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Bureau of Land Management
Royal Gorge Field Office
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Cañon City, CO 81212

NW Fremont Bark Beetle Salvage

Draft Environmental Assessment

DOI-BLM-CO-F02-2015-0039 EA

July 2015

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1.0 Chapter 1 – Introduction

This environmental assessment (EA) was prepared by the United States Department of Interior, Bureau of Land Management (BLM) Royal Gorge Field Office (RGFO) to address the potential environmental effects of the NW Fremont Bark Beetle Salvage Project. This chapter of the EA provides background information on the proposed project, including its purpose and need, the decisions to be made, conformance with applicable management plans, and a summary of public involvement that occurred during project development.

1.1 Identifying Information

Project Title: NW Fremont Bark Beetle Salvage

County: Fremont

Planning Units:

- #3 – Badger Creek
- #6 – Waugh Mountain / Tallahassee Creek

Legal Description (New Mexico Principal Meridian, Colorado):

- T. 50 N., R. 11 E., sections 1 through 12, 14 through 23, and 25 through 30
- T. 50 N., R. 12 E., sections 1 through 18 and 20 through 24
- T. 51 N., R. 11 E., sections 24 through 28 and 32 through 36
- T. 51 N., R. 12 E., sections 19 through 21 and 28 through 34

1.2 Background

Insect and disease activity is occurring in and affecting Colorado forests at a level never before seen in recorded history. Periodic insect and disease infestations are natural elements of the landscape, but past management decisions and changing forest conditions have increased infestations to epidemic levels. The main insect agents are the mountain pine beetle, spruce beetle, *Ips* beetle, Douglas-fir beetle, and the western balsam bark beetle. Since 1996, bark beetles have affected more than 3.3 million acres statewide (BLM 2012). Years of fire suppression, less active forest management, drought, and increasing temperatures have altered the natural historic range of variability for disturbance and made forests susceptible to unprecedented insect and disease outbreaks (BLM 2012).

The spruce beetle (*Dendroctonus rufipennis*) is currently the most widespread insect pest in Colorado's forests, infesting 398,000 acres of spruce forest in 2013; this is a substantial increase from the 326,000 acres infested by beetles in 2012 (Colorado State Forest Service [CSFS] 2014). Spruce beetles are the most significant natural mortality agent in mature Engelmann spruce (*Picea engelmannii*) and blue spruce (*Picea pungens*) (United States Department of Agriculture, Forest Service [USFS] 2010). Bark beetles tend to attack trees weakened by disease, drought, or physical damage. As seen by the current epidemic, even trees that are relatively healthy are becoming infested. During periods of normal moisture, trees

typically ward off attacks by producing resin to push out the invaders; however, the sheer number of beetles, combined with stress caused by drought, has overwhelmed these defenses (BLM 2012).

The Colorado State Office of the BLM issued its Bark Beetle Strategic Plan in 2012. The purpose of this plan is to identify the issues, goals, objectives, and actions needed to effectively manage the bark beetle epidemic in Colorado (BLM 2012). Several of these goals, objectives, and actions are listed in Section 1.5 – Plan Conformance Review.

On lands managed by the RGFO, spruce beetle was present at normal endemic levels as recently as 2008. In 2011, spruce beetle was observed in standing, live spruce in groups of 5 to 10 trees on Jack Hall Mountain in northwestern Fremont County. By 2012, these groups had expanded to patches of 50 or more trees. During the summer of 2014, patches were estimated to contain hundreds of infested trees. Spruce beetle is currently killing more than 90 percent of the large Engelmann spruce in infested stands. Bark beetles prefer large trees to smaller ones because larger trees contain more of the cambium on which the beetles feed. An area on the south edge of South Park, made up of three connected mountains [Stoney Face, Waugh, and Jack Hall (Figure 1)], has been identified as having extensive infestations of spruce beetle, as well as being suitable for management actions to address these infestations. If the spruce beetle epidemic in this area progresses in a pattern similar to that on the Rio Grande National Forest, all spruce larger than seedlings could be dead in the next 5 to 10 years. In addition to spruce beetle infestations, the RGFO forestry crew located an active infestation of mountain pine beetle in lodgepole pine in the Bills Creek portion of the project area in 2014. Additionally, Douglas-fir beetle has been active throughout the RGFO and was recently found in an area five miles south of Jack Hall Mtn.

A wide variety of forest types exists across the project area, which ranges in elevation from approximately 9,000 to 11,500 feet. The higher elevations are dominated by Engelmann spruce and lodgepole pine, which both extend to the middle elevations on north-facing slopes. The middle elevations are dominated by quaking aspen (*Populus tremuloides)* and Douglas-fir (*Pseudotsuga menziesii)*. The lower elevations are dominated by aspen, ponderosa pine (*Pinus ponderosa)*, and Douglas-fir. Meadows and shrublands are scattered throughout, especially on south aspects and at lower elevations. Forests across much of the project area lack age-class diversity, being made up primarily of mature, closed canopy stands, which can be highly susceptible to insects such as the spruce beetle.

1.3 Purpose and Need

The purpose of the NW Fremont Bark Beetle Salvage Project is to reduce the threat to public safety and infrastructure posed by beetle-killed trees in travel corridors and other high-risk areas, provide for resilient forests and diverse wildlife habitats, and reduce the risk of severe wildfires and subsequent erosion and watershed damage. Removing and using many of the dead or dying trees, while minimizing adverse effects to other resources, can accomplish this purpose. The need for the action stems from compliance with the multi-use and sustainable-yield mandate of Section 302 of the Federal Land Use and Policy Management Act (FLPMA) and resource objectives defined in the 1996 RGFO Resource Management Plan (RMP), the Healthy Forests Initiative, Healthy Forests Restoration Act of 2004, and the Colorado Bark Beetle Strategic Plan (BLM 2012).

Figure 1-1 Regional Context

NW Fremont Bark Beetle Salvage EA
Figure 1-1 Regional Context
Bureau of Land Management
Royal Gorge Field Office

Date: 4/29/2015

Legend

- Project Area
- BLM
- Private
- State
- USFS

0 1.5 3 6 9 12 Miles

N W E S

NOTE TO MAP USERS
No warrantee is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of the data layers shown on this map. The official land records of the data provided should be checked for current status on any specific tract of land.

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1.4 Decision(s) to Be Made

This EA is not a decision document. It does not identify the alternative to be implemented. The BLM will decide whether to implement the proposed project based on the analysis contained in this EA. The potential environmental consequences of implementing the proposed action, and alternatives to that action, are described within this EA. The BLM may choose to: (1) implement the proposed action; (2) implement the proposed action with modifications or additional mitigation; (3) implement an alternative to the proposed action; or (4) not implement the project at this time (by selecting the No Action Alternative).

1.5 Plan Conformance Review

The Proposed Action is subject to and has been reviewed for conformance with the following plans, described below (43 Code of Federal Regulations [CFR] 1610.5, BLM 1617.3). For the Royal Gorge RMP and the Standards for Public Land Health, specific findings of conformance are included in the appropriate resource sections in Chapter 3. The purpose of and need for the project (Section 1.3) and the various components of each of the action alternatives (Sections 2.1.2 and 2.1.3) have been found to be in conformance with the Colorado Bark Beetle Strategic Plan. Conformance with the Colorado Bark Beetle Strategic Plan is not discussed further in this EA.

Name of Plan: Royal Gorge RMP

Date Approved: 05/13/1996

Decision Number: 3-1, 6-1 (same for both Planning Units)

Decision Language: Vegetation management will be as follows:

- Vegetation will be managed to accomplish other BLM initiatives i.e., riparian, wildlife, etc.
- Improved forage conditions will be distributed through cooperative efforts i.e. Colorado Habitat Partnership Program
- Management of forest lands will be for enhancement of other values
- Desired plant condition objectives will be developed for all Integrated Activity Plans (IAPs)
- Vegetation monitoring will be accomplished on an interdisciplinary basis

Decision Number: 3-13, 6-12 (same for both Planning Units)

Decision Language: Productive forested lands will be managed for sustained yields.

Decision Number: 3-14, 6-13 (same for both Planning Units)

Decision Language: A portion of forested lands will be available for intensive management.

Name of Plan: Standards for Public Land Health

Date Approved: 01/1997

In January 1997, the Colorado State Office of the BLM approved the Standards for Public Land Health and amended all RMPs in the state. The Standards for Public Land Health describe conditions needed to sustain public land health and apply to all uses of the public lands.

Standard 1: Upland soils exhibit infiltration and permeability rates that are appropriate to soil type, climate, landform, and geologic processes. Adequate soil infiltration and permeability allow for the accumulation of soil moisture necessary for optimal plant growth and vigor and minimize surface runoff.

Standard 2: Riparian systems associated with both running and standing water function properly and have the ability to recover from major disturbance such as fire, severe grazing, or 100-year floods. Riparian vegetation captures sediment and provides forage, habitat, and biodiversity. Water quality is improved or maintained. Stable soils store and release water slowly.

Standard 3: Healthy, productive plant and animal communities of native and other desirable species are maintained at viable population levels commensurate with the species' and habitat's potential. Plants and animals at both the community and population level are productive, resilient, diverse, vigorous, and able to reproduce and sustain natural fluctuations and ecological processes.

Standard 4: Special status, threatened and endangered species (federal and state), and other plants and animals officially designated by the BLM and their habitats are maintained or enhanced by sustaining healthy, native plant and animal communities.

Standard 5: The water quality of all water bodies, including ground water where applicable, located on, or influenced by BLM lands, will achieve or exceed the Water Quality Standards established by the State of Colorado. Water Quality Standards for surface and ground waters include the designated beneficial uses, numeric criteria, narrative criteria, and anti-degradation requirements set forth under State law as found in 5 CR 1002-8, as required by Section 303(c) of the Clean Water Act (CWA).

Name of Plan: Colorado Bark Beetle Strategic Plan

Date Approved: 05/2012

Goal 1 - Safety

Falling Trees (Human, Infrastructure): Reduce the threat to public safety and Infrastructure posed by dead, beetle-killed trees within travel corridors and in other high-use areas.

Objective: Identify and prioritize high-risk areas.

Action: Where feasible, remove and use dead trees, thereby improving public safety along travel corridors and high priority infrastructure.

Fire/Hydrology/Erosion: Reduce fire and erosion risk where appropriate.

Objective: Be aware of different fire and erosion risks associated with varying stand conditions.

Action: Where feasible, remove and use dead trees to reduce future wildfire severity.

Goal 2 – Operations

Logistics: Increase forest industry capacity.

Objective: Work with forest product stakeholders and the public to encourage a vibrant forest industry.

Action: Through stewardship and timber sale contracts, plan projects that provide forest products to build capacity among contractors, mills, and local markets.

Goal 3 – Key Concerns

Forest Health/Wildlife Habitat/Climate Change: Ensure forests in Colorado are sustainable and provide healthy and diverse wildlife habitat.

Objective: Plan and implement for a more resilient and diverse forest landscape.

Action: When planning forestry treatments, maximize age class, patch size and species diversity.

BLM Forestry Program Integration: Collaborate with other natural resource disciplines within the BLM to be more efficient and accomplish common goals.

Objective: Find ways to accommodate other disciplines' goals into forestry work.

Action: Participate in the Integrated Vegetation Management Team and continue to be involved in other interdisciplinary teams.

1.6 Scoping, Public Involvement, and Issues

The first step in environmental analysis is to determine what needs to be analyzed. To achieve this, scoping was conducted to determine the potential issues associated with the proposed action and further identify those issues that are substantial and relevant to the decision.

1.6.1 Scoping Summary

A public announcement was prepared and mailed on December 22, 2014, requesting that public input be provided by January 30, 2015. The mailing list consisted of 128 unique addresses including representatives of federal, tribal, state, and local governments; federal, tribal, state, and local agencies; media; interested groups and individuals; nearby landowners; and grazing permittees. Supporting information, including a map, was posted to the RGFO web site. A copy of the public announcement mailing and the mailing list are located in the administrative record. Seven responses were received, generating 25 distinct comments.

1.6.2 Issues

The term "issue" refers to a topic of interest relevant to the proposed action or alternatives. An issue is more than a statement for or against some aspect of a project. It: (1) has a cause and effect relationship with the proposed project; (2) is within the scope of the analysis; (3) has not been decided by law, regulation, or previous decision; and (4) is amenable to scientific analysis rather than conjecture. Issues are related to environmental effects and, consequently, provide key information for defining alternatives. While many issues may arise during scoping, not all issues will warrant detailed analysis. Issues raised through scoping should be analyzed if that analysis is necessary to make an informed choice between alternatives, or if the issue is potentially significant (where analysis is necessary to determine the potential significance).

Public comments were reviewed and then used in the issue-development process. In several cases, an issue was identified by the BLM interdisciplinary team (IDT) based on the existence of a resource in the project area or a legal, regulatory, or policy requirement that a resource be addressed. The issues developed during scoping were combined with IDT input to develop the issue statements in the EA. The issue statements, in turn, will be used to guide the level of analysis for each resource discussed in the EA.

Each issue identified during scoping was evaluated to determine its relevance to the decision and then placed in one of the following categories:

1) Dismissed because the issue:

    - Is not relevant to the decision (for example, because a particular resource of concern is not present in the analysis area); or
    - Is beyond the scope of the project (for example, changes in BLM regulations).

2) Eliminated from detailed study because:

    - The issue is based on incomplete or erroneous information that would be corrected in the EA;
    - The proposed project would have minimal or no effects on a resource of concern; or
    - Effective mitigation would minimize or eliminate effects to a resource of concern.

3) Analyzed in detail because

    - The proposed project is expected to have effects on a resource of concern;
    - The effects of the proposed project may be potentially significant; or
    - The analysis is expected to inform the decision.

Nineteen preliminary issues were identified for consideration based on public comments received during scoping. Internal discussion among the IDT led to the identification of 21 additional issues, bringing the total number of identified issues to 40. Of these 40 issues, two related to the specifics of any timber sales that may be offered after a decision is reached on the project, one advocated for research on drought- and insect-resistant seedlings, and one related to how proceeds from the timber sales should be spent. These issues are not discussed further in this EA because they were determined to be not relevant to the decision

or to be beyond the scope of the project. Six issues pertained to potential details of the action alternatives and how they may be implemented. These issues have been incorporated into one or more of the action alternatives. Two comments referred to potential action alternatives. Both of these alternatives are considered in Chapter 2 of the EA. Additional discussion on the remaining 28 issues is provided in the following sections.

1.6.2.1 *Issues Dismissed from Detailed Analysis*

The following 10 issues were eliminated from detailed study because the proposed project would have minimal, if any, effects or effective mitigation would minimize or eliminate effects to these resources. The rationale for elimination of these issues is provided in the IDT Checklist (Appendix A).

- Air Quality / Greenhouse Gas Emissions
- Geology and Minerals / Energy Production
- Native American Religious Concerns
- Paleontology
- Visual Resources
- Noise
- Environmental Justice
- Realty Authorizations/Lands
- Cadastral Survey
- Access and Transportation

1.6.2.2 *Issues Analyzed in Detail*

The remaining 18 issues will be analyzed in detail in the EA because the proposed project may affect related resources, the potential significance of the effects to these resources needs to be assessed, or the difference in effects among alternatives may inform the decision.

1.6.2.2.1 Soils

One purpose of the proposed project is to reduce the risk of severe wildfire and subsequent soil erosion. Activities associated with the proposed project may contribute to soil compaction, erosion, or other effects.

1.6.2.2.2 Water Resources

One purpose of the proposed project is to reduce the risk of severe wildfire and subsequent watershed damage. Activities associated with the proposed project may decrease surface-water quality or otherwise affect watersheds.

1.6.2.2.3 Vegetation

Activities associated with the proposed project may alter the existing vegetation from its present condition.

1.6.2.2.4 Wetlands and Riparian Zones

There are a small number of wetlands and riparian areas associated with streams in the project area. Effects to or conversion of wetlands is a federally regulated activity under Section 404 of the Clean Water Act. Activities associated with the proposed project may affect wetlands or riparian zones.

1.6.2.2.5 Invasive, Non-native Species

Activities associated with the proposed project may increase the susceptibility of the project area to invasion and spread of noxious weeds.

1.6.2.2.6 Terrestrial Wildlife

Activities associated with the proposed project may affect terrestrial wildlife species directly, through disturbance from project activities or indirectly because of habitat alteration.

1.6.2.2.7 Migratory Birds

Migratory birds are protected by the Migratory Bird Treaty Act (MBTA). Activities associated with the proposed project may affect migratory birds directly by disturbance from project activities or indirectly because of habitat changes.

1.6.2.2.8 Aquatic Wildlife

Activities associated with the proposed project may affect aquatic wildlife species directly through disturbance from project activities or indirectly through changes in habitat.

1.6.2.2.9 Special Status Animals

The Endangered Species Act (ESA) and BLM policy require the assessment of potential effects of proposed agency actions on species that are listed as threatened, endangered, or proposed under the ESA, or as sensitive by the BLM. Activities associated with the proposed project may affect special status animals directly, through disturbance from project activities, or indirectly through changes in habitat. A Biological Assessment (BA) will be prepared for threatened, endangered, and proposed species.

1.6.2.2.10 Special Status Plants

The ESA and BLM policy require the assessment of potential effects of proposed agency actions on species that are listed as threatened, endangered, or proposed under the ESA, or as sensitive by the BLM. Activities associated with the proposed project may affect special status plants directly through disturbance from project activities or indirectly through changes in habitat. A BA will be prepared for threatened, endangered, and proposed species.

1.6.2.2.11 Cultural Resources

Several federal laws require consideration of potential effects to cultural resources. The proposed project has the potential to cause adverse effects to properties considered eligible for the National Register of Historic Places (NRHP).

1.6.2.2.12 Public Health and Safety

One purpose of the proposed project is to reduce the risk to public safety and infrastructure posed by beetle-killed trees. Of concern is the risk from dead trees that will eventually rot and fall over, potentially injuring or killing the public or damaging property or infrastructure. Another concern is the risk to the public and to firefighters from severe wildfire exacerbated by high fuel loads.

1.6.2.2.13 Economics

Implementing the proposed project may not produce a net financial benefit to the BLM because the costs associated with planning and timber-sale preparation and administration may not be recovered. However, intangible benefits to natural resources (for example, lowered risk of wildfire, increased forest resistance to insects and disease, and reduced costs for future firefighting) and public and private property may be more important than the direct monetary cost. Commercial timber products may be sold to help offset costs and recover value in trees killed by spruce beetles. Timely harvest (within a few years) is key to recovering the highest economic value of beetle-killed spruce. The proposed project may also benefit the local and regional work force by providing work in the form of timber sale or service contracts.

1.6.2.2.14 Forest Management

The forested stands in the project area tend to be dense and lack tree age-class diversity. They are therefore more susceptible to crown fires, insects, and disease. One purpose of the proposed project is to create forest stands that are resilient to fire, insects, and diseases. The proposed project may alter the existing vegetation from its present condition in order to meet this purpose.

1.6.2.2.15 Rangeland Management

Activities associated with the proposed project may alter the existing vegetation from its present condition, in turn altering forage availability on range allotments.

