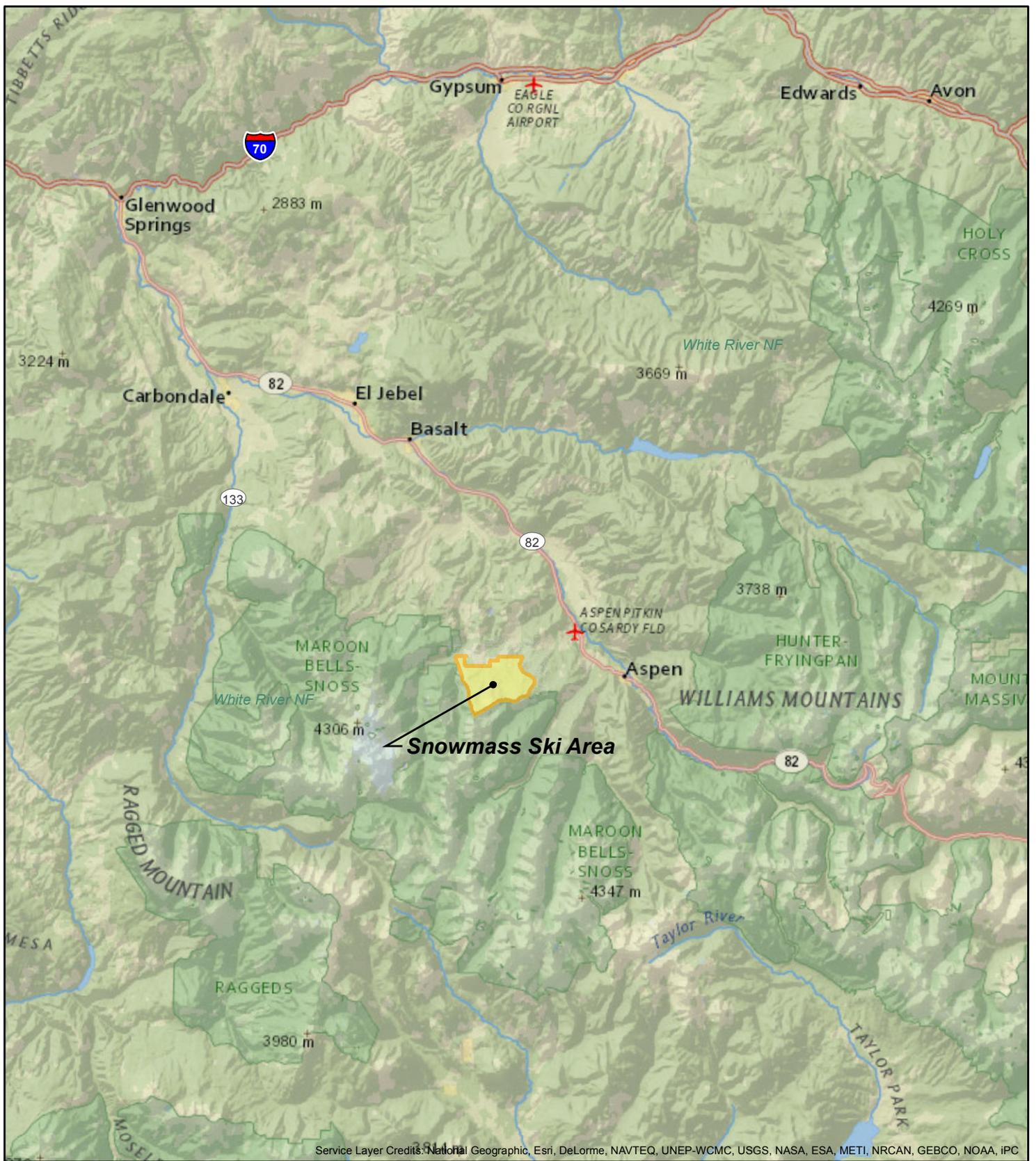
Figures

6. FIGURES

VICINITY MAP

FIGURE 1: ALTERNATIVE 1 – NO ACTION

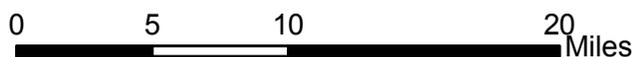
FIGURE 2: ALTERNATIVE 2 – PROPOSED ACTION



ASPEN SNOWMASS

Snowmass Ski Trail Enhancements
and High Alpine Lift Replacement
Environmental Assessment

Vicinity Map



Date: December 2014
Prepared By:



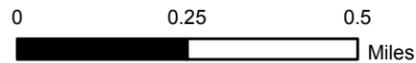
Snowmass Ski Trail Enhancements and High Alpine Lift Replacement Environmental Assessment