1.6.2.2.16 Fuels / Fire Management

The spruce-beetle epidemic has greatly increased the amount of dead fuels in affected stands, and this has the potential to increase the risk of severe wildfire. One purpose of the proposed project is to reduce the risk of severe wildfire and subsequent soil erosion and watershed damage, along with the risk to public safety and infrastructure. The proposed project may alter fuel loads, potential fire behavior, and overall landscape susceptibility to fire and potential intensity of fire.

1.6.2.2.17 Recreation

Treatment operations for the proposed project may conflict with hunting or other recreational use of the analysis area.

1.6.2.2.18 Lands with Wilderness Characteristics

Several of the potential treatment areas contain lands with wilderness characteristics. Activities associated with the proposed project may alter the wilderness characteristics of these areas.

2.0 Chapter 2 – Proposed Action and Alternatives

This chapter describes the alternatives considered to achieve the purpose and need discussed in Chapter 1. Following completion of scoping and issue analysis, the IDT discussed the array of issues and the range of potential alternatives. An alternative was considered reasonable if it was feasible and would achieve the purpose and need. Alternatives considered but eliminated from further analysis included those that were beyond the scope of the proposed action, failed to meet the purpose and need, were poorly defined, or were unlikely to be implemented. Five alternatives were developed and considered. Three of these (the Proposed Action, an action alternative, and a No Action Alternative) were identified for detailed study based on the issues. The other two alternatives were considered but eliminated from detailed study because they did not sufficiently address the relevant issues or meet the purpose and need for the project or were not reasonably implementable.

2.1 Alternatives Analyzed in Detail

This section describes the features of the three alternatives that were considered in detail. First, the No Action Alternative is described. Then, the various components of the Proposed Action Alternative are explained. For the Proposed Action Alternative, the specific treatment types are described, followed by a description of other aspects of the alternative. Next, a second action alternative is described. This section concludes with a list of project design standards common to the action alternatives.

2.1.1 Alternative A – No Action

The No Action Alternative provides a baseline for comparison to aid in determining the relevance of issues and effects of the proposed action and any action alternatives. Under the No Action Alternative, the proposed salvage harvest, slash treatments, and associated activities would not occur. Current management activities, such as maintenance of roads and trails and wildfire suppression or management, would continue, but no action would be taken to meet the purpose of and need for the project.

2.1.2 Alternative B – Proposed Action – Salvage of Dead and Dying Spruce

Alternative B is the initial action proposed to meet the purpose and need for the project. The RGFO is proposing to salvage dead, dying, and high-risk spruce in portions of the project area infested with spruce beetle. These areas are shown in Figure 2-1.

<u>Note</u>: The exact size and location of the potential treatment areas discussed here and throughout the EA is the best available current estimate; however, the final acreage that is implemented may vary based on any number of factors such as feasibility of the proposed treatments or the need to protect various resources. The spruce beetle epidemic is an ongoing, natural process. As treatments proceed, new priority areas may be identified for treatment based on the spread of spruce beetle. The BLM would review any changes to the potential treatment areas to ensure all potential effects are adequately analyzed and disclosed. Regardless of the final location and size of the treatment areas, the total of all treatment areas would not exceed 2,900 acres.

The main purpose of this alternative is to address the effects of the spruce beetle epidemic in the project area; however, if patches of active mountain pine beetle or Douglas-fir beetle infestations are located within the potential treatment areas, dead, dying, and high-risk lodgepole pine and Douglas-fir would be salvaged at the same time. In addition, trees with broken tops caused by snow, or windthrow trees, may be salvaged where they occur within the potential treatment areas. Treatments are expected to begin in late 2015 or early 2016 and continue for a number of years, depending on the availability of funding and other

factors such as spread of spruce beetle mortality, work-force availability, and weather conditions. The methods to be used in implementing the project are described below.

Dead or beetle-infested spruce and other species would be removed in potential treatment areas to the extent feasible. Harvest units would be concentrated in areas where 50 percent or more of the large trees are dead or under attack. Other trees species that are not dead or beetle-infested (for example, aspen) would be retained except where individual trees impede treatment operations or pose a hazard. Advanced regeneration of spruce and other species would be retained to the extent feasible. Post-harvest, the treated stands would resemble a regeneration harvest, such as a seed-tree cut or overstory removal, because the targeted stands are dominated by spruce and mortality of the large spruce in infested stands generally exceeds 50 percent. Some potential treatment areas currently have only a few trees under attack; however, the RGFO expects additional mortality in these areas based on the results of insect and disease flights in 2014 and the pattern of spruce beetle spread observed in other parts of Colorado.

Alternative B would also involve removing some green standing timber in the early stages of beetle infestation. An advantage of this action is that some of the trees removed would contain the next generation of spruce beetle and, by removing these trees, the spread of the beetle would be somewhat slowed. Early treatment of beetle-infested areas would also accelerate spruce regeneration by creating conditions that allow it to initiate more quickly. Suppressed trees would be released, thereby giving them an increased ability to contribute to reforestation and regeneration Furthermore, by removing green, standing timber in the early stages of beetle infestation, the green value of the tree would be captured, rather than the lower value associated with dead timber. The value of dead spruce typically declines within three-to-five years because of checking or cracking of the timber.

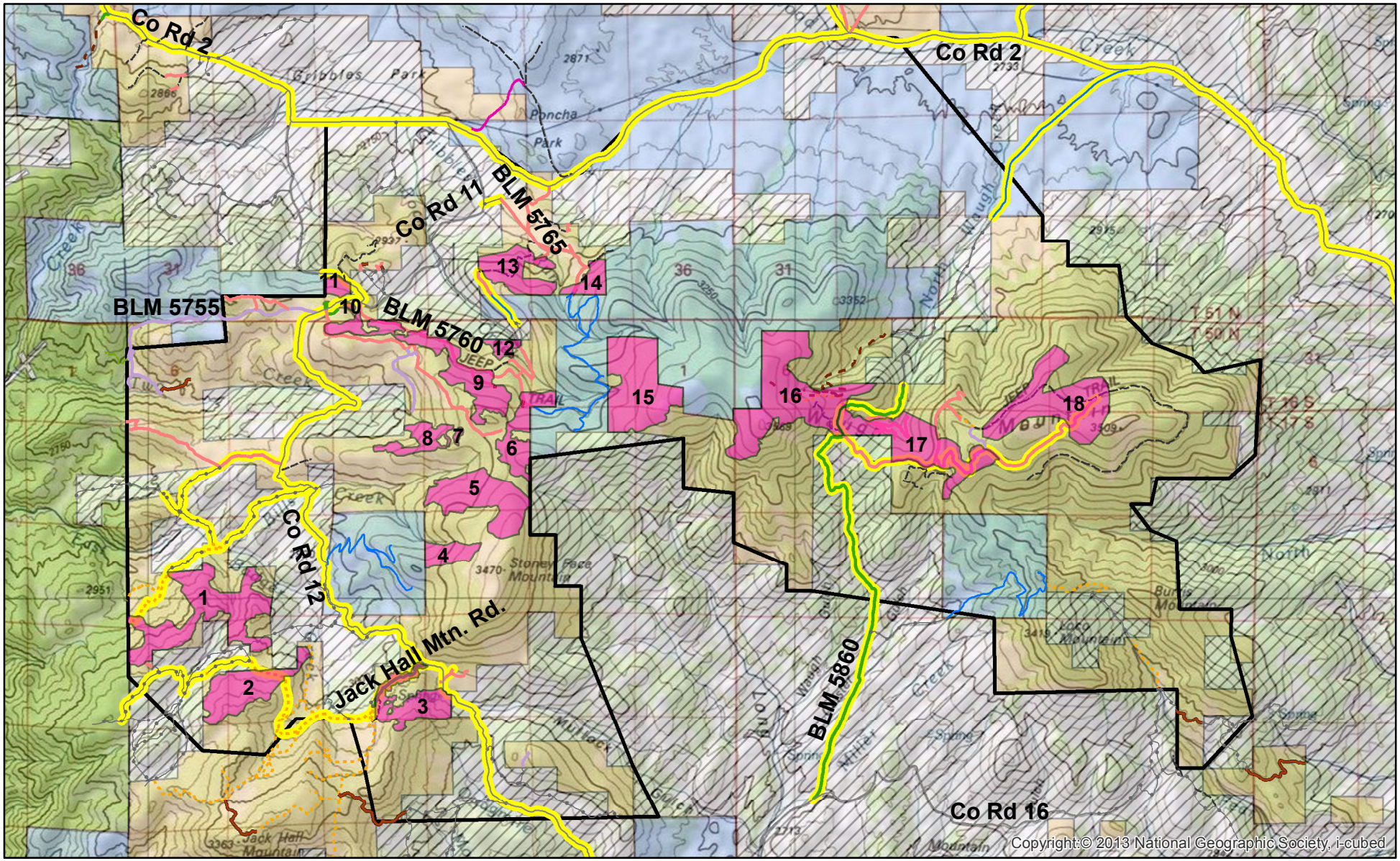
The primary method used to accomplish this treatment would be implementation of multiple timber sales, with the goal of removing and using the salvaged trees for timber products. The timber-sale contractor would generally use ground-based equipment to cut designated trees. Tractor or other ground-based yarding systems would be used to move logs to landings after they are cut.

Non-commercial timber management, such as removal of hazard trees near roads and other infrastructure, would be a part of this project. Uninfected trees would be left in the harvest units to provide a future seed source, maintain forest vertical diversity, maintain age-class diversity, provide protection for regeneration, and provide future genetic variability. These treatments would be designed to blend into the landscape as much as possible and would vary in size depending on site conditions. Incidental harvest of green, uninfected trees may occur; however, green uninfected trees would not be targeted for treatment.

This alternative is expected to reduce future fuel loading by 40-to-60 tons of large woody debris per-acre in the treated areas. Slash would be treated by lopping and scattering, piling and burning, or other methods, depending on slash volume, fuel loads, or other factors. Some slash would be left to enhance soil-moisture retention, seedling microsites, soil nutrients, and erosion control. Trees may be limbed before skidding or whole-tree yarded. Slash would be piled primarily by tractors; however, hand piling may be used on steeper slopes and other areas that are not accessible to tractors. Slash may be piled at landings for later disposal by burning or other methods.

Natural regeneration of treated areas is anticipated; therefore, seeding or planting treated sites is not expected to be necessary. If natural seeding leads to inadequate stocking, the sites would be artificially regenerated through seeding or planting to achieve minimum stocking standards. All existing small spruce in the potential treatment areas would be considered protected reserves; however, some of these trees may be damaged or killed by treatment activities.

Figure 2-1 Project Location



NW Fremont Bark Beetle Salvage EA
Figure 2-1 Project Location
Bureau of Land Management
Royal Gorge Field Office

Date: 6/15/2015

Legend

- Project Area
- Potential Treatment Areas
- BLM
- Private
- State
- USFS

Non - BLM Routes

GTLF Ownership

- StOther
- County Road
- Forest Service Road
- Private Road

BLM Routes

Driveability Classification

- 2wd (includes 4wd, ATV, MC, Bike, Stock, Foot)
- 4wd-Technical (high clearance and big tires, also includes ATV, MC, Bike, Stock, Foot)
- 4wd-Touring (low clearance 4wd, also includes ATV, MC, Bike, Stock, Foot)
- ATV (includes MC, Bike, Stock, Foot)
- Foot Only
- Stock (includes Foot)

BLM Admin Only & Closed

Use Restriction

- AdminOnly
- Closed

Easement or Right of Way Flag

- Yes - Affirmative or Present

N
W E
S

0 0.75 1.5 3 Miles

NOTE TO MAP USERS
No warrantee is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of the data layers shown on this map. The official land records of the data provided should be checked for current status on any specific tract of land.

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Primary access for this project would be provided via existing roads. These roads may be maintained or reconstructed as needed to accommodate safety or environmental considerations. No new permanent roads would be constructed.

Temporary roads may be needed to access potential treatment areas. Temporary roads would be constructed to the minimum standard needed for safe and efficient use by project equipment, and this construction may include vegetation clearing and minor earth movement. Temporary roads would be constructed immediately before access is needed for a particular treatment area and then closed and obliterated as soon as possible after treatment is complete. Public use of these roads would be prohibited. Temporary road construction and obliteration would be phased throughout the life of the project to minimize the extent of open temporary roads. Closed temporary roads would be thoroughly obliterated using physical barriers to prevent future use by motorized vehicles and would be monitored to ensure such use does not occur.

2.1.3 Alternative C – Maximum Reduction of Spruce Beetle Habitat and Timber Output

The goal of Alternative C would be to remove all trees in the potential treatment areas that are susceptible to spruce beetle, thereby minimizing the extent of future mortality, and maximizing timber output.

Note: The exact size and location of the potential treatment areas discussed here and throughout the EA is the best available current estimate; however, the final acreage that is implemented may vary based on any number of factors such as feasibility of the proposed treatments or the need to protect various resources. The spruce beetle epidemic is an ongoing, natural process. As treatments proceed, new priority areas may be identified for treatment based on the spread of spruce beetle. The BLM would review any changes to the potential treatment areas to ensure all potential effects are adequately analyzed and disclosed. Regardless of the final location and size of the treatment areas, the total of all treatment areas would not exceed 2,900 acres.

The scientific literature suggests that spruce beetles usually attack the largest trees first, progressing to smaller trees as the infestation progresses in the stand (Holsten et al. 2000, Schmid and Frye 1977). Trees as small as 5-inches in diameter at breast height (DBH) have been attacked in past spruce beetle epidemics (Samman and Logan 2000), although hazard-rating models generally consider trees less than 8- to 10-inches DBH to be at low risk (Fettig et al 2007). The goal of this alternative would be to remove as many spruce trees greater than 8-inches DBH as possible, regardless of whether or not they are currently infested by spruce beetle. The result would be stands with substantially reduced habitat for the spruce beetle. This alternative would capture maximum timber values by harvesting a greater proportion of green spruce. Maximizing timber values would generate the greatest return from this public asset and help offset BLM's costs of planning, implementing, and administering the proposed project. It would also reduce the number of future hazard trees should the spruce beetle continue to spread into trees that are currently not infested because those trees would be cut in advance. This alternative would not change the location or extent of the potential treatment areas, but harvest activities would be more intensive because more trees would be removed. Landings may be larger and skid trails and temporary roads would be used more intensively. Post-treatment, stands would resemble clear-cuts because all of the larger spruce would be removed.

The other components of Alternative C would be essentially the same as Alternative B. For example, slash treatments would be the same, although more slash would have to be treated because of increased project activity. The same combination of existing and temporary roads would be used to access potential treatment areas.

2.1.4 Project Design Standards – Common to All Action Alternatives

The following project design standards are common to both action alternatives and would be used to protect infrastructure and important forest resources.

2.1.4.1 *Cultural Resources*

- The BLM would require reconnaissance (Class II) or intensive (Class III) inventory within the area of potential effects (APE) to identify and evaluate potential effects to historic properties. The BLM has developed the following general process for identifying and evaluating effects to cultural resources from the proposed project.

- Project Initiation
    - BLM would identify and involve the public, interested parties, and Native American tribes as necessary.

- Inventory and Identification
    - BLM or a qualified archaeological consultant would conduct Class II or Class III inventories for all potential treatment areas and other areas where ground-disturbing activities may occur to identify historic properties that may be affected.
    - BLM or a qualified archaeological consultant would conduct a Class III inventory for all proposed pile burning areas, temporary roads, landings, and staging areas associated with the proposed project.
    - BLM would seek and consider the views of any Native American tribes that attach religious or cultural significance to cultural resources or places within the APE.

- Evaluation of Eligibility and Effects:
    - If previously recorded historic properties are located in the APE, the BLM would analyze the potential effects of the project activities on those properties, including a field visit and subsequent mitigation, if necessary.
    - If cultural resources are identified within the APE during Class II or Class III inventories, or both, BLM would evaluate the resources for NRHP significance and integrity and would develop a plan to protect historic properties. Protection would be accomplished by avoidance during project layout and implementation, as well as through project implementation monitoring in coordination with the RGFO Archaeologist (if necessary).

- Implementation
    - If any previously unknown cultural resource sites are found during implementation, project activities would stop and the RGFO Archeologist would be contacted immediately. The RGFO Archeologist would evaluate the site and determine future actions.

2.1.4.2 *Infrastructure*

- Any property-survey monuments including brass-cap monuments, bearing trees, fences, or other infrastructure would be located, flagged, and protected.

- Ownership boundaries would be identified before project implementation. Adjacent landowners would be notified before treatment begins.

2.1.4.3 *Migratory Birds*

- A survey for migratory bird nests would be conducted during the bird breeding season by wildlife personnel in each potential treatment area before temporary road construction, tree felling, or harvest operations begin in that treatment area.

- If migratory bird nests that could be negatively affected by project activities are detected, they would be identified and the nest trees would not be cut or incidentally damaged between May 15 and July 15, to ensure completion of the nesting season. A different protection period specific to avian species of concern may be needed, as determined by a BLM wildlife biologist.

- If migratory bird nest surveys are not feasible, felling operations, temporary road construction, and other habitat-altering activities would cease from May 15 through July 15 (or other appropriate period specific to the project area) to avoid the core breeding season for avian species of concern, unless otherwise determined by a BLM wildlife biologist.

- Skidding, limbing, bucking, hauling, pile burning, and slash piling (including hand or mechanical piling of existing material) may be implemented during the migratory-bird nesting season, unless otherwise determined by a BLM wildlife biologist.

- Trees with cavities, and especially snags with cavities, would be retained whenever possible.

2.1.4.4 *Noxious Weeds*

- The contractor would be required to clean all equipment that operates off road before the first entry into the project area.

- All equipment would be inspected by the BLM before it is allowed to enter the project area.

- Any weed infestations would be treated by the BLM following project completion. Chemical, biological, cultural, or mechanical techniques would be used as appropriate to control populations of noxious weeds. All treatments of noxious weeds would follow state and federal regulations.

- Disturbed areas would be monitored and treated as needed for noxious weeds for at least two growing seasons after the project is completed.

2.1.4.5 *Public Safety*

- The public would be notified through the Decision Notice, individual timber sale notices, and a news release once the project is approved. The notification would describe the location, extent, and type of activities that would occur.

- Travel routes open to public use would be signed to warn of project traffic or other potential hazards (such as prescribed fire). Where public safety cannot be reasonably ensured, portions of the project area, including public roads, may be temporarily closed to public use.

2.1.4.6 *Range Management*

- During the periods in which allotment permittees are allowed to graze stock, the contractor would open and close all gates, and immediately repair damage to fences.

- Potential treatment areas within active grazing allotments would be monitored to ensure that tree regeneration is not being damaged or heavily browsed by livestock. If tree utilization standards are exceeded, numbers and timing of livestock use may be modified.

2.1.4.7 *Special Status Animal and Plant Species*

- Surveys would be conducted in each potential treatment area before implementation to identify occurrences of special status animal and plant species where suitable habitat for these species exists. Identified locations of special status species would be protected as appropriate. Protection would be accomplished by avoidance during project layout and implementation, as well as through project implementation monitoring in coordination with the RGFO Wildlife Biologist. Since it may take several years to fully implement the project, consecutive surveys for special status animals may be required on an annual basis as potential treatment areas are implemented.

- When feasible, salvage treatments and other silvicultural methods would be designed to promote multi-storied conifer stand structure that provides snowshoe hare winter browse and dense horizontal cover during average snow depths across the project area (or Lynx Analysis Unit [LAU]).

- Timber harvest would be implemented in a manner that would promote suitable winter snowshoe hare habitat. Suitable winter snowshoe hare habitat is characterized by having 35 percent or more horizontal cover in forested stands identified as habitat for Canada lynx.

- If any previously unknown special status animal or plant species are found during implementation, project activities would stop and the RGFO Wildlife Biologist would be contacted immediately. The RGFO Wildlife Biologist would evaluate the occurrence and determine the need for additional actions.

2.1.4.8 *Terrestrial Wildlife*

- A diurnal survey for active raptor nests or territories would be conducted during the breeding season by wildlife personnel prior to operations in the project area. The Best Management Practice for raptor surveys would be to conduct surveys for two years prior to operations, to the degree possible, as determined by the RGFO Wildlife Biologist. The survey area would include all suitable raptor habitat believed to occur within the potential treatment areas, as well as a ½-mile buffer beyond the potential treatment areas.

- If an active or inactive raptor nest is located, project activities would be restricted in a manner that protects the nest stand or nest area for both active and inactive nests. To the degree possible, best management practices would be followed as recommended in the Colorado Parks and Wildlife (CPW) Recommended Buffer Zones and Seasonal Restrictions for Colorado Raptors (CPW 2008) and the United States Fish and Wildlife Service (USFWS) Guidelines for Raptor

Conservation in the Western United States (Whittington and Allen 2008). Table 2-1 lists the appropriate spatial buffer and timing restrictions for the most common species likely to be found in the project area.

- Spatial buffers around all active and inactive raptor nests are needed to maintain the integrity of the nest area, which includes inactive nest sites that are used in alternate years. Within the spatial buffer, no project activities that alter habitat structure or capability would be allowed, unless determined otherwise by a BLM wildlife biologist.

- Timing restrictions would apply within the species-specific spatial buffer of all active nests to avoid nest failure. Timing restrictions would apply to all project activities, including, but not limited to, timber purchaser operations harvest/treatment activities, and hauling; use of roads not open to the public; prescribed burning; fuel reduction mechanical treatments; road construction, maintenance, or obliteration work (including temporary roads); post-sale treatment activities; and any additional activities that involve the use of mechanical equipment (including, but not limited to, heavy equipment, chainsaws, or chippers). The timing restriction may be altered, as determined by a BLM wildlife biologist.

Table 2-1 Raptor Nest Buffers and Timing Limitations

Species	Spatial Buffer for Active and Inactive Nests (Mile)[1]	Timing Restriction Around Active Nests[1]
Sharp-shinned Hawk	0.25	3/15-8/31
Cooper's Hawk	0.25	3/15-8/31
Northern Goshawk	0.5	3/1-9/15
Red-tailed Hawk	0.33	2/15-7/15
Golden Eagle	0.5	12/15-7/15
American Kestrel	0.125	4/1-8/15
Prairie Falcon	0.5	3/15-7/15
Great Horned Owl	0.125	12/1-9/31
Northern Pygmy Owl	0.25	4/1-8/1
Boreal Owl	0.125	2/1-7/31
Northern Saw-Whet Owl	0.125	3/1-8/31

[1] Based on CPW (2008) recommendations where available, otherwise on Whittington and Allen (2008).

- To protect American elk calving, as recommended by CPW, no occupancy, cutting of trees, road construction, or other habitat altering activities would occur in elk production areas mapped by CPW (map in administrative record) from May 1st to June 15th, unless determined otherwise by a BLM wildlife biologist.

- In potential treatment areas, retain a total of:

  - Four snags per acre, using the following criteria:

    - Three snags per acre, 10 to 25 feet in height, and 10 to 15 inches DBH

        - One snag per acre, 26 to 50 feet in height, and greater than or equal to 16 inches DBH
        - If no snags meet the minimum diameter and height criteria, use the largest snags available. Snags may exceed the maximum height criteria.
        - "Snags" refers to both older standing dead trees that pre-date the current spruce beetle outbreak, as well as trees recently killed by spruce beetles.
        - When identifying snags for retention, select (in order of preference): (1) older snags; (2) recent snags where beetles have already exited; and (3) recent snags where beetles are still present.
        - Snag density would be averaged across each potential treatment area, to allow for removal of snags that pose a safety hazard to treatment operations or the public (for example, along roads).
    - Eight tons per acre of small (3- to 10-inch diameter) coarse woody debris
        - Small coarse woody debris may be limbed, cut into 4-foot sections, and scattered to speed up drying and reduce the potential for this material to support breeding of spruce beetles.
    - Two tons per acre of large (greater than 10-inch diameter) coarse woody debris
        - Large coarse woody debris would include at least one bole per acre more than 12 feet in length with limbs intact. To avoid creating breeding habitat for spruce beetles, meet this requirement using older logs or recent logs where beetles have already exited.

2.1.4.9 *Transportation*

- Roads constructed for temporary access into a treatment area would be guided by the principles of temporary road construction. In general, these roads are short and used where the topography and drainage requirements are minimal and the potential for adverse effects to other resources is low.
- Temporary road and landing locations would be approved by the BLM before development. Construction would not occur during periods of wet soils. Temporary roads would generally not exceed 15 percent grade and the running surface would not exceed 12 feet in width.
- Public use of temporary roads would be prohibited.
- Temporary roads serve no long-term need and would be closed and rehabilitated by the contractor or BLM after use.
- Temporary roads would be closed and obliterated as soon as possible once treatments are complete. Obliteration measures may include water-bar placement, seeding with BLM-approved seed mixes, and placement of slash or other erosion-control materials.

- Off-road travel would be minimized during operations. Any new vehicular travel routes, such as temporary roads, would be closed and rehabilitated, especially where they connect to existing roads or trails. As much as possible, agency and contractor personnel would use existing roads and trails to eliminate the need for development of new roads and trails.

- The Fremont County Road Supervisor would be notified of upcoming large sales.

2.1.4.10 *Treatment Operations*

- Project elements would be designed to blend with topographic forms and existing vegetation patterns and use both to screen the project as much as possible. The elements of form, line, color, and texture of the existing landscape would be repeated.

- Landings and skid trails would be rehabilitated to reduce risk of erosion and visual effects. Cut and fill material would be re-contoured. Slash would be used to protect exposed soil. Landings and heavily used skid trails may be seeded to promote re-establishment of vegetation and reduce erosion risk. Seed mixes would be approved by the BLM.

- Slash piles would be located where they can be burned effectively in suitable weather without damaging remaining trees. Machine piles would be a minimum of 15 feet by 15 feet by 10 feet and no larger than 30 feet by 30 feet by 20 feet in size. Machine piles would be constructed to minimize the incorporation of dirt into the piles. To minimize emissions from burning green material, piles may be allowed to cure for a season prior to treatment. Piles would be eliminated (burned) before the second year to avoid use of slash by breeding beetles.

- Slash piles would be constructed to minimize amounts of large-diameter woody debris, per the technical specifications for all contracts, where hand or machine piling is required. Contractors would be responsible for demonstrating correct slash-piling practices to the Contracting Officer's Representative (COR) to ensure that specifications are understood completely before proceeding with further treatment.

- Cull logs, and other coarse woody debris generated by salvage operations, that are greater than 4 inches in diameter at the small end would be limbed, cut into 4-foot sections, and scattered to speed up drying and reduce the potential for this material to support breeding of spruce beetles, except as noted in the coarse woody debris retention standards for wildlife.

- Fueling of machinery would take place at designated fueling sites. No more fuel than is necessary for daily operations would be stored on site. Any spills in volumes in excess of 25 gallons would be reported to the BLM project administrator and appropriate cleanup measures would be taken.

- All equipment and construction debris (man-made debris, including old culverts) left after timber operations would be removed from the site at sale completion by the contractor. Trash would be removed weekly by the contractor.

- All burn plans would have an approved smoke permit issued by the Colorado Air Pollution Control Division. The Burn Boss would have a copy of issued permits on site and would undertake and document visual monitoring of smoke. Notification of Ignition and Daily Actual Activity Reports would be submitted to the Colorado Air Pollution Control Division. Monitoring can consist of visually tracking smoke plumes by persons on the ground or in aircraft and by installing PM10/2.5 particulate monitors at sensitive receptors.

- Burning prescriptions would be prepared by a qualified Burn Boss and approved before implementation of any burning activities. The Burn Boss would be asked to participate in all treatment-area design and layout activities where prescribed fire is planned. The treatment objectives, along with burn-unit design and layout, would determine the feasibility of using prescribed fire. Burn prescriptions would be consistent with weather conditions and fuel moistures, and would be designed to best achieve desired fuels reduction. Fires would be variable in intensity and consistent with prescribed-fire and other resource-management objectives.

2.1.4.11 *Watersheds*

- Where crossings of intermittent or perennial stream channels are needed to access treatment areas, the appropriate BLM official would approve designated crossings.

- To protect steep slopes adjacent to stream channels, work would not be conducted when soils are saturated.

- To protect soils, no mechanical treatments would occur on slopes greater than 35 percent.

- Treatments would occur when soils are dry or frozen to minimize soil disturbance.

2.2 Alternatives Considered but Not Analyzed in Detail

This section describes two alternatives that were considered but eliminated from further analysis in the EA.

2.2.1 Alternative Beetle Control Methods

A scoping comment was received that promoted using alternative beetle-control measures, rather than removing the infested trees. The comment suggested a specific beetle-control technique: wrapping the trunks of infested trees in plastic wrap to smother beetles. Although there is some logic to this idea, the BLM is not aware that this method has been tested for effectiveness. In addition, the cost for materials and labor to implement this approach across the landscape would be prohibitive. Although not feasible, this comment did foster consideration of alternatives that would focus on combatting the beetle directly rather than by treatment of the affected trees. The BLM is not aware of any beetle-control methods that can be feasibly applied on a landscape-scale. For example, insecticides (either applied directly to the trees or injected into the roots or surrounding soils) can be successful on a small scale, such as for a single high-value tree in a campground; however, the cost to treat thousands of acres would be prohibitively high, and would require retreatment every year to address new infestations. Additionally, neither of these approaches would address trees that are already dead. Dead trees would continue to pose a risk to public health and safety. Fuel loads and the risk of severe fire and subsequent erosion and watershed damage would not be reduced. Residual economic value of the dead trees would not be captured and the local timber industry would not be supported. This alternative was eliminated from further analysis because it is not reasonably implementable and would fail to meet the purpose and need of the project.

2.2.2 No Project Activities during Big Game Hunting Seasons

The IDT identified a concern with potential conflict between treatment operations and use of the project area for hunting by the public. This alternative would be essentially the same as Alternative B, except that no project-related activities would be allowed during the various big-game hunting seasons. In the project area, big-game hunting seasons extend from approximately September 1 to January 31. This restricted

period, when combined with the existing restrictions for migratory bird nesting season and elk calving, would reduce the potential operating season for timber sales to two separate periods, totaling less than five months: February 1 to April 15 and July 15 to September 1. Most potential timber-sale contractors, especially those likely to bid on larger timber sales, would be unable to complete the proposed project in these limited periods, necessitating multiple move-ins and move-outs of equipment. The high cost and lost productivity caused by the short operating periods may lead to no bids being received on timber sales and the failure of the BLM to accomplish the project. This alternative was eliminated from further analysis because it is not reasonably implementable and would fail to meet the purpose and need of the project.

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3.0 Chapter 3 – Affected Environment and Environmental Consequences

This chapter provides a description of the human and natural environmental resources that could be affected by the proposed action. It presents a comparative analysis of the direct, indirect, and cumulative effects that may be caused by implementation of the proposed action and other alternatives.

3.1 Interdisciplinary Team Review

During analysis of this project, an IDT checklist (Appendix A) was completed by the IDT. The purpose of this checklist is to provide a mechanism for resource staff review and to identify those resource values with unresolved conflicts or potential effects caused by the proposed action and alternatives. Resources that are not present in the analysis area are noted in the IDT checklist and are not analyzed in the EA. Resources that are present in the analysis area, but that would not be affected, or would be minimally affected, by the proposed action and alternatives are discussed briefly in the IDT checklist, but not carried forward for detailed analysis. Those resources that are identified as potentially being more than minimally affected by the proposed action and alternatives have been brought forward for detailed analysis in the remainder of this chapter.

3.2 Past, Present, and Reasonably Foreseeable Future Actions

The National Environmental Policy Act (NEPA) requires federal agencies to consider the cumulative effects of proposals under their review. Cumulative effects are defined in the Council on Environmental Quality (CEQ) regulations as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR 1508.7).

In its guidance, the CEQ (1997) has stated that the "cumulative effects analyses should be conducted on the scale of human communities, landscapes, watersheds, or airsheds" using the concept of "project impact zone" (that is, the area within which a particular resource may be affected by the project). Table 3-1 lists the past, present, and reasonably foreseeable future actions in the general area that may be affected by the proposed action and alternatives. Following Table 3-1, each of the major categories of actions is described briefly. The need to include various actions in the cumulative effects analysis for an individual resource depends on the extent of the cumulative effects analysis area and the duration of effects for that resource; therefore, the extent of the analysis area and actions analyzed are described in the cumulative effects analysis for each resource.

Table 3-1 Past, Present, and Reasonably Foreseeable Actions

Action	Period		
	Past	Present	Future
Invasive, Non-native Species Management	X	X	X
Livestock Grazing	X	X	X
Recreation	X	X	X
Rural Residential Development	X	X	X
Transportation Corridors	X	X	X
Utility Corridors	X	X	X

Table 3-1 Past, Present, and Reasonably Foreseeable Actions

Action	Period		
	Past	Present	Future
Vegetation Treatments	X	X	X
Wildfire	X	X	X

3.2.1 Invasive, Non-native Species Management

Herbicides have been applied to existing noxious-weed infestations within the analysis area. Treatment of known infestations and continued surveying for new infestations of noxious weeds would continue.

3.2.2 Livestock Grazing

All BLM lands in the analysis area have been and continue to be leased for livestock grazing, as are nearby state and USFS lands. Range improvements such as fences and stock tanks have been constructed and maintained. No changes are anticipated to the current levels of livestock use or range improvements on BLM lands. Larger parcels of the surrounding private land are grazed, as are some smaller ranchettes and horse properties. Levels of livestock grazing may stay similar into the future or may decrease gradually as larger private parcels are divided for rural residential use.

3.2.3 Recreation

Recreation use in the analysis area is generally low, except during the fall big-game hunting seasons. Future recreational uses are expected to be similar to current uses, with similar numbers of people participating in these activities. No specific plans exist for changes to current recreation developments.

3.2.4 Rural Residential Development

Residential use of private lands in the analysis area began more than 100 years ago and has slowly increased ever since. Over the last 10 to 20 years, this use has increased substantially as large properties have been subdivided and more people from Front Range communities are building primary or secondary residences on small parcels. Continued development of primary and secondary residences on nearby private lands at an accelerated pace is expected in the future.

3.2.5 Transportation Corridors

Many of the main access routes in and around the analysis area are quite old. In the recent past, there has been little change to the road system, except on private lands in areas of rural residential development, where local roads have been built to access individual homes. Some future expansion of residential roads on private lands is also expected, but specific plans are not available.

3.2.6 Utility Corridors

Large transmission line corridors run east-west across both the northern and southern edges of the analysis area. Smaller distribution lines connect to ranches and rural residences on the northern, eastern, and southern edges, but do not cross the center, of the analysis area. Further expansion of distribution lines is expected as rural residential development continues, but specific plans are not available.

3.2.7 Vegetation Treatments

Timber harvest probably occurred extensively in the late 1800s and early 1900s as wood products were needed in surrounding communities and on the Front Range. Stumps of trees that were cut with crosscut saws and axes in the 1800s can be found throughout the area. There are no specific records, but many of the existing timber stands are likely composed of trees that regenerated after these harvests. Evidence of more recent (mid-20th century) timber harvest, in the form of stumps and skid trails, can be observed on BLM, state, and private lands in the analysis area. These stumps and skid trails are from a large harvest effort in the late 1950s and early 1960s, although records of these harvests are incomplete. More recently, five timber sales that were part of the BLM's Three Peaks Forest Health and Fuels Treatment Project treated approximately 288 acres in the west half of the project area. These timber sales consisted primarily of small patch cuts designed to improve forest age class and diversity, although restoration of Douglas-fir stands and treatment of small patches of spruce beetle infestations were components of some sales. Currently, 79 acres of spruce beetle salvage is under contract, but not completed, in the Jack Hall Mountain area. The BLM is also preparing a spruce beetle salvage project near Black Mountain, five miles north of the project area. On state lands, the Colorado State Forest Service (CSFS) has one timber sale, of 34 acres, active in the northwest portion of the project area. The USFS has no current or planned forestry projects near the project area.

Relatively little fuel treatment has been conducted in the analysis area in the past. Most fuel treatment activities in the analysis area in the past were completed in conjunction with timber harvest. The Three Peaks project contained several components, such as prescribed fire and creation of shaded fuel breaks, that were designed to reduce fuel loads and the risk of large-scale wildfire. There are no known plans for large-scale fuel treatments nearby, although private landowners may conduct small-scale fuel reductions on their private parcels.

3.2.8 Wildfire

The analysis area has not had any large-scale fires in recent years, unlike other parts of the RGFO and the BLM's Front Range District. Small fires, generally caused by lightning, occur occasionally and have been suppressed. The recently updated RGFO Fire Plan would allow wildfires in this area to be managed for resource benefit. With the mixed land ownership pattern and presence of rural residences, suppression may continue in the future depending on moisture conditions.

3.3 Soils

This section discusses current soil resources, as well as potential changes to those conditions from the proposed alternatives.

3.3.1 Affected Environment

Soils in the project area fit the following texture classifications: very gravelly sandy loam and very gravelly fine sandy loam. Surface horizons are sandy loam in texture, with some organic accumulations at the surface. Rock and gravel content increases with depth. The surface soils become increasingly coarse with an increase in slope gradient. Soils range from 0 inches in depth in the rock types to 40 inches in depth in some timber types and valley bottoms. There are no hydric soils identified in the potential treatment areas; therefore, wetlands should not be present.

3.3.2 Analysis of Effects

This section describes the anticipated direct, indirect, and cumulative effects of implementing each of the alternatives on soils, and compares and contrasts these effects between alternatives.

3.3.2.1 *Direct and Indirect Effects*

The analysis area for direct and indirect effects to soils was the project area (Figure 2-1).

3.3.2.1.1 Alternative A – No Action

Alternative A would have no direct short-term effects on soils in the project area. No vegetation treatments would be implemented under this alternative. Indirect effects include an increase in beetle mortality of spruce over time, which would increase the load of heavy fuels and may increase the risk of severe wildfire and subsequent erosion compared to existing conditions.

3.3.2.1.2 Alternative B – Proposed Action – Salvage of Dead and Dying Spruce

Vegetation treatment activities, including felling, skidding, decking, hauling, and slash disposal, can affect soils. Potential effects to soils include soil compaction and displacement. Burning of piles can also remove vegetation and affect soil structure immediately under the burned piles. In addition, slash that is not piled may increase intensity and residence time for wildfires, which could kill more vegetation and affect soil structure. Soil erosion can occur when rainstorms occur on sites where the ground cover has been removed and the infiltration rate has been reduced by compaction. Soil erosion can lead to increased sediment yield in affected watersheds. Sediment yield is analyzed in detail in Section 3.4.