**Figure 1:
Alternative 1 – No Action**

Legend

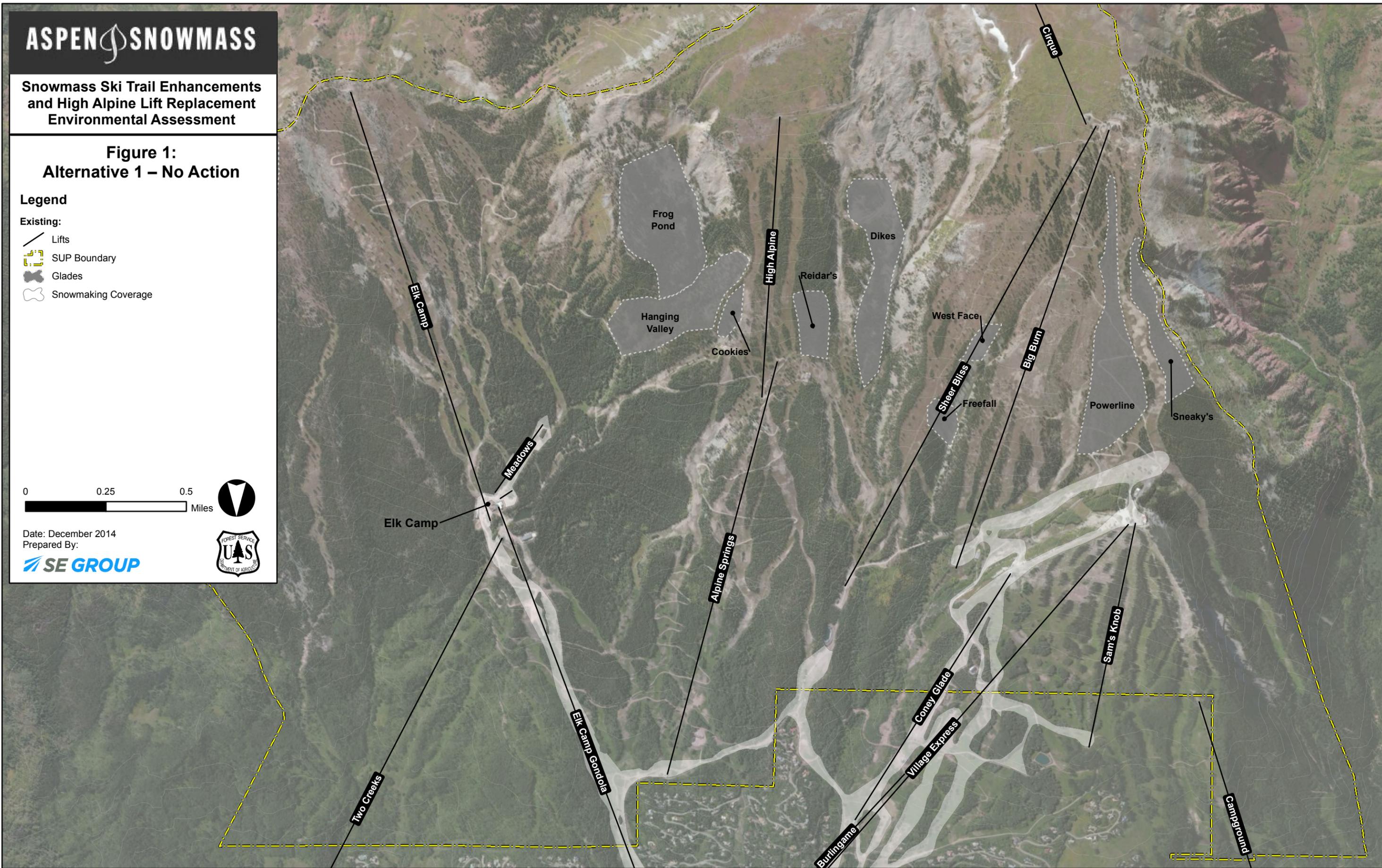
Existing:

-  Lifts
-  SUP Boundary
-  Glades
-  Snowmaking Coverage



Date: December 2014
Prepared By:

SE GROUP



Snowmass Ski Trail Enhancements and High Alpine Lift Replacement Environmental Assessment

**Figure 2:
Alternative 2 – Proposed Action**

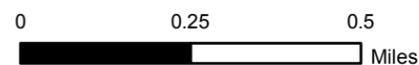
Legend

Existing:

-  Lifts
-  SUP Boundary
-  Glades
-  Snowmaking Coverage

Proposed:

-  Construction Access On Existing Roads
-  Construction Access On Proposed Roads
-  High Alpine Lift Removal
-  High Alpine Lift Replacement and Realignment
-  Elk Camp Lower Bypass Trail
-  Level 3 Trail
-  Glades
-  Snowmaking Coverage



Date: December 2014
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