Project design standards (Section 2.1.4) include BMPs developed to limit the extent of detrimentally compacted, eroded, and displaced soils. Compaction and displacement are most likely to occur on heavily used skid trails, at landings, and along temporary roads. Implementation of the project design standards, especially closure and rehabilitation of skid trails, landings, and temporary roads (Section 2.1.4.9 and 2.1.4.10) would minimize the extent of bare ground and the risk of soil erosion. With the full implementation of the project design standards, project activities are not expected to cause significant effects on soils. In summary, the expected direct and indirect effects of Alternative B on soils would be a slight decrease in soil productivity in areas of displacement and compaction in the short term (less than five years) and no change in soil productivity in the long term (greater than five years).

3.3.2.1.3 Alternative C – Maximum Reduction of Spruce Beetle Habitat and Timber Output

Treatments proposed under Alternative C would be essentially the same as Alternative B, except that additional timber volume would be removed from the same area. The primary effect of this difference on soils would be increased traffic on some skid trails and temporary roads, potentially increasing compaction and displacement. In addition, more slash would be generated, increasing the number of piles burned and the extent of soils affected by burning. Project design standards (Section 2.1.4) would be implemented to minimize the extent of bare ground and the risk of soil erosion. Alternative C may have a slightly greater decrease in soil productivity in the short term along the more heavily used skid trails and temporary roads; however, no significant effects on soils are expected.

3.3.2.2 *Cumulative Effects*

The analysis area for cumulative effects to soils was the project area (Figure 2-1), and the nearby surrounding matrix of BLM, USFS, state, and private lands.

3.3.2.2.1 Alternative A – No Action

There has been minimal forest management within the watersheds encompassing the analysis area. Past road construction and vegetation treatments have likely caused some soil compaction, displacement, and erosion. As described in Section 3.4, most streams in the analysis area are in relatively good condition, indicating that any soil erosion has not adversely affected watershed conditions. Alternative A is not expected to have any direct cumulative effects to soils. Alternative A would indirectly contribute to increased heavy fuel loads, which, over time and in the absence of other forest management actions, may contribute to large-scale, high intensity wildfires that could damage soils.

3.3.2.2.2 Alternative B – Proposed Action – Salvage of Dead and Dying Spruce

Alternative B, in conjunction with past and other planned vegetation treatments (Section 3.2) are expected to have minimal, non-significant cumulative effects on soils because project design standards would be implemented to minimize new soil erosion caused by this project. As described in Section 3.4, no increase in sediment yield is predicted; therefore, any short-term increase in soil erosion would not reach a level that watersheds in the analysis area are measurably affected.

3.3.2.2.3 Alternative C – Maximum Reduction of Spruce Beetle Habitat and Timber Output

Alternative C would remove a greater proportion of the trees within the potential treatment areas, in some cases up to 95 percent of the larger trees. The cumulative effects of Alternative C would be slightly greater than those for Alternative B because there would be more equipment traffic during timber cutting, skidding, and hauling. Nevertheless, the disturbance footprint would be the same and implementation of project design standards would minimize the risk of soil erosion.

3.3.2.3 *Plan Conformance Review*

Overall soil management objectives in the RGFO RMP are to manage surface-disturbing activities (for example, road construction and vegetation management) to avoid soil erosion and loss of watershed values. Each of the action alternatives would implement appropriate BMPs to minimize soil erosion and prevent adverse effects to watersheds; therefore, the proposed project would conform to the RMP.

With respect to soils, both action alternatives for the project would conform to Public Land Health Standard 1. Upland soils would exhibit infiltration and permeability rates that are appropriate to soil type, climate, landform, and geologic processes. Adequate soil infiltration and permeability would allow for the accumulation of soil moisture necessary for optimal plant growth and vigor and minimize surface runoff.

3.4 Water Resources

This section discusses current water resource conditions in terms of beneficial uses, water yield, peak flow, and sediment yield, as well as potential changes to those conditions from the proposed alternatives.

3.4.1 Affected Environment

There are nine sixth-level watersheds in the Project Area (Table 3-2). All project area watersheds are tributaries to the Arkansas River. The total watershed area is greater than the project area because portions of the watersheds are located outside of the project area boundaries. The total watershed area for the nine watersheds is 207,523 acres. Two of the watersheds (East Gulch and Lower Cottonwood Creek) that overlap the project area have been dropped from further analysis. The portion of the Lower Cottonwood Creek watershed in the project area does not contain any BLM lands. The East Gulch

watershed contains a small area of BLM lands; however, this area has no potential for treatment because of steep slopes and poor access.

Table 3-2 Watersheds

Sixth-level Watershed	Hydrologic Unit Code (HUC)	Watershed Area (acres)	Potential Treatment Areas?
Gribbles Run	110200010804	12,893	Yes
Willow Creek-Badger Creek	110200010806	34,852	Yes
Upper Cottonwood Creek	110200011106	23,024	Yes
Middle Cottonwood Creek	110200011107	19,305	Yes
Lower Cottonwood Creek	110200011108	20,983	No
Tallahassee Creek	110200011110	32,098	Yes
Carrol Creek	110200011401	17,260	Yes
Monument Creek	110200011402	28,456	Yes
East Gulch	110200011405	18,652	No
Total		**207,523**	

3.4.1.1 *Beneficial Uses*

The Colorado Department of Public Health and Environment Water Quality Control Commission has assigned beneficial or protected uses of the surface waters in the project area through Regulation No.32 - The Basic Standards and Methodologies for Surface Water (5 CCR 1002-32). These uses are protected by water-quality standards. Waters are classified by the uses for which they are presently suitable or intended to become suitable. Table 3-3 lists the beneficial use classifications for each watershed in the project area.

3.4.1.2 *Water Yield*

Increases in water yield from forest areas have generally been regarded as a positive effect of forest management in the semi-arid West. Many watershed studies have been conducted to determine how to increase water yield because of the relatively limited amount of water available in Colorado's forests. MacDonald and Stednick (2003) conducted a literature review of water yield studies and found that water yield increases from timber harvesting are relatively short-lived, lasting approximately 8 to 13 years. The magnitude of water yield increases tends to decline following treatment because of revegetation. Sheppard and Battaglia (2002) confirmed the results of MacDonald and Stednick and added that the level of treatment needed would be 20 to 25 percent of a watershed to realize and sustain increased water yields. The largest percentage of the watersheds in the project area that would be salvaged is six percent of Gribbles Run; therefore, no changes in water yield would be expected. Water yield is not evaluated further in this analysis.

3.4.1.3 *Peak Flow*

Forest management activities have been extensively studied with regard to the effects of timber harvesting and road building on changes in peak flow. The consensus in the literature is that peak flow changes from timber harvesting generally occur during drier seasons where the amount of evapotranspiration exceeds available soil moisture (Harr 1979). During the summer and fall, the trees generally transpire soil

moisture that is not being recharged by rainfall. When the tree density, and consequently transpiration, is reduced, the soil moisture remains higher and there is a greater potential for runoff from summer or fall storms.

Table 3-3 Beneficial Uses by Watershed

Watershed	Stream Segment Designation	Classification[1]
All watersheds in the project area, except those listed below	14d. All tributaries to the Arkansas River, including wetlands, which are not on National Forest lands, from the Chaffee/Fremont County line to the inlet to Pueblo Reservoir, except for specific listings in segments 14a, 14c, and 15-27.	Aquatic Life Cold 2 Recreation E Agriculture
North Tallahassee Creek	16b. Main stem of North Tallahassee Creek, South Tallahassee Creek, Middle Tallahassee Creek, and Tallahassee Creek from their sources to a point immediately below their confluence with South Tallahassee Creek, except for the specific listing in segment 16a.	Aquatic Life Cold 2 Recreation E Water Supply Agriculture
Upper Cottonwood Creek	17a. Main stem of Cottonwood Creek (Fremont County), including all tributaries and wetlands, from the source to a point immediately below the confluence with North Waugh Creek.	Aquatic Life Cold 1 Recreation E Water Supply Agriculture
Middle Cottonwood Creek	17b. Main stem of Cottonwood Creek (Fremont county), including all tributaries and wetlands, from a point immediately below the confluence with North Waugh Creek to the intersection with F6 Road.	Aquatic Life Cold 2 Recreation E Agriculture

[1] Classifications are defined as:
Aquatic Life Cold 1 - These are waters that (1) currently are capable of sustaining a wide variety of cold water biota, including sensitive species, or (2) could sustain such biota but for correctable water quality conditions. Waters shall be considered capable of sustaining such biota where physical habitat, water flows or levels, and water quality conditions result in no substantial impairment of the abundance and diversity of species.
Aquatic Life Cold 2 - These are waters that are not capable of sustaining a wide variety of cold or warm water biota, including sensitive species, due to physical habitat, water flows, or levels, or uncorrectable water quality conditions that result in substantial impairment of the abundance and diversity of species.
Recreation E - These surface waters are used for primary contact recreation or have been used for such activities since November 28, 1975.
Water Supply - These surface waters are suitable or intended to become suitable for potable water supplies. After receiving standard treatment (defined as coagulation, flocculation, sedimentation, filtration, and disinfection with chlorine or its equivalent), these waters will meet Colorado drinking water regulations and any revisions, amendments, or supplements thereto.
Agriculture - These surface waters are suitable or intended to become suitable for irrigation of crops usually grown in Colorado and which are not hazardous as drinking water for livestock.

Road drainage systems may alter a stream's hydrograph. These changes occur when subsurface and surface flow is captured at road cuts and in ditches, and redirected into a channel (USFS 2001). Roads can also direct water away from a stream (USFS 2001). The effects of road drainage can include an increase in the peak discharge, changes in the shape and timing of the hydrograph, increases in the total discharge, and a decrease in water quality (USFS 2001). Roads that are near streams and road-stream crossings may cause changes to a stream's hydraulic regime, reduction in water quality, and sedimentation (USFS 2001).

Increases in runoff and peak flow events following wildfire can be of concern in watersheds that have a higher probability of flooding and debris flows (Cannon and Reneau 2000). Increased runoff from burned areas, combined with erosion, may cause significant sedimentation downstream (Moody and Martin 2001).

Higher peak flows could cause changes in channel dynamic equilibrium. If the channel is moved out of dynamic equilibrium, the integrity of pools and riffles may be compromised and fish habitat could decrease. The most recent research findings have concluded that in snow zones, changes in peak flows are only partly caused by changes in evapotranspiration. They are also caused by changes in snow distribution in harvested areas and how those changes contribute to snowmelt peak flows (Elliot et al. 2010). These changes may be partly realized in areas of beetle mortality because of changes in evapotranspiration and snow distribution. Elliot and others (2010) also documented that changes in peak flows can be caused by forest management in snow zones; however, those changes are proportional to the amount of the watershed that is harvested. In Fool Creek in the Fraser Experimental Forest (Grand County, Colorado), peak flow increases of 20 percent were measured with clearcutting of 40 percent of the watershed. For this analysis, it is assumed that changes in peak flows are directly proportional to the amount of the watershed in a clear-cut condition. Increases in peak flows by themselves do not constitute an adverse effect. However, when they adversely affect the beneficial uses of a stream they would be considered an adverse effect. For this analysis, potential peak flow increases are evaluated by the percentage of watersheds salvaged converted to an assumed peak flow increase.

3.4.1.4 *Sediment Yield*

Watershed cumulative effects from sediment are an important concern in managed watersheds (Megahan and Hornbeck 2000). Sediments that reach the stream system can stay in the channel for years and create instream sediment sources that may affect the site and areas downstream. Riparian vegetation provides a wide variety of benefits to stream systems, including providing shade to control stream temperature, root strength to maintain stream banks, and input of nutrients that form the base of many aquatic food webs (Bisson et al. 1987). Riparian areas can also serve as filters for increased sediment generated upslope. Stream buffers have been shown to be very effective in moderating cumulative watershed effects (Thomas et al. 1993 and Elliot et al. 2010).

Sediment yield changes following forest management have been studied in several locations. Experimental watersheds in Arizona show that sediment yields in managed ponderosa pine forests were low (Rich et al. 1961), most sediment was moved during larger storms, and originated from channels and logging roads (Rich and Gottfried 1976). Other studies have shown no changes in total sediment production from various treatments compared to a control (Baker et al. 1999).

Roads are considered the primary contributors of sediments to streams in managed watersheds (Swanson et al. 1981, Amaranthus et al. 1985, Rice and Lewis 1986, Bilby et al. 1989, Donald et al. 1996, Megan and Kidd 1972, Reid and Dunne 1984, Rothacher 1971, Sullivan and Duncan 1981, and Swift 1988). Roads can also affect the ecological integrity of a watershed in many ways. Roads built on erodible soils and with an improperly planned road drainage network can impair water quality in nearby streams (USFS 2001). Under-sized culverts or bridges can wash out, contributing to erosion and sedimentation at levels that can be detrimental to other aquatic resources (USFS 2001).

Forests generally have very low erosion rates unless they are disturbed. Common disturbances include prescribed fire, wildfire, insect epidemics, and vegetation treatments. The effects of most of these disturbances generally last only for a short time, perhaps one or two years. In one study, Robichaud and Brown (1999) reported that erosion rates after a wildfire dropped from almost 40 Mg per hectare (18 tons per acre) the first year to 2.3 Mg per hectare (1 ton per acre) the second year, and 1 Mg per hectare (0.45 tons per acre) during the third year. However, some of the recent experiences in Colorado have shown that post-wildfire erosion can remain increased for longer periods. Portions of the burned area from the Hayman Fire of 2002 are still experiencing increased erosion. For disturbances other than wildfire, rapid regrowth of vegetation soon covers the soil surface with plant litter and erosion is quickly reduced. The regrowth of vegetation and subsequent increase in canopy and ground cover overshadow any differences

caused by climate variation among the years. For any one of the given years, however, the potential erosion depends on the climate. Increases in sediment yield by themselves do not constitute an adverse effect. However, when they adversely affect the beneficial uses of a stream they would be considered an adverse effect.

3.4.1.5 *Watersheds for Analysis*

The 6th-level watersheds in which potential treatment areas are located (Table 3-2) were evaluated to determine the level of analysis they would receive. Three watersheds (Middle Cottonwood Creek, Monument Creek, and Tallahassee Creek) have less than one percent of their areas proposed for treatment (Table 3-4). Their water quality, peak flows, water yields, and sediment yields would not be affected because of the very small extent of proposed treatment in these watersheds and because BMPs would further minimize any effects. The remaining four watersheds, in which there would be a higher extent of proposed treatment (Table 3-4), are carried forward for detailed analysis.

Table 3-4 Watersheds Analyzed

Sixth-level Watershed	Watershed Area (acres)	Potential Treatment Area (acres)	Percentage of Watershed (percent)	Carried Forward in Analysis?
Carrol Creek	17,260	243	1.4%	Yes
Gribbles Run	12,893	774	6.0%	Yes
Middle Cottonwood Creek	19,305	157	0.8%	No
Monument Creek	28,456	5	0.0%	No
Tallahassee Creek	32,098	50	0.2%	No
Upper Cottonwood Creek	23,024	694	3.0%	Yes
Willow Creek-Badger Creek	34,852	981	2.8%	Yes
Totals	167,888	2,904		

Throughout the project area, precipitation averages approximately 17 inches per year. The potential treatment areas are range in elevation from 9,200 to 11,700 feet. Snow during the winter months provides the majority of precipitation at these elevations. Summer thunderstorms occur in July and August. Peak flows are dominated by snowmelt runoff and occur during the months of May and June, when discharge increases dramatically. Stream flows during the late summer fall and winter are typically much lower and originate mainly from groundwater discharge. Streams and creeks are generally high gradient, linear (with little meandering) and often tightly confined. Table 3-5 provides the proportion of each watershed in several slope categories.

Table 3-5 Percent of Watersheds by Slope Categories

Watershed	Slope Category			
	0 to 10%	11 to 20%	21 to 30%	31 to 40%
Carrol Creek	12.3%	57.3%	30.2%	0.3%
Gribbles Run	20.4%	74.9%	4.8%	0.0%
Middle Cottonwood Creek	52.1%	47.2%	0.7%	0.0%

Table 3-5 Percent of Watersheds by Slope Categories

Watershed	Slope Category			
	0 to 10%	11 to 20%	21 to 30%	31 to 40%
Monument Creek	36.2%	59.0%	4.8%	0.0%
Tallahassee Creek	53.2%	46.8%	0.0%	0.0%
Upper Cottonwood Creek	15.3%	72.3%	11.9%	0.5%
Willow Creek-Badger Creek	10.3%	76.6%	12.6%	0.6%

3.4.1.5.1 Existing Conditions – Carrol Creek Watershed

The Carrol Creek watershed flows south into the Arkansas River. The main stream in this watershed is named Long Gulch. Long Gulch flows into Fernleaf Gulch before entering the Arkansas River. Elevations range from about 8,600 to 11,700 feet. The project area is in the extreme northern portion of the watershed at the highest elevations. Mulch Gulch, Long Gulch, and Galster Gulch are the intermittent, headwater streams that drain the project area in this watershed. These streams are known to be in good condition. The watershed is moderately steep with the majority of slopes in the 11- to 30-percent categories (Table 3-5).

3.4.1.5.2 Existing Conditions – Gribbles Run Watershed

The Gribbles Run watershed flows to the west into Badger Creek, which flows south into the Arkansas River. Two streams, Gribbles Run and Rock Creek, drain the watershed in the project area. Both streams run intermittently within the project area. Elevations range from about 8,600 to 11,500 feet. The project area is in the southern portion of the watershed, at higher elevations. Gribbles Run and Rock Creek have both been evaluated by the BLM and were determined to be in properly functioning condition. The watershed is mostly on relatively shallow slopes with the majority of slopes in the 0- to 20-percent categories (Table 3-5).

3.4.1.5.3 Existing Conditions –Upper Cottonwood Creek Watershed

The Upper Cottonwood Creek watershed is at the headwaters of the Cottonwood Creek watershed, which flows to the southeast, where it joins Currant Creek and then Tallahassee Creek, before entering the Arkansas River. Elevations range from about 8,800 to 11,700 feet. The project area is in the extreme southern portion of the watershed at the highest elevations. North Waugh Creek, and some small, unnamed tributaries to Upper Cottonwood Creek, drain the potential treatment areas. Both streams run intermittently within the project area. A tributary to North Waugh Creek near the potential treatment areas has been evaluated by the BLM and was determined to be in properly functioning condition. The watershed is moderately steep with the majority of slopes in the 11- to 20-percent category (Table 3-5).

3.4.1.5.4 Existing Conditions – Willow Creek-Badger Creek Watershed

The Willow Creek-Badger Creek watershed is one sub-watershed of the larger Badger Creek watershed that drains south into the Arkansas River. Elevations range from about 7,100 to 11,400 feet. The Badger Creek and Two Creek sub-watersheds contain potential treatments areas. Two Creek is intermittent in the project area. Most of East Badger Creek in the project area is intermittent, except for the lowest half mile, which is perennial. Badger Creek and Two Creek have been evaluated by the BLM. Badger Creek was determined to be in properly functioning condition, but Two Creek was rated as functioning at risk

because of grazing issues, but has been recently determined to be recovering. The watershed is moderately steep with the majority of slopes in the 11- to 20-percent category (Table 3-5).

3.4.2 Analysis of Effects

This section describes the anticipated direct, indirect, and cumulative effects of implementing each of the alternatives on water resources, and compares and contrasts these effects between alternatives. The analysis concentrates on the potential effects of the alternatives on peak flows and sediment yield.

3.4.2.1 *Direct and Indirect Effects*

The analysis area for direct and indirect effects to water resources was the four 6th-level watersheds (Carrol Creek, Gribbles Park, Upper Cottonwood Creek, and Willow Creek-Badger Creek) that were analyzed in detail.

3.4.2.1.1 Alternative A – No Action

Alternative A would have no direct short-term effect on the water resources within the analysis area. Indirect effects include an increase in fuels over time that may increase the risk of severe wildfire compared to the existing conditions. A severe wildfire, if one were to occur, could lead to substantially higher peak flows and sediment yields. Peak flows may increase somewhat, as more spruce trees die because of decreased evapotranspiration and changes in snow pack distribution; however, the pattern of spruce mortality and any subsequent changes in peak flow is difficult to predict. Published studies on the effects of spruce beetle on watersheds are lacking. One study (Stednick and Jensen 2007) in an area of northern Colorado affected by mountain pine beetle found that water yield increases were measured but variable. Peak flow increases were not statistically significant in some watersheds and non-existent in others. Much of the variation observed depended on stand conditions (even vs. uneven-aged, abundant vs. sparse understory). Detailed information on many of the stands in the project area is unavailable; therefore, the effects of spruce beetle on water yield and peak flow are difficult to predict.

3.4.2.1.2 Alternative B – Proposed Action – Salvage of Dead and Dying Spruce

The direct and indirect effects of Alternative B may include increased peak flows. For this analysis, potential increases in peak flow were evaluated by the percentage of each watershed treated. The analysis assumed that treatments in Alternative B would result in a 50 to 90 percent removal of the forest canopy. The average removal used in this analysis was 70 percent.

Peak flow increases would not be measurable. This conclusion is based on the assumption that changes in peak flows would be proportional to reductions in forest cover. Based on past research findings, increase in peak flow would be half of the change in effective forest cover. Therefore, the maximum change in peak flow would be less than three percent in Gribbles Creek watershed, and less than two percent in the other watersheds (Table 3-6). These very small changes in peak flow would not be measureable among the variations in peak flow caused by typical weather events, such as daily temperature fluctuations.

Peak flow increases would have to adversely affect the beneficial uses of a stream before they would be considered a violation of the Clean Water Act. The direct and indirect effects of Alternative B on peak flows would be less than measurable; therefore, the beneficial uses of streams in the watersheds analyzed would not be adversely affected and the Clean Water Act would not be violated.

Table 3-6 Peak Flow Analysis

Sixth-level Watershed	Watershed Area (acres)	Potential Treatment Area (acres)	Effective Treatment Area (acres)	Effective Treatment Area (%)	Predicted Peak Flow Increase (%)
Carrol Creek	17,260	243	182	1.1%	0.5%
Gribbles Run	12,893	774	580	4.5%	2.2%
Upper Cottonwood Creek	23,024	694	521	2.3%	1.1%
Willow Creek-Badger Creek	34,852	981	736	2.1%	1.1%
Totals	88,029	2,692	2,019		

The Water Erosion Prediction Project (WEPP) model was used to compare the changes in sediment yield from salvage treatments, use of roads, and wildfire to background conditions. The WEPP is a predictive tool used by the USDA Natural Resources Conservation Service, USFS, BLM, and others involved in soil and water conservation and environmental planning and assessment. This improved erosion prediction technology is based on modern hydrologic and erosion science, is process-oriented, and is computer-implemented. The WEPP model computes spatial and temporal distributions of soil loss and deposition, and provides explicit estimates of when and where in a watershed or on a hill slope that erosion is occurring so that best management practices can be selected to most effectively control soil loss and sediment yield.

Changes in sediment yield were estimated using the Disturbed WEPP model. The model was run for three slope categories (10, 20, and 30 percent) and for a skid trail condition. These modeling runs estimate the changes for hillslopes that would be treated, and are only estimates for those portions of the watersheds. The estimates of increased sedimentation were scaled to each watershed by the area that would be treated in those watersheds. The Disturbed WEPP results show that no increases in sediment yield are expected. However, skid roads can generate increased sediment yield on slopes greater than 20 percent. Changes in sediment yield are not expected from the treatment operations themselves, but skid roads should be carefully designed on steeper slopes to avoid soil compaction, soil erosion, and potentially increased sediment yield. Temporary roads would generally be limited to slopes of 15 percent or less (Section 2.1.4.9), which would, along with post-harvest rehabilitation, minimize increased sediment yield from Alternative B.

No new permanent roads would be constructed as part of Alternative B. However, increased use of existing roads by logging trucks and other heavy equipment could generate an increase in soil erosion and sediment yield. Several sections of existing roads would likely be used during implementation and are located on severe erosion hazard areas as defined by the Natural Resource Conservation Service (NRCS) Soil Survey Geographic Database (SSURGO) database. "*Severe* indicates that significant erosion is expected, that the roads or trails require frequent maintenance, and that costly erosion-control measures are needed." The BLM roads listed in Table 3-7 (BLM 5795 and 5860) would be reviewed in the field to ensure that adequate drainage and surfacing is present to minimize any potential sediment yield.

Table 3-7 Existing Roads on Severe Erosion Hazard Areas

Watershed	Road Number	Length (feet)	Length (miles)
Carrol Creek	CR 12	2,527	0.5
Carrol Creek	BLM 5860	6,684	1.3
Carrol Creek	CR 16	1,467	0.3
Gribbles Run	CR 11	4,893	0.9
Gribbles Run	CR 12	3,000	0.6
Upper Cottonwood Creek	BLM 5795	1,792	0.3
Willow Creek-Badger Creek	CR 12	5,403	1.0
Total			4.9

With the full implementation of the project design standards (Section 2.1.4), the amount of increased sediment from project activities would not cause a significant effect on water quality. The direct and indirect effects of Alternative B on sediment yield would be a potential slight increase in sediment yield in the short term (less than five years) and a potential decrease in sediment in the long term (greater than five years) because of the reduction in risk of a severe wildfire. The slight short-term increase in sediment yield is not expected to adversely affect the beneficial uses of streams in the watersheds analyzed; therefore, the Clean Water Act would not be violated.

3.4.2.1.3 Alternative C – Maximum Reduction of Spruce Beetle Habitat and Timber Output

Alternative C would remove a greater proportion of the trees within the potential treatment areas, in some cases up to 100 percent. Road use would be slightly greater under Alternative B because of the additional hauling and road maintenance needed under Alternative C. The direct and indirect effects of Alternative C include slightly higher erosion potential compared with Alternative B because roads have been identified as the key concern. The additional hauling and maintenance under Alternative C would increase the potential for erosion from roads.

3.4.2.2 *Cumulative Effects*

The analysis area for cumulative effects to water resources was the four 6th-level watersheds (Carrol Creek, Gribbles Park, Upper Cottonwood Creek, and Willow Creek-Badger Creek) that were analyzed in detail.

3.4.2.2.1 Alternative A – No Action

There has been minimal forest management within the watersheds encompassing the analysis area. Past road construction and use are the actions that have likely had the biggest cumulative effect. However, streams in the analysis area appear to be in relatively good condition, with some exceptions such as Two Creek in the Willow Creek-Badger Creek watershed, which is showing improvement. Sediment, at some level, is naturally occurring in the environment. The stream systems have adapted to and function at different levels and ranges. The introduction of sediment from human activity, if excessive, can adversely affect stream function. Past activities (usually road related) within the project area have likely contributed sediment to the streams. Existing road-stream crossings, and other contributions from roads in the project area, are expected to remain unchanged.

3.4.2.2.2 Alternative B – Proposed Action – Salvage of Dead and Dying Spruce

Additional vegetation treatments may be implemented within the watersheds analyzed for the proposed project (Section 3.2). However, the currently planned actions are small compared to the extent of activities proposed for Alternative B. The cumulative effects on peak flows and sediment yield would be similar to the direct and indirect effects because any additional incremental contributions from other vegetation treatments would not be measureable.

3.4.2.2.3 Alternative C – Maximum Reduction of Spruce Beetle Habitat and Timber Output

Alternative C would remove a greater proportion of the trees within the potential treatment areas, in some cases up to 95 percent. Road use and management would increase compared to Alternative B. The cumulative effects of Alternative C would be slightly higher than those for Alternative B because roads have been identified as the key concern for Alternative B, and because road use and maintenance would increase. This alternative may cause more ground disturbance within the potential treatment areas; however, the project design standards are expected to be equally effective at preventing adverse effects to soils.

3.4.2.3 *Plan Conformance Review*

Overall water-resource management objectives in the RGFO RMP call for following minimum state water-quality standards for all activities. Water quality will continue to be maintained or improved in accordance with state and federal standards. Monitoring and evaluating water quality and quantity, as well as controlling erosion and sediment production, will remain as high-priority management goals. Emphasis will be put on the continuation of all watershed activities that provide protection, maintenance, and enhancement of the watershed resources, including the support watershed activities provide to other resource programs and activities. BLM policy is to protect, maintain, restore, and/or enhance the quality of waters on BLM-administered lands. Implementation of best management practices will be utilized to help achieve this goal. Each of the action alternatives would implement appropriate BMPs for watershed protection. Through use of BMPs, water resources would be protected and the Clean Water Act would not be violated; therefore, the proposed project would conform to the RMP.

With respect to water resources, both action alternatives for the project would conform to Public Land Health Standard 5. Treatments would employ design standards to ensure that the water quality of all water bodies located on or influenced by BLM lands, would achieve or exceed the Water Quality Standards established by the State of Colorado, including beneficial uses, and would not violate the Clean Water Act.

3.5 Vegetation

This section discusses current vegetation conditions in terms of cover type, structure, and presence of insects, as well as potential changes to those conditions from the proposed alternatives.

3.5.1 Affected Environment

Vegetation cover types determined by remote sensing are shown on Figure 3-1. The project area is predominantly aspen and spruce forests (Table 3-8). The aspen stands are generally found at lower elevations on all aspects, while the spruce stands are at higher elevations and on northern aspects. Lesser amounts of mixed conifer stands, grasslands, and shrublands are present at lower elevations as well. Within the potential treatment areas, Engelmann spruce is the dominant tree type, with a lesser

component of Douglas-fir and aspen (Table 3-9). The potential treatment areas are generally north facing with near 100 percent tree cover.

Table 3-8 Project Area Vegetation Types

Cover Type	Acres	Percent of Project Area
Aspen	13,448	42.3
Grassland/Shrubland	7,006	22.1
Spruce/fir*	6,836	21.5
Douglas-fir/Mixed Conifer	2,106	6.6
Lodgepole Pine	925	2.9
Limber Pine	827	2.6
Ponderosa Pine	348	1.1
Non-vegetated	210	0.7
Riparian	38	0.1
Pinyon/Juniper	22	0.1
Total	**31,767**	**100**

* Subalpine fir, which is typically the fir component in spruce/fir stands, is present only as scattered individuals in the project area. Douglas-fir is the most common conifer species associated with spruce in the project area.

Table 3-9 Potential Treatment Area Vegetation Types

Cover Type	Acres	Percent of Potential Treatment Areas
Spruce/fir*	1,594	54.9
Aspen	627	21.6
Douglas-fir/Mixed Conifer	369	12.7
Lodgepole Pine	224	7.7
Limber Pine	83	2.9
Non-vegetated	5	0.2
Grassland/Shrubland	2	0.1
Total	**2,906**	**100.0**

* Subalpine fir, which is typically the fir component in spruce/fir stands, is present only as scattered individuals in the project area. Douglas-fir is the most common conifer species associated with spruce in the project area.

Inventory data were collected from five stands that are representative of the potential treatment areas. The stands are dominated by Engelmann spruce, both in basal area (73 to 99 percent) and trees per acre (77 to 97 percent). Other tree species present in these stands included Douglas-fir, bristlecone pine, and quaking aspen. With the exception of a few areas of dense, young Engelmann spruce regeneration, the majority of the spruce is 6 to 16 inches DBH.

High populations of defoliating insects and bark beetles can cause substantial tree mortality; however, normal endemic populations rarely cause noticeable large-scale damage. The project area is experiencing an infestation of bark beetles and spruce budworm. Mountain pine beetle and Douglas-fir beetle are also present and show signs of increasing populations. Similar infestations are widespread throughout

Colorado, and the BLM has developed a plan to manage infested areas (Section 1.2). Outbreaks of these insects have historically killed thousands of acres of forest. Several species of bark beetles have caused the greatest amount of mortality. These include the western pine beetle, mountain pine beetle, Douglas-fir beetle, and spruce beetle. Ongoing outbreaks of mountain pine beetle are killing large areas of lodgepole pine and ponderosa pine in other parts of Colorado and threaten uninfested areas. In addition, several species of beetle in the *Ips* genus have the potential to cause extensive damage. The insect of primary concern in the project area is the spruce beetle. All of these bark beetles are native insects and considered endemic in the project area; however, the spruce beetle and spruce budworm are currently present at epidemic population levels.

The stand data from the potential treatment areas, though several years old, indicate that the early stages of spruce beetle infestation were present with several dead trees. In 2011, bark beetle was observed affecting groups of trees numbering five to ten. Subsequent assessments of the potential treatment areas have found that the infestation is now affecting patches of hundreds of trees. This beetle produces a new generation of beetles every two years; however, the presence of multiple populations means that a new generation of beetles is produced every year.

3.5.2 Analysis of Effects

This section describes the anticipated direct, indirect, and cumulative effects of implementing each of the alternatives on vegetation, and compares and contrasts these effects between alternatives.

3.5.2.1 *Direct and Indirect Effects*

The analysis area for direct and indirect effects to vegetation was the project area (Figure 2-1).

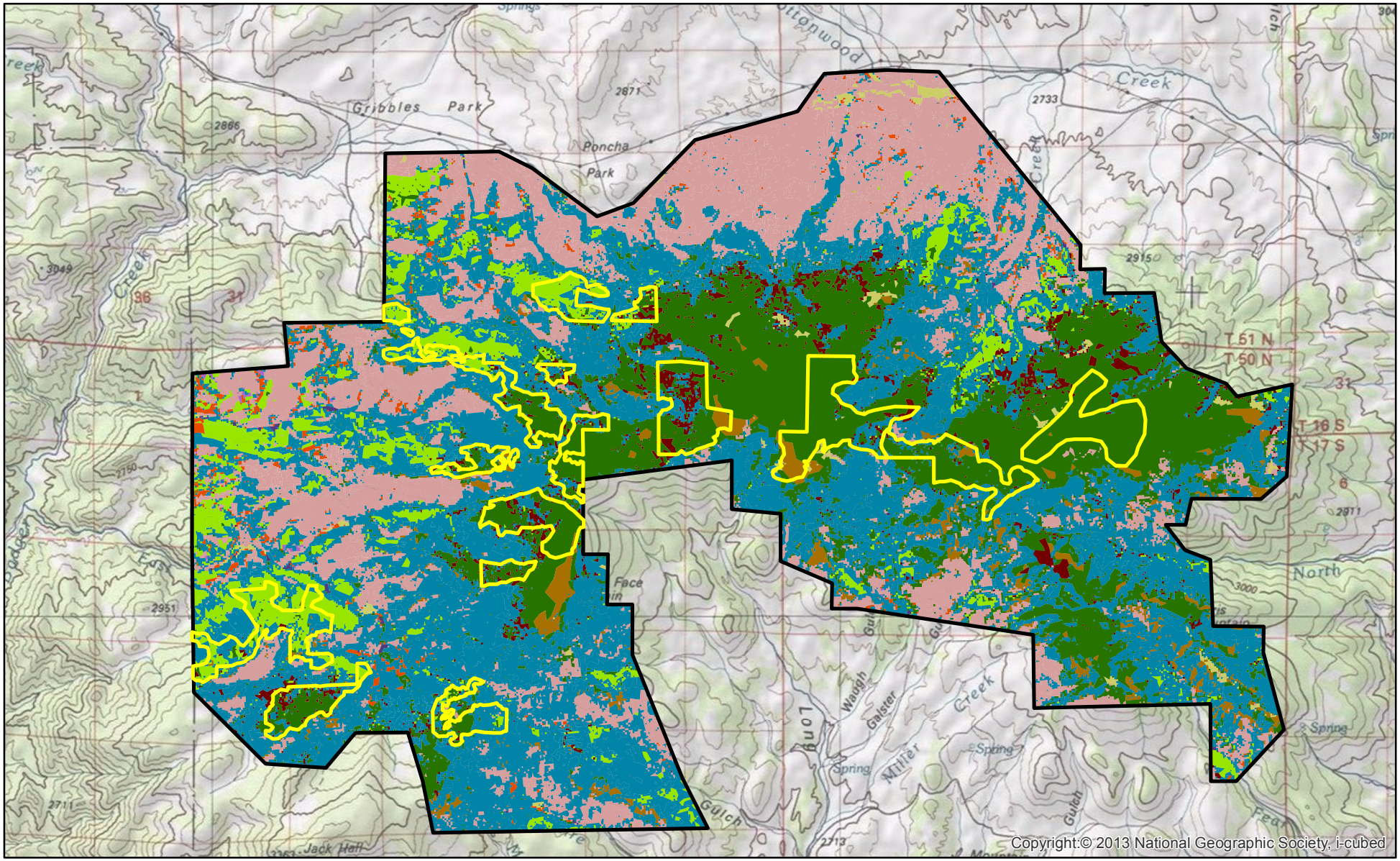
3.5.2.1.1 Alternative A – No Action

Under the No Action Alternative, there would be no vegetation treatment in beetle-infested spruce stands. Affected spruce trees would continue to decline in vigor, and likely eventually die. Presently uninfested trees may become infested as beetles continue to spread within and between stands. Smaller-diameter spruce (for example, seedlings) may avoid infestation and be able to mature. Natural processes would drive vegetation composition. Examining spruce stand data following a 1940s beetle outbreak in Colorado provides some indication of the likely post-outbreak vegetation composition in the project area. One study indicated that accelerated growth of existing seedlings drives future vegetation composition more than new seedling establishment (Veblen et al. 1991). Spruce and Douglas-fir seedlings already present within the affected stands would be allowed to continue growth. Even with this release of seedlings, infested treatment areas with high mortality should be expected to require 300 to 400 years before spruce dominance is restored (Jenkins et al. 2014).

3.5.2.1.2 Alternative B – Proposed Action – Salvage of Dead and Dying Spruce

Alternative B would remove dead, infested, and high-risk spruce trees. This would have similar effects to Alternative A, in that the outcome would be a near-complete removal of overstory spruce. The main difference between Alternatives A and B would be the duration of the successional process. Aspen, Douglas-fir, and other uninfested or susceptible species would be retained to the extent feasible. Advanced regeneration of spruce would be similarly retained. These retained individuals would be expected to mature naturally, as with Alternative A. Likewise, treated stands would not be dominated by spruce again for many decades. As needed, the RGFO would plant harvested areas to ensure adequate regeneration.

Figure 3-1 Vegetation Types



NW Fremont Bark Beetle Salvage EA
Figure 3-1 Vegetation Types
Bureau of Land Management
Royal Gorge Field Office

N
W E
S

Legend

- Potential Treatment Areas
- Project Area

Vegetation Types

- Aspen
- Grasslands/Shrublands
- Douglas-fir/Mixed Conifer
- Non-vegetated
- Limber Pine
- Lodgepole Pine
- Pinyon-Juniper
- Ponderosa Pine
- Spruce/Fir
- Riparian

0 0.75 1.5 3 Miles

NOTE TO MAP USERS
No warrantee is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of the data layers shown on this map. The official land records of the data provided should be checked for current status on any specific tract of land.

Date: 6/15/2015

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Disturbance from treatments would create the opportunity for other species to colonize the potential treatment areas. Soil disturbance from road construction and rehabilitation, equipment movement, and slash treatments would provide conditions for early successional species to take hold. No subsequent treatments are planned that would control or direct the establishment of herbaceous or shrub vegetation.

3.5.2.1.3 Alternative C – Maximum Reduction of Spruce Beetle Habitat and Timber Output

Vegetation composition following implementation of Alternative C would be similar to that of Alternative B; however, a greater number of sawtimber-sized spruce would be removed. It is unknown if these trees would fully mature or be subjected to future bark beetle infestations. Depending on the size-class distribution of a given treatment area, the effect of removing smaller-diameter spruce would vary. For example, a stand with a large stock of 8- to 10-inch diameter trees would be more open following their removal under Alternative C, whereas they may be retained (if uninfested) in Alternative B. This difference may influence regeneration and vegetation establishment on a small scale; however, Alternative C would the same as Alternative B in that the majority of the spruce-dominated overstory would be removed.

3.5.2.2 *Cumulative Effects*

The analysis area for cumulative effects to vegetation was the project area (Figure 2-1), and the nearby surrounding matrix of BLM, USFS, state, and private lands.

3.5.2.2.1 Alternative A – No Action

The analysis area contains a matrix of federally managed (BLM and USFS), state, and private lands. Alternative A would not add to the cumulative effects of past or ongoing activities in the analysis area. The majority of spruce stands would not be treated, and would continue to be affected by bark beetles. The resulting vegetation composition would be driven by natural process across the landscape, such as insects, climate, and fire. Large-scale decline of spruce and other conifers has occurred in Colorado. As the large majority of infested stands have not been treated or salvaged, the No Action Alternative would contribute to the overall beetle-influenced landscape.

3.5.2.2.2 Alternative B – Proposed Action – Salvage of Dead and Dying Spruce

The vegetation types in the project area are not unique or otherwise absent from the surrounding landscape. Vegetation management certainly occurred in the past, but records of the specifics do not exist. The BLM has recently implemented several forest-vegetation management projects, primarily designed to improve age-class diversity and to salvage beetle-infested spruce. Approximately 400 acres have been treated, or are slated for treatment, on BLM and state lands within the analysis area. Alternative B would treat approximately 2,900 additional acres. Since 1996, bark beetles have affected more than 3.3 million acres in Colorado, of which more than 227,000 are managed by the BLM. With approximately 25,000 acres affected in the RGFO, the cumulative effects of Alternative B, in the broader context of spruce decline from bark beetle, would not be significant.

3.5.2.2.3 Alternative C – Maximum Reduction of Spruce Beetle Habitat and Timber Output

Cumulative effects from Alternative C are expected to be the same as for Alternative B. Though this alternative would employ a slightly different treatment approach, the resulting stands would be similar in terms of removal of a dominant spruce overstory. In the context of ongoing projects and the continued beetle outbreak in Colorado, the cumulative effects would not be significant.

3.5.2.3 *Plan Conformance Review*

Overall vegetation management objectives in the RGFO RMP are to attain a stable watershed and soil condition based on site potential. The RMP allows for vegetation-manipulation practices, as proposed and analyzed in this EA. Specifically, the RMP calls for 253 acres of forest treatments to create diversity in age class. While the project would authorize treatment on greater than 253 acres, it is expected that the treatments would be implemented over several years. Even if an annual treatment exceeds 253 acres, the RMP does not constrain the extent of timber-stand harvest and improvement.

With respect to vegetation, both action alternatives for the project would conform to Public Land Health Standard 3. Treatments would employ design standards to ensure healthy, productive plant communities of native and other desirable species are maintained at viable population levels commensurate with the species' and habitat's potential. Plants at both the community and population level would remain productive, resilient, diverse, vigorous, and able to reproduce and sustain natural fluctuations and ecological processes.

3.6 Wetlands and Riparian Zones

This section discusses current conditions of wetlands and riparian areas within the analysis area, as well as potential changes to those conditions caused by the proposed alternatives.

3.6.1 Affected Environment

The USFWS maintains an inventory of wetland habitats within the United States through the National Wetland Inventory (NWI) program. The USFWS generally defines these wetlands as lands that are transitional between terrestrial and aquatic systems, where the water table is usually at or near the surface or the land is covered by shallow water.

Riparian areas are generally defined as plant communities contiguous to, and affected by, surface and subsurface hydrologic features of perennial or intermittent lotic and lentic water bodies (rivers, streams, lakes, or drainage ways). Riparian areas have one or both of the following characteristics: (1) distinctly different vegetative species than adjacent areas, and (2) species similar to adjacent areas but exhibiting more vigorous or robust growth forms. Riparian areas are usually transitional between wetland and upland habitat (USFWS 2009).

Vegetation mapping for the project area (Figure 3-1) indicates wetland and riparian habitats occur along North Waugh Creek, Gribbles Run, Rock Creek, East Bobcat Creek, and Quagmire Creek. As shown in Tables 3-8 and 3-9, wetland and riparian areas are limited in extent in the project area and not present in the potential treatment areas.

3.6.2 Analysis of Effects

This section describes the anticipated direct, indirect, and cumulative effects of implementing each of the alternatives on wetlands and riparian areas, and compares and contrasts these effects between alternatives.

3.6.2.1 *Direct and Indirect Effects*

The analysis area for direct and indirect effects to wetlands and riparian areas was the project area (Figure 2-1).

3.6.2.1.1 Alternative A – No Action

Under the No Action Alternative, there would be no salvage activities in the project area. Any suitable wetland or riparian habitat would remain undisturbed. Some naturally occurring hydrology changes may take place because of wind throw of dead trees, potentially increasing runoff in affected watersheds and contributing to increased input to streams and wetlands (Nature 2014).

3.6.2.1.2 Alternative B – Proposed Action – Salvage of Dead and Dying Spruce

Under Alternative B, salvage activities would take place in designated potential treatment areas within the project area. No salvage harvest would occur in riparian areas or wetlands. Logging decks, staging areas, temporary roads, and other areas of ground disturbance associated with this alternative would not be located within riparian or wetland areas. Trees cut adjacent to riparian areas would be felled in a direction away from the riparian area, or in such a manner as to minimize disturbance to wetlands and riparian areas.

Indirect effects could occur from upslope vegetative buffers failing to capture runoff and sediment from surface disturbances associated with salvage activities and temporary roads (BLM 2014). Since salvage activities would be limited to slopes less than 35 percent, the upslope buffers are expected to protect wetlands and riparian zones from increased sediment deposition. Proposed temporary roads would be held to the minimal configuration needed to perform the work safely, and designed and located to minimize effects to the wetlands and riparian areas. All temporary roads would be closed and revegetated at completion of project activities.

Increases in runoff could occur because of tree removal from the potential treatment areas. This would most likely be caused by soil compaction in work areas and from heavy equipment on access roads. No increase in water yield caused by vegetation removal is predicted (Section 3.4.1.2).

3.6.2.1.3 Alternative C – Maximum Reduction of Spruce Beetle Habitat and Timber Output

As with Alternative B, salvage activities implemented under Alternative C would take place in designated potential treatment areas within the project area. Although there would be removal of green timber in addition to the beetle-killed timber, there would be no additional effects to riparian areas or wetlands beyond those discussed for Alternative B.

3.6.2.2 *Cumulative Effects*

The analysis area for cumulative effects to wetlands and riparian areas was the project area (Figure 2-1).

3.6.2.2.1 Alternative A – No Action

Under the No Action Alternative, there would be no cumulative effects to wetlands and riparian areas because there would be no direct or indirect effects.

3.6.2.2.2 Alternative B – Proposed Action – Salvage of Dead and Dying Spruce

Under Alternative B, salvage activities would take place to remove beetle-killed trees. No measurable cumulative effects to wetland or riparian areas are predicted because project design standards would serve to minimize any direct or indirect effects to wetlands and riparian areas. Ongoing activities, such as recreational use, livestock grazing, road maintenance, and wildfire would continue, but the effects of these activities on wetlands and riparian areas would not be altered by implementation of this alternative.

3.6.2.2.3 Alternative C – Maximum Reduction of Spruce Beetle Habitat and Timber Output

Under Alternative C, even though green timber would be removed in addition to dead trees, salvage activities would avoid riparian and wetland habitat and project design standards would minimize direct and indirect effects. As with Alternative B, no measurable cumulative effects to wetland or riparian areas are predicted.

3.6.2.3 *Plan Conformance Review*

The RMP requires that riparian areas be managed to maintain or achieve a properly functioning condition (Decisions 3-8 and 6-7). In addition, IAPs are required to reflect riparian objectives (Decisions 3-12 and 6-11). The functioning levels of riparian areas in the project area are known to be in good condition. The proposed salvage efforts are not expected to degrade functional values. Riparian objectives have been incorporated into each action alternative through the use of project design standards.

With respect to wetlands and riparian areas, both action alternatives for the project would conform to Public Land Health Standard 2 because project activities would largely avoid these areas. Project design standards would be implemented to ensure that proper function of these systems is not degraded or impaired.

3.7 Invasive, Non-Native Species

This section discusses current conditions for invasive, non-native species in the analysis area as well as potential changes to those conditions from the proposed alternatives.

3.7.1 Affected Environment

Invasive and non-native plant species (noxious weeds) are those that spread into areas where they are not native and typically displace native vegetation or bring about changes in species composition, community structure, or ecosystem function. The Colorado Department of Agriculture maintains a list of noxious weeds by county. The current list for Fremont County includes 33 species. The BLM RGFO has a Noxious Weed Coordinator who tracks infestations and manages control measures. Noxious weed species of concern for the RGFO include, but are not limited to, the following six species: Canada thistle (*Cirsium arvense*), leafy spurge (*Euphorbia esula*), yellow toadflax (*Linaria vulgaris*), musk thistle (*Carduus nutans*), salt cedar (*Tamarix* ssp.), and Russian knapweed (*Acroptilon repens*) (BLM 2015b). Canada thistle can be found in past treatment units and other parts of the project area. Other noxious weed species may or may not be present in the project area. Once specific salvage treatment areas have been identified, site-specific surveys may be used to identify and map infestations of noxious weeds.

3.7.2 Analysis of Effects

This section describes the anticipated direct, indirect, and cumulative effects of implementing each of the alternatives on invasive, non-native species, and compares and contrasts these effects between alternatives.

3.7.2.1 *Direct and Indirect Effects*

The analysis area for direct and indirect effects to invasive, non-native species was the project area (Figure 2-1).

3.7.2.1.1 Alternative A – No Action

The spread of noxious weeds is commonly caused by vehicles, wildlife, livestock, or contaminated hay. The No Action Alternative would not change current and future patterns of these types of activities; therefore, it would have no direct or indirect effects on noxious weeds.

3.7.2.1.2 Alternative B – Proposed Action – Salvage of Dead and Dying Spruce

Under Alternative B, the building of temporary roads, the use of existing roads by project equipment, and the disturbance of native habitat during salvage operations have the potential to introduce and spread noxious weeds. Project design standards have been developed, and would be implemented to reduce the risk of noxious-weed introduction or spread. Despite these measures, the potential would remain for limited introduction and spread of invasive, non-native species.

3.7.2.1.3 Alternative C – Maximum Reduction of Spruce Beetle Habitat and Timber Output

The potential effects of Alternative C on invasive, non-native species would be essentially the same as Alternative B.

3.7.2.2 *Cumulative Effects*

The analysis area for cumulative effects to invasive, non-native species was the project area (Figure 2-1).

3.7.2.2.1 Alternative A – No Action

Under the No Action Alternative, there would be no cumulative effects to invasive, non-native species because there would be no direct or indirect effects. Noxious weeds may continue to be spread through vehicles, wildlife, livestock, or contaminated hay. Infestations under BLM jurisdiction would continue to be treated and managed as they currently are.

3.7.2.2.2 Alternative B – Proposed Action – Salvage of Dead and Dying Spruce

The activities proposed under Alternative B would increase the risk of introduction and spread of noxious weeds posed by other ongoing activities, such as recreational use and livestock grazing. Implementation of project design standards, including monitoring and treatment, would limit this risk and may serve to control existing infestations caused by past activities. Post-project, levels of noxious weed infestation are expected to be similar to current levels; that is, no significant change in levels of infestation is predicted.

3.7.2.2.3 Alternative C – Maximum Reduction of Spruce Beetle Habitat and Timber Output

The potential cumulative effects of Alternative C on invasive, non-native species would be essentially the same as Alternative B.

3.7.2.3 *Plan Conformance Review*

The RMP states that throughout the planning area, noxious weeds will be managed according to the principles of integrated pest management and the Colorado Undesirable Plan Act. The plan also calls for cooperation with county weed boards. Both action alternatives of the proposed project would comply with the RMP because noxious weed infestations would be treated according to BLM standards and disturbed areas would be monitored following ground-disturbing activities.

3.8 Terrestrial Wildlife

This section discusses terrestrial wildlife and current habitat conditions (in terms of cover type, structure, and suitability), as well as potential changes to those conditions from the proposed alternatives.

3.8.1 Affected Environment

The project area provides habitat for a variety of big game species, most importantly Rocky Mountain elk (*Cervus canadensis*) and Rocky Mountain bighorn sheep (*Ovis canadensis*), which was recently added to the BLM Sensitive species list for the RGFO. Several species of raptors, including the golden eagle (*Aquila chrysaetos*) and prairie falcon (*Falco mexicanus*), have been documented nesting near, but not within the project area. Each of these species is discussed in more detail below. The northern goshawk (*Accipiter gentilis*), which is known to inhabit the project area, is discussed in Section 3.11.

3.8.1.1 *Elk*

Rocky Mountain elk graze and browse for forage. In the northern and central Rocky Mountains, grasses and shrubs compose most of the winter diet, with grasses being of primary importance in the spring months. Elk tend to inhabit higher elevations during spring and summer and migrate to lower elevations for winter range. During winter, elk form large mixed herds and congregate on favored winter range. Elk are found throughout the project area, which is located within DAU E-22. The 2004 population estimate of 3,350 elk is within the objective of 3,150 to 3,500 animals for DAU E-22 (CPW 2005). The project area contains winter range, winter concentration areas, summer range, summer concentration areas, and production (calving) areas for elk. Maintenance of calving habitat and protection of calving elk is a primary concern in the project area. High quality calving habitat contains hiding cover and abundant succulent vegetation, which is related to the receding snow line and plant phenology and determined by elevation. Solitude during calving season is important to ensure cows do not abandon their newborn calves. Approximately half of the potential treatment areas are located within elk calving habitat.

3.8.1.2 *Bighorn Sheep*

In Colorado, bighorn sheep prefer high-visibility habitat dominated by grass, low shrubs, and rock cover, areas near open, escape terrain, and topographic relief for predator avoidance. Lambing habitat tends to occur in the most precipitous, inaccessible terrain near patches of abundant succulent and nutritious vegetation, and generally has a dry, southern exposure. Vegetation succession has led to declines in bighorn sheep populations in recent years on some ranges. Bighorn sheep occupy the western half of the project area. No population data are available for DAU RBS-47. The project area contains winter range, summer range, summer concentration areas, and production (lambing) areas for bighorn sheep. No potential treatment areas are located in lambing habitat; however, several potential treatment areas are located immediately adjacent to lambing areas. Maintenance of lambing habitat and protection of lambing sheep is a not a concern because the mapped lambing areas do not contain the cliffs or open terrain that is typical of quality lambing habitat.

3.8.1.3 *Raptors*

Golden eagles are common in the region and nest, primarily on cliffs and rock outcroppings, but also occasionally in trees. Prairie falcons are widespread in the area and use cliff and rock habitats for nesting. No suitable nesting habitats for golden eagles or prairie falcons are known in the project area; however, one golden eagle nest and two prairie falcon nests have been documented within approximately five miles of the project area. Foraging habitat (generally open grasslands and shrublands) for these species is present in the project area.

3.8.2 Analysis of Effects

This section describes the anticipated direct, indirect, and cumulative effects of implementing each of the alternatives on terrestrial wildlife and wildlife habitat, and compares and contrasts these effects between alternatives.

3.8.2.1 *Direct and Indirect Effects*

The analysis area for direct and indirect effects to terrestrial wildlife was the project area (Figure 2-1) and a ½-mile buffer.

3.8.2.1.1 Alternative A – No Action

Under Alternative A, no direct effects are expected to elk, bighorn sheep, raptors, or their habitats. The lack of active timber management would lead to natural forest succession and decomposition, leaving heavy accumulations of forest material on the ground. Continuous fuel loading would leave these areas susceptible to wildfire with the potential to burn at intense temperatures closer to the ground. This would have detrimental effects to soil fertility and structure, which could substantially reduce vegetation regrowth and recovery of affected wildlife habitats.

Elk and bighorn sheep would experience reduced thermal and hiding cover as trees die and fall down. More browse or other forage would become available over time, although these species may have a hard time accessing these areas because of the large amounts of downed woody debris. Reduced access to forage may reduce the quality of calving and lambing habitats in the long-term. Some cover would be lost in calving and lambing habitats in the short-term, but it is expected to recover as the understory grows up.

This alternative would not affect the availability of nest sites for golden eagles or prairie falcons. Foraging habitat for these species is not expected to change because by the time many of the snags fall, a new understory layer of shrubs and young trees is likely to have grown up.

3.8.2.1.2 Alternative B – Proposed Action – Salvage of Dead and Dying Spruce

Habitat quality for the species described in Section 3.8.1 is determined by a combination of many different factors, and is reflective of the inherent variability, complexity, and uncertainty associated with ecosystems. Primarily, wildlife habitat quality is based on vegetative composition and structure (Thomas et al. 1979). The structure and composition of the forest affects food availability and cover (Smith 2000). In turn, the availability of food and cover is affected by changing landscape patterns. Species may respond to landscape patterns in different ways, depending on their habitat needs (Gergel and Turner 2002). Natural processes, such as fire, forest insect and disease outbreaks (such as the spruce-beetle epidemic), and wind--in conjunction with management activities--all contribute to changing landscape patterns and vegetation mosaics. These mosaics create habitat heterogeneity, or discontinuity, across a landscape, which is important for maintaining animal diversity (Smith 2000). Although some discontinuity is generally positive, at some level (which is different for each species) heterogeneity becomes habitat fragmentation (Smith 2000). Management actions that manipulate land cover, including timber salvage, may have variable effects on different wildlife species because habitat improvements for some species may lead to a decrease in habitat quality for others (Smith 2000, Gergel and Turner 2002).

Direct effects to elk, bighorn sheep, golden eagles, and prairie falcons would be limited to temporary displacement from potential treatment units during active timber salvage operations if this activity occurs during a period when these species are present. Project design standards to protect reproducing big game (Section 2.1.4.8) would be implemented to minimize the risk of displacing elk during the calving seasons

and avoid newborn calf abandonment. Similarly, raptor surveys and timing limitations (Section 2.1.4.8) would be used to identify and protect any nests of golden eagles, prairie falcons, or other raptors that become established in or near the potential treatment areas.

Alternative B would reduce thermal and hiding cover for elk and bighorn sheep as trees are cut and removed. More browse and other forage would become available in and adjacent to treated areas after the dense forest canopy is removed. These two big game species would also have easier access to these areas, compared to Alternative A, because much of the timber would be removed instead of falling to the ground. Increased understory forage and reduced down woody debris would improve the condition of big game ranges, including calving and lambing areas. Effects from this alternative to the American elk population at the DAU level would be insignificant. Effects from this alternative to Rocky Mountain bighorn sheep at the RGFO planning level scale would be insignificant and the planning area population would be maintained. Perching and roosting opportunities for golden eagles and prairie falcons would be reduced where large numbers of trees are removed; however, project design standards (Section 2.1.4.8) would ensure sufficient snags and coarse woody debris are retained in the potential treatment areas. Immediately after the salvage is complete, these species may see increased foraging opportunities in the treated area; however, in the long-term, these areas are expected to regenerate into forest.

3.8.2.1.3 Alternative C – Maximum Reduction of Spruce Beetle Habitat and Timber Output

The effects to elk, bighorn sheep, golden eagles, prairie falcons, and their habitats from Alternative C would be similar to those described for Alternative B; however, a greater number of trees (primarily Engelmann spruce) would be removed. Depending on the size-class distribution of spruce in a given potential treatment area, implementation of Alternative C would lead to the removal of more overstory than Alternative B but other tree species of various size classes would remain. Increased windthrow of these residual trees would be possible, which would also decrease the amount of overstory remaining. Effects to big game and raptors would be similar to those described for Alternative B, except that the changes to habitats would be more intensive. For example, in the short-term, cover would be reduced more in calving habitat with Alternative C. Cover is expected to recover quickly after treatments and understory forage is likely to increase more with Alternative C, compared with Alternatives A or B, because more of the canopy would be removed. This would improve forage in calving and lambing habitats. As with Alternative B, project design standards (Section 2.1.4.8) would minimize the potential for direct effects to these two big game species and raptors through surveys and timing limitations, and would encourage snag and coarse woody debris retention, maintaining important habitat components for raptors and their prey. Effects from this alternative to the American elk population at the DAU level would be insignificant. Effects from this alternative to Rocky Mountain bighorn sheep at the RGFO planning level scale would be insignificant and the planning area population would be maintained.

3.8.2.2 *Cumulative Effects*

The analysis areas for cumulative effects to large mammals were the DAUs listed in Section 3.8.1. The analysis area for cumulative effects to raptors was the project area (Figure 2-1) and a five-mile buffer.

3.8.2.2.1 Alternative A – No Action

There would be no cumulative effects to terrestrial wildlife from Alternative A because there would be no direct or indirect effects.

3.8.2.2.2 Alternative B – Proposed Action – Salvage of Dead and Dying Spruce

This alternative, in conjunction with past, present, and reasonably foreseeable actions in the analysis areas, would have limited, insignificant, cumulative effects to populations of elk, bighorn sheep, golden eagles, and prairie falcons. Changes in cover and forage for elk and bighorn sheep would generally be beneficial, especially in the long-term, because this alternative and other timber harvest projects in the analysis area would create more open, mosaic habitats these species favor. Calving and lambing habitats would remain available and may be improved in the long-term where they occur within or adjacent to timber salvage or harvest areas. Some minor, short-term increases in foraging habitat may be experienced by golden eagles or prairie falcons; however, the potential treatment areas are expected to regenerate to forest cover. In the long-term, foraging habitats for raptors in the analysis area are expected to remain at current levels.

3.8.2.2.3 Alternative C – Maximum Reduction of Spruce Beetle Habitat and Timber Output

Cumulative effects from Alternative C are expected to be similar to those for Alternative B. Although this alternative would implement a more intensive treatment, the resulting stands would be similar in that the dominant spruce overstory would be removed. At the scale of the cumulative effects analysis areas for elk, bighorn sheep, golden eagles, and prairie falcons, no measureable differences in the cumulative effects between Alternatives B and C are expected. Combined with other past, present, and reasonably foreseeable activities, cumulative effects to populations of these species would be insignificant.

3.8.2.3 *Plan Conformance Review*

The RMP requires that conflicts between wildlife habitat and other uses be resolved in favor of achieving vegetation management goals (Decisions 3-15 and 6-14). The proposed salvage efforts are not expected to degrade overall wildlife habitats in the long term although there would be minor effects in the short term. Wildlife objectives have been incorporated into each action alternative through the use of project design standards, which would minimize these effects.

Both action alternatives for the project would conform to Public Land Health Standard 3, with respect to terrestrial wildlife. Project design features (Section 2.1.4.8) that conserve important habitats for elk, bighorn sheep, golden eagle, and prairie falcon, among other terrestrial wildlife species, would be implemented. Live trees would be retained and the project would accelerate regeneration of conifer trees in the long term. Understory forage would increase in the short term. These conditions would maintain habitats for these species. Populations and habitats for these terrestrial wildlife species would be maintained in the short term or enhanced in the long term by sustaining healthy, native plant and animal communities.

3.9 Migratory Birds

The Migratory Bird Treaty Act (MBTA) of 1918, as amended, implements various treaties and conventions for the protection of migratory birds. The MBTA prohibits hunting, taking, capturing, killing, possessing, selling, purchasing, shipping, transporting, or exporting of any migratory bird, part, nest, or egg.

3.9.1 Affected Environment

The Colorado Partners in Flight (CPF) and Landbird Conservation Priority Birds list (CPF 2000) and BLM priority migratory birds list were reviewed for this project. As it is highly unlikely that this project

would harm adult birds, the discussion is focused on priority species that may use nesting habitats within the potential treatment areas.

Forest-dependent bird species of concern that may nest and forage in the potential treatment areas include Williamson's sapsucker (*Sphyrapicus thyroideus*), band-tailed pigeon (*Patagioenas fasciata*), boreal owl *(Aegolius funereus*), flammulated owl *(Psiloscops flammeolus*), Grace's warbler (*Dendroica graciae*), Hammond's flycatcher (*Empidonax hammondii*), olive-sided flycatcher (*Contopus cooperi*), and red-naped sapsucker (*Sphyrapicus nuchalis*). Broad-tailed hummingbirds (*Selasphorus platycercus*) may nest in riparian woodlands and forage in open habitats within the project area. Violet-green swallows (*Tachycineta thalassina*) may nest in tree cavities and cliffs and forage in open habitats within the project area. Information noted below on these species was derived from The Birds of North America website (Poole 2015).

3.9.2 Analysis of Effects

This section describes the anticipated direct, indirect, and cumulative effects of implementing each of the alternatives on migratory birds, and compares and contrasts these effects between alternatives. While many other species of migratory birds may nest in the project area, the following discussion focuses on the migratory bird species of concern identified in Section 3.9.1.

3.9.2.1 *Direct and Indirect Effects*

The analysis area for direct and indirect effects to migratory birds was the project area (Figure 2-1).

3.9.2.1.1 Alternative A – No Action

Under Alternative A, no direct effects to the species listed in Section 3.9.1 or their nesting habitats are expected to occur. The lack of active timber management would lead to natural forest succession and decomposition, leaving heavy accumulations of forest material on the ground. Continuous fuel loading would leave these areas susceptible to wildfire with the potential to burn at intense temperatures closer to the ground. This would have detrimental effects to soil fertility and structure, which could substantially reduce vegetation regrowth and recovery of effected migratory bird habitats.

As timber dies and begins to fall, nesting habitat for migratory birds that nest in live trees, such as band-tailed pigeon, Grace's warbler, Hammond's flycatcher, and olive-sided flycatcher would decline. Initially, habitat for primary and secondary cavity nesters such as the Williamson's sapsucker, boreal owl, flammulated owl, red-naped sapsucker, and violet green swallow would increase because of the large number of snags although it may take time for these snags to become soft enough for cavities. Over time, these snags would fall and no longer provide nesting opportunities for these species. The large number of snags would also provide more foraging opportunities for the Williamson's and red-naped sapsuckers and roosting opportunities for species that forage in the open, such as violet-green swallow and broad-tailed hummingbird. The more open canopy and denser understory vegetation may lead to increased insect populations, which would increase foraging opportunities for flycatchers and swallows. Increased grass and shrub habitats may provide better foraging for the broad-tailed hummingbird as well.

3.9.2.1.2 Alternative B – Proposed Action – Salvage of Dead and Dying Spruce

The project design criteria listed in Section 2.1.4.3 would be implemented, requiring pre-disturbance surveys during the nesting period for many of the migratory birds (May 15 – July 15) and protection of active nests and tree cavities. Bird species nesting outside this period could be negatively affected by project activities through nest removal or failure.

Implementation of salvage harvest, hazard tree removal, and creation of temporary roads would decrease the number of snags in the potential treatment areas. Snag retention requirements (Section 2.1.4.8) would preserve some habitat for primary and secondary cavity nesters such as the Williamson's sapsucker, boreal owl, flammulated owl, red-naped sapsucker, and violet green swallow. Additional snag nesting habitat would be available in untreated areas that experience spruce beetle infestation.

As with Alternative A, loss of live trees would reduce nesting habitat for species such as band-tailed pigeon, Grace's warbler, Hammond's flycatcher, and olive-sided flycatcher, which nest in live trees. Over time, tree regeneration would provide renewed nesting opportunities for these species.

Under Alternative B, changes to forest structure in the potential treatment areas would differ from Alternative A because dead and dying timber would be removed and not allowed to pile up, allowing grasses, shrubs, and tree saplings to re-inhabit the area more quickly. The more open forest understory and new growth of understory vegetation would benefit species that forage in these conditions, such as the Hammond's flycatcher, olive-sided flycatcher, violet-green swallow, and broad-tailed hummingbird.

3.9.2.1.3 Alternative C – Maximum Reduction of Spruce Beetle Habitat and Timber Output

The effects of Alternative C on migratory birds would be essentially the same as Alternative B, except they would be more intensive, because more spruce trees would be removed from the same area. For example, fewer live trees would remain to provide nesting habitat for species such as band-tailed pigeon, Grace's warbler, Hammond's flycatcher, and olive-sided flycatcher nest in live trees. The removal of more trees, including green trees, would also decrease future snag recruitment. This would reduce future nesting opportunities for primary and secondary cavity nesters such as the Williamson's sapsucker, boreal owl, flammulated owl, red-naped sapsucker, and violet green swallow, as well as foraging opportunities for the sapsuckers.

The removal of more forest overstory would allow denser growth of grasses, shrubs, and tree saplings compared with Alternative B. This would provide a greater benefit to species that forage in these conditions, such as the Hammond's flycatcher, olive-sided flycatcher, violet-green swallow, and broad-tailed hummingbird.

The same project design criteria listed in Section 2.1.4.3 would be implemented, requiring pre-disturbance surveys during the nesting period for many of the migratory birds (May 15 – July 15) and protection of active nests and tree cavities. Any bird species nesting outside this period would be affected by project activities through nest removal or failure. Snag retention requirements (Section 2.1.4.8) would preserve some habitat for primary and secondary cavity nesters such as the Williamson's sapsucker, boreal owl, flammulated owl, red-naped sapsucker, and violet green swallow.

3.9.2.2 *Cumulative Effects*

The analysis area for cumulative effects to migratory birds was the project area (Figure 2-1) and a ½-mile buffer.

3.9.2.2.1 Alternative A – No Action

There would be no cumulative effects to migratory birds from Alternative A because there would be no direct or indirect effects.

3.9.2.2.2 Alternative B – Proposed Action – Salvage of Dead and Dying Spruce

This action in conjunction with past, present, and reasonably foreseeable actions in the analysis area would have limited, insignificant cumulative effects to populations of migratory birds. The cumulative effects of Alternative B are essentially the same as the direct and indirect effects, but spread over a larger area and across time, because past, present, and reasonably foreseeable timber harvests are the primary activity that affect habitats for species discussed in this analysis. These activities are expected to remove variable percentages of forest habitat available to migratory bird species, depending on conditions at the time of treatment. Populations of species dependent on live forests, such as the band-tailed pigeon, Grace's warbler, Hammond's flycatcher, and olive-sided flycatcher may decline in the short-term, but recover as forests regenerate. The abundance of snags may initially benefit primary and secondary cavity nesters such as the Williamson's sapsucker, boreal owl, flammulated owl, red-naped sapsucker, and violet green swallow; however, long-term lack of large trees and snag recruitment may reduce nesting abundance of these species. None of these effects are expected to contribute to substantial, long-term declines in populations or habitats of migratory birds in the analysis area.

3.9.2.2.3 Alternative C – Maximum Reduction of Spruce Beetle Habitat and Timber Output

Cumulative effects from Alternative C are expected to be essentially the same as those for Alternative B. Although this alternative would implement a more intensive treatment, the resulting stands would be similar in that the dominant spruce overstory would be removed. At the scale of the cumulative effects analysis area, no measureable differences in the cumulative effects between Alternatives B and C are expected to Williamson's sapsucker, band-tailed pigeon, boreal owl, flammulated owl, Grace's warbler, Hammond's flycatcher, olive-sided flycatcher, red-naped sapsucker, broad-tailed hummingbird, and violet-green swallow. Combined with other past, present, and reasonably foreseeable activities, cumulative effects to populations of these species would be insignificant.

3.9.2.3 *Plan Conformance Review*

The RMP requires that conflicts between wildlife habitat and other uses be resolved in favor of achieving vegetation management goals (Decisions 3-15 and 6-14). Both action alternatives include project design standards that are designed to minimize effects to migratory birds and their breeding habitats.

Both action alternatives would conform to Public Land Health Standard 3 with respect to Williamson's sapsucker, band-tailed pigeon, boreal owl, flammulated owl, Grace's warbler, Hammond's flycatcher, olive-sided flycatcher, red-naped sapsucker, broad-tailed hummingbird, and violet-green swallow. The project design standards in sections 2.1.4.3 and 2.1.4.8 would be implemented, which would protect migratory bird nests and retain important habitat components, such as snags and coarse woody debris. Populations and habitats for migratory bird species would be maintained over the long term because the action alternatives would promote forest succession and sustain healthy, native plant and animal communities within the range of variability induced by natural ecosystem processes, such as insect outbreaks.

3.10 Aquatic Wildlife

This section discusses aquatic wildlife species and their habitats, as well as potential changes from the proposed alternatives.

3.10.1 Affected Environment

As discussed in Section 3.4, the project area contains nine sixth-level watersheds, seven of which contain one or more potential treatment areas. All are tributary to the Arkansas River. Three watersheds have less than one percent of their areas proposed for treatment; therefore, water quality, peak flows, water yields, and sediment yields would not be affected by Alternatives B or C and they are not carried forward for detailed analysis. The Carrol Creek, Gribbles Run, Upper Cottonwood Creek, and Willow Creek-Badger Creek watersheds were selected for detailed analysis.

3.10.1.1 *Carrol Creek*

The main stream in this watershed is named Long Gulch. Long Gulch flows into Fernleaf Gulch before entering the Arkansas River. The project area is in the extreme northern portion of the watershed at the highest elevations. Mulch Gulch, Long Gulch, and Galster Gulch are the intermittent, headwater streams that drain the project area within this watershed. These streams are known to be in good condition. Since they are intermittent and high up in the watershed, they are not expected to support populations of fish or aquatic insects.

3.10.1.2 *Gribbles Run*

Two streams, Gribbles Run and Rock Creek, drain this watershed. Both streams are intermittent within the project area. These streams flow into Badger Creek, which flows south into the Arkansas River. Since they are intermittent and high up in the watershed, they are not expected to support populations of fish or aquatic insects.

3.10.1.3 *Upper Cottonwood Creek*

The main stream in this watershed is Cottonwood Creek, which flows to the southeast where it joins Currant Creek and then Tallahassee Creek before entering the Arkansas River. The project area is in the extreme southern portion of the watershed at the highest elevations. North Waugh Creek and five small, unnamed tributaries to Upper Cottonwood Creek drain the potential treatment areas. All are intermittent within the project area. Since they are intermittent and high up in the watershed, they are not expected to support populations of fish or aquatic insects.

3.10.1.4 *Willow Creek-Badger Creek*

East Badger Creek and Two Creek drain the portion of this watershed that contains potential treatment areas. Badger Creek drains south into the Arkansas River. The project area is in the extreme eastern portion of the watershed at the highest elevations. Two Creek is intermittent, while the lower reaches of East Badger Creek within the project area are perennial. East Badger Creek and possibly the lower reaches of Two Creek are known to support fish populations and aquatic insects.

Perennial streams downstream of the project area primarily contain brook trout (*Salvelinus fontinalis*), rainbow trout (*Oncorhynchus mykiss*), and brown trout (*Salmo trutta*). They also contain an assemblage of aquatic insects including caddis, stone, and mayflies, among others.

3.10.2 Analysis of Effects

This section describes the anticipated direct, indirect, and cumulative effects of implementing each of the alternatives on aquatic wildlife resources, and compares and contrasts these effects between alternatives.

3.10.2.1 *Direct and Indirect Effects*

The analysis area for direct and indirect effects to aquatic wildlife was the four 6th-level watersheds (Carrol Creek, Gribbles Run, Upper Cottonwood Creek, and Willow Creek-Badger Creek) that were analyzed in detail.

3.10.2.1.1 Alternative A – No Action

Alternative A would have no direct short-term effect on aquatic wildlife. Indirect effects include an increase in fuels over time that may increase the risk of severe wildfire compared to the existing conditions. A severe wildfire, if one were to occur, could lead to substantially higher peak flows and sediment yields, potentially affecting downstream species. Peak flows may also increase as more spruce trees die because of decreased evapotranspiration and changes in snow pack distribution; however, the pattern of spruce mortality and any subsequent changes in peak flow is difficult to predict. As discussed in Section 3.4.2.1.1, studies (for example, Stednick and Jensen 2007) have shown variable to non-existent changes in water yield and peak flow following insect outbreaks, depending on stand conditions and other factors.

3.10.2.1.2 Alternative B – Proposed Action – Salvage of Dead and Dying Spruce

Mechanisms that can affect aquatic wildlife and their habitats include increased sedimentation, increased turbidity, and loss or reduction of streamside vegetation cover. Increased sedimentation and turbidity can affect trout and their habitat by reducing dissolved oxygen, raising stream temperature, covering spawning and rearing areas, filling pool habitats, and making foraging more difficult. Loss or reduction of streamside vegetation cover can affect nutrient inputs, water temperature, light levels, macroinvertebrate production, and stream velocities.

The direct and indirect effects of Alternative B may include increased peak flows, though they would not be measurable (Section 3.4.2.1.2). Very small changes in peak flow would not be measureable among the variations in peak flow caused by typical weather events, such as daily temperature fluctuations. The direct and indirect effects of Alternative B on peak flows would be less than measurable; therefore, aquatic wildlife and habitat would not be affected.

Section 3.4.2.1.2 compares the changes in sediment yield from salvage treatments, use of roads, and wildfire to background conditions. The results show that no increases in sediment yield or turbidity are expected. However, skid roads can generate increased sediment yield on slopes greater than 20 percent. Changes in sediment yield are not expected from the treatment operations themselves, but skid roads located on steeper slopes should be carefully designed to avoid soil compaction, soil erosion, and potentially increased sediment yield. Temporary roads would generally be limited to slopes of 15 percent or less, and intermittent stream channel crossings would be designated by the BLM (Section 2.1.4.9 and 2.4.4.11). These measures, along with post-harvest rehabilitation, would minimize increased sediment yield from Alternative B.

No new permanent roads would be constructed as part of Alternative B. However, increased use of existing roads by logging trucks and other heavy equipment generates concern that there could be increased soil erosion and sediment yield. With the full implementation of the project design standards (Section 2.1.4), the direct and indirect effects of Alternative B on sediment yield would be a potential slight increase in the short term (less than five years) and a potential decrease in the long term (greater than five years) because of the reduction in risk of a severe wildfire. The slight short-term increase in sediment yield is not expected to adversely affect aquatic wildlife or habitat.

Riparian habitats would not be affected by this alternative (Section 3.6). Removal of vegetation outside riparian areas would not affect aquatic wildlife because no treatment units are located near perennial streams.

3.10.2.1.3 Alternative C – Maximum Reduction of Spruce Beetle Habitat and Timber Output

Alternative C would remove a greater proportion of the trees within the potential treatment areas, in some cases up to 95 percent. Road use and management would be the same as that under Alternative B. The direct and indirect effects of Alternative C would be essentially the same as those for Alternative B because roads have been identified as the key concern for Alternative B and the same roads would be used for Alternative C.

3.10.2.2 *Cumulative Effects*

The analysis area for cumulative effects to water resources was the four 6th-level watersheds (Carrol Creek, Gribbles Park, Upper Cottonwood Creek, and Willow Creek-Badger Creek) that were analyzed in detail.

3.10.2.2.1 Alternative A – No Action

There has been minimal forest management within the watersheds encompassing the analysis area. Past road construction and use are the actions that have likely had the biggest cumulative effect. However, streams in the analysis area appear to be in relatively good condition, with some exceptions such as Two Creek in the Willow Creek-Badger Creek watershed. Sediment, at some level, is naturally occurring in the environment. The stream systems have adapted to and function at different levels and ranges. The introduction of sediment from human activity, if excessive, can adversely affect aquatic habitats and aquatic wildlife. Past activities (usually road related) in the analysis area have likely contributed sediment to the streams. Existing road-stream crossings and other contributions from roads in the analysis area are expected to remain unchanged.

3.10.2.2.2 Alternative B – Proposed Action – Salvage of Dead and Dying Spruce

Additional vegetation treatment projects (for example, on state or private lands) may be implemented within the watersheds analyzed (Section 3.2). However, these actions are expected to be small compared to the extent of activities proposed for Alternative B. The cumulative effects on increased sedimentation, increased turbidity, and loss or reduction of streamside-vegetation cover would be similar to the direct and indirect effects because any additional incremental contributions from other vegetation treatment projects would not be measureable. The proposed project, when added to the past, current, and reasonably foreseeable activities would cause no detectable cumulative effects.

3.10.2.2.3 Alternative C – Maximum Reduction of Spruce Beetle Habitat and Timber Output

Alternative C would remove a greater proportion of the trees within the potential treatment areas, in some cases up to 100 percent. Road use and management would be the same as that for Alternative B. Because roads have been identified as the key concern for Alternative B, the cumulative effects of Alternative C would be essentially the same as those for Alternative B.

3.10.2.3 *Plan Conformance Review*

The RMP requires that conflicts between fisheries habitat and other uses be resolved in favor of achieving fisheries management goals (Decisions 3-23, 3-25, 6-22, and 6-24). The proposed salvage efforts are not

expected to degrade aquatic wildlife habitats. Aquatic wildlife objectives have been incorporated into each action alternative through the use of project design standards.

Both action alternatives for the project would conform to Public Land Health Standard 3 with respect to aquatic wildlife, because project design features (Section 2.1.4.8) would be implemented. Healthy, productive aquatic wildlife communities would be maintained at viable population levels commensurate with the species' and habitat's potential. Aquatic wildlife at both the community and population level would be productive, resilient, diverse, vigorous, and able to reproduce and sustain natural fluctuations and ecological processes.

3.11 Special Status Animals

This section discusses special status wildlife species and their habitats, as well as potential changes from the proposed alternatives.

3.11.1 Affected Environment

The RGFO verified the USFWS list of threatened, endangered, candidate, and proposed (TECP) wildlife species that may occur within the project area (USFWS 2015). Upon further analysis, it was determined that Canada lynx *(Lynx canadensis*) is the only TECP species that may occur in the project area; therefore, there would be no effect on any TECP species other than the Canada lynx. Of the BLM sensitive species identified by the state director, northern goshawk and Townsend's big-eared bat *(Corynorhinus townsendii pallescens)* are known to occur, or may occur, in the project area (Table 3-10).

Table 3-10 Special Status Wildlife Species

Species	Status	Description/Habitat	Potential to be Affected by Project Activities
Canada lynx	Federal Threatened	Dense spruce-fir, Douglas-fir, early seral lodgepole pine, and mature lodgepole pine forests with an understory of spruce-fir and aspen in the subalpine life zone up to timberline. Uses caves, rock crevices, banks, and coarse-woody debris for denning. Closely associated with snowshoe hare *(Lepus americanus*), but also preys on other small mammals and ground-dwelling birds.	Suitable habitat is present in the project area.
Northern goshawk	BLM Sensitive	Mature-to-late seral coniferous, deciduous, and mixed forests; nests in large forked trees near riparian areas and aspen at less than 11,500 feet elevation. Occupy the same territories year after year. May construct and maintain one or more alternate nests. Diet consists of small mammals and birds such as flickers and jays.	Known to occur in the project area. Suitable habitat is present in the project area. Nesting surveys would be conducted.
Townsends big-eared bat	BLM Sensitive	Caves, mines, rock crevices, and structures in woodlands and forests, edge habitats from 6,100 to 10,500 feet in elevation in dry-to-mesic forests.	Suitable foraging habitat occurs within the project area. Potential roost sites would be identified during wildlife surveys.

3.11.1.1 *Canada Lynx*

The RGFO (in coordination with the USFWS and Pike and San Isabel National Forests) recently drafted the Waugh Mountain Lynx Analysis Unit (LAU). This LAU is still under review; at present, the project area is not within a designated LAU. The draft Waugh Mountain LAU includes much of the project area and surrounding lands. An LAU is an analysis unit within which direct, indirect, and cumulative effects of proposed projects are evaluated. The draft Waugh Mountain LAU encompasses a total of 43,798 acres of public (state and federal) lands, of which 22,471 acres have been mapped as lynx habitat (Table 3-11). The remaining 21,327 acres is not habitat for Canada lynx, meaning these areas support vegetation that would never become lynx habitat (for example, meadows, rocks, shrubs, etc.).

The project area is not within an established lynx linkage area. Critical habitat for Canada lynx has not been designated in or near the project area (USFWS 2014). No occupancy surveys have been conducted, but this analysis assumes that lynx may be present at any time in the project area, based on movement maps of radio-collared lynx published by Colorado Parks and Wildlife since the reintroduction of lynx in the State.

Based on lynx horizontal cover board data collected in 2015 in the project area and subsequent GIS analysis, all of the mapped lynx habitat in the potential treatment areas is currently unsuitable (Table 3-11); however, these areas have the potential to become suitable over time. In their current condition, these areas are single-storied, even-aged, and generally lack the young trees and low-lying branches that provide winter browse for snowshoe hare. Average horizontal cover for these areas is less than 35 percent. Some individual plots had greater than 35 percent horizontal cover; however, field data show these plots are not multi-storied stands. In these cases, the horizontal cover is created by dead tree boles and there is no browse for snowshoe hare. Field observations in 2015 also indicated that few red squirrel (a lynx secondary food source) middens were present in the potential treatment areas. There is an abundance of coarse woody debris in the stands, which could contribute to improved lynx habitat in long term. Lynx are not expected to den or forage in the potential treatment areas because they are currently unsuitable. The only likely use of these areas in their present state by lynx would be for movement between patches of suitable habitat in surrounding areas.

Table 3-11 Existing Lynx Habitat at Draft LAU and Project Scale

Habitat Type		Draft Waugh Mountain LAU* (acres)	Potential Treatment Areas (acres)	Percent of Total Lynx Habitat in the LAU
Lynx Habitat	Suitable	17,666	0	78.6%
	Unsuitable	4,805	2,214	21.4%
	Total	22,471	2,214	100.0%
Not Habitat		21,327	690	--
LAU Total		43,798	2,904	--

*Includes only public (state and federal) lands in the LAU boundary)

3.11.1.2 *Northern Goshawk*

Suitable nesting, foraging, and roosting habitats for northern goshawks exist in the project area. The first year of surveys for goshawk were implemented within high priority potential treatment areas and a ½-mile buffer. These surveys identified active goshawk territories, including one active nest. Additional

surveys (described in Section 2.1.4.8) may be needed before project implementation to locate alternate and active nests and to determine nest status, especially in areas that were not surveyed in 2015.

3.11.1.3 *Townsend's Big-Eared Bat*

Occurrence of Townsend's big-eared bat in the project area would be rare, but possible, because of the lack of cliff and rock structures for maternity roosts and hibernacula. There are no known caves, mines, or buildings within ½ mile of the project area. Trees in the project area may be suitable for bachelor roosting. Foraging habitat exists within the project area.

3.11.2 Analysis of Effects

This section describes the anticipated direct, indirect, and cumulative effects of implementing each of the alternatives on special status wildlife, and compares and contrasts these effects between alternatives.

3.11.2.1 *Direct and Indirect Effects*

The analysis area for direct and indirect effects to Canada lynx was the draft Waugh Mountain LAU. The analysis area for direct and indirect effects to northern goshawk and Townsend's big-eared bat was the project area (Figure 2-1) and a ½-mile buffer.

3.11.2.1.1 Alternative A – No Action

Under the No Action Alternative, there would be no direct effects to Canada lynx, northern goshawk, or Townsend's big-eared bat. Lack of active timber management would lead to natural forest succession and decomposition, leaving heavy accumulations of forest material on the ground. Continuous fuel loading would leave these areas susceptible to wildfire with the potential to burn at intense temperatures closer to the ground. This would have detrimental effects to soil fertility and structure, which could substantially reduce vegetation regrowth and recovery of suitable habitats. The possibility of this chain of events occurring is speculative; therefore, no measureable indirect effects to Canada lynx, northern goshawk, or Townsend's big-eared bat are expected.

Biological Determination for Canada Lynx: For the reasons described above, there would be no effect to Canada lynx from Alternative A.

3.11.2.1.2 Alternative B – Proposed Action – Salvage of Dead and Dying Spruce

3.11.2.1.2.1 Canada Lynx

Direct effects to lynx are unlikely because of the general mobility of lynx and the lack of suitable habitat in the potential treatment areas. The only expected use of the potential treatment areas in their present state by lynx would be by individuals moving from one patch of suitable habitat to another (Section 3.11.1.1). Lynx are considered nocturnal; therefore, project operations that cause loud noise or commotion at night or during dusk/dawn may cause individual lynx in or near the potential treatment areas to temporarily leave or avoid the area. This disturbance would subside after the project is complete, with the post-harvest areas available for use by lynx immediately following completion of the activity. Outside the potential treatment areas and a buffer of up to ½ mile, no direct effects to lynx are expected.

No lynx habitat that is currently suitable would be converted to an unsuitable condition in the draft Waugh Mountain LAU by Alternative B. Mapped lynx habitat in the potential treatment areas is currently unsuitable because of a low amount of horizontal cover. This alternative would further reduce horizontal

cover in the short-term. Advanced regeneration that provides horizontal cover would be retained; however, based on past projects, incidental loss of horizontal cover during salvage operations would be about 15 percent. Although there would be a short-term decrease in horizontal cover, Alternative B is expected to create stands that are more diverse, in terms of tree species and age class, as well as understory diversity, than the pre-treatment stands. In the long-term, this is expected to lead to better habitat conditions for lynx.

Following harvest, spruce and other tree species are expected to regenerate. If necessary, the RGFO would seed or plant to ensure adequate stocking of treated sites. Project design standards that would promote development of suitable lynx habitat (Section 2.1.4.7) would be implemented as part of Alternative B. These include designing salvage treatments to promote multi-storied conifer stand structure. In the long-term (20 to 30 years), regeneration of spruce and other tree species would provide snowshoe hare winter browse and dense horizontal cover during periods of average snow depth across the project area. Another outcome of Alternative B is that spruce is expected to regenerate more quickly within the potential treatment areas, providing higher quality prey habitat sooner compared to Alternative A. This acceleration of regeneration and dense horizontal cover would benefit Canada lynx because it would provide winter browse for snowshoe hare.

Despite the loss of some horizontal diversity during treatment, the potential treatment areas would retain sufficient cover, in the form of coarse woody debris, advanced regeneration of spruces, shrubs, and other trees species (such as aspen), for any lynx that may move through the area.

Biological Determination for Canada Lynx: Alternative B <u>may affect, but is not likely to adversely affect</u> Canada lynx because the habitat for Canada lynx in the project area is: 1) currently not suitable; 2) does not contain 35 percent or more horizontal cover; 3) is single story; 4) lacks signs of primary and secondary prey species; and 5) for the other reasons described above. The 2013 Interagency Southern Rockies Lynx Project Decision screens (Screen 4A and 4B) were used to satisfy Section 7 consultation with USFWS for Canada lynx.

3.11.2.1.2.2 Northern Goshawk

Project design criteria (Section 2.1.4.7) would protect active and inactive northern goshawk nests and nest stands. Goshawk survey results would be used to establish locations for buffers and timing limitations. These actions would minimize the risk of any direct effect to goshawks, such as direct mortality of nestlings or disturbance of nesting adults. Activities associated with Alternative B would reduce nesting habitat and foraging opportunities, if any goshawks are present. These effects would be short lived, as prey availability is expected to increase in treated areas. In addition, suitability of the potential treatment areas for nesting has likely already been reduced or lost because of spruce beetle mortality in the overstory.

3.11.2.1.2.3 Townsend's Big-Eared Bat

Roosting sites for Townsend's big-eared bat, which are primarily located in caves and mines, are not known or expected to occur in the project area. This species may also roost in cavities or under loose bark in trees. Removal of any roost trees that may exist in the potential treatment areas would be detrimental to the species; however, the risk of this occurring is thought to be low, because most documented roosts are in caves or mines. Implementation of project design standards (Section 2.1.4.8) would also ensure that some snags would be retained that could contain roosting cavities. Foraging may be disrupted if project activities occur at night. Quality of foraging habitat would be maintained and may be improved because of the increased diversity of vegetation post-treatment, which may support more diverse and abundant populations of its primary prey, insects such as small moths, beetles, flies, and wasps.

3.11.2.1.3 Alternative C – Maximum Reduction of Spruce Beetle Habitat and Timber Output

3.11.2.1.3.1 Canada Lynx

Direct effects to Canada lynx from Alternative C would be the same as Alternative B because the potential treatment areas would be the same. The indirect effects of Alternative C would be similar to those for Alternative B; however, a greater number of trees would be removed, some of which would be green Engelmann spruce. Post-harvest windthrow of residual trees is also more likely with this alternative. Given the uncertainty in the progress of the spruce beetle infestation, it is difficult to predict how many more trees would be removed by this alternative when compared to Alternative B, and how many of those trees would not be affected by spruce beetle. Depending on the size-class distribution in a given potential treatment area, the number of trees removed would vary but, in general, more overstory would be removed with Alternative C than Alternative B.

No lynx habitat that is currently suitable would be converted to an unsuitable condition in the draft Waugh Mountain LAU by Alternative C. Advanced regeneration would be protected; however, higher intensity of treatment activities is expected, and thus more horizontal cover would be incidentally removed under Alternative C than Alternative B. Although there would be a short-term decrease in horizontal cover, Alternative C is expected to create stands that are more diverse, in terms of tree species and age class, as well as understory diversity, than the pre-treatment stands. In the long-term, this is expected to lead to better habitat conditions for lynx. The progress from post-treatment stand to suitable habitat for snowshoe hare and lynx may take longer under this alternative because of the greater amount of incidental loss of horizontal cover.

Biological Determination for Canada Lynx: Alternative C may affect, but is not likely to adversely affect Canada lynx because the habitat for Canada lynx in the project area is: 1) currently not suitable; 2) does not contain 35 percent or more horizontal cover; 3) is single story; 4) lacks signs of primary and secondary prey species; and 5) for the other reasons described above. The 2013 Interagency Southern Rockies Lynx Project Decision screens (Screen 4A and 4B) were used to satisfy Section 7 consultation with USFWS for Canada lynx.

3.11.2.1.3.2 Northern Goshawk

Project design criteria (Section 2.1.4.7) would protect active and inactive northern goshawk nests and nest stands. Goshawk survey results would be used to establish locations for buffers and timing limitations. These actions would minimize the risk of any direct effect to goshawks, such as direct mortality of nestlings or disturbance of nesting adults. Nesting habitat may be reduced more by Alternative C than by Alternative B because a greater number of trees would be removed, some of which would be green Engelmann spruce. Given the uncertainty in the progress of the spruce beetle infestation, it is difficult to predict how many more trees would be removed by this alternative when compared to Alternative B, and how many of those trees would not be affected by spruce beetle. With the greater removal of the overstory, development of a more diverse and dense understory is possible, which would improve habitat for some northern goshawk prey species, such as birds that prefer open forest structure or early seral forest/meadow. Other effects to foraging and nesting opportunities would be similar to those described for Alternative B. Suitability of potential treatment areas for nesting has likely already been reduced or lost because of spruce beetle mortality in the overstory. Suitable nesting habitat would likely still be present within the project area but outside of the potential treatment areas.

3.11.2.1.3.3 Townsend's Big-eared Bat

Effects to Townsend's big-eared bats from implementation of Alternative C would be similar to those described under Alternative B. Additional removal of recently dead, dying, or green trees is not expected to affect Townsend's big-eared bat, because these trees typically do not have the cavities or loose bark that provide roosting opportunities.

3.11.2.2 *Cumulative Effects*

The analysis area for cumulative effects to Canada lynx was the draft Waugh Mountain LAU. The analysis area for cumulative effects to northern goshawk and Townsend's big-eared bat was the project area (Figure 2-1) and a ½-mile buffer.

3.11.2.2.1 Alternative A – No Action

Alternative A would have no cumulative effects to Canada lynx, northern goshawk, or Townsend's big-eared bat because there would be no direct or indirect effects.

3.11.2.2.2 Alternative B – Proposed Action – Salvage of Dead and Dying Spruce

3.11.2.2.2.1 Canada Lynx

As described above, Alternative B would not convert suitable lynx habitat to an unsuitable condition in the draft Waugh Mountain LAU. This alternative is expected to accelerate the development of understory trees used for browse by snowshoe hare, improving the suitability of these stands as lynx habitat over time. All known completed and planned vegetation treatments are accounted for in the analysis shown in Table 3-11. The proportion of currently unsuitable habitat (21.4 percent, Table 3-11) is less than the maximum of 30 percent recommended by the Lynx Conservation Assessment and Strategy (LCAS) (Interagency Lynx Biology Team 2013). This amount would not increase because of this alternative and other ongoing and planned activities. All suitable habitat in the draft LAU would remain available to lynx. In the long term (20 to 30 years), the proposed project would likely increase the quality of habitat for lynx and snowshoe hare once sufficient horizontal cover and winter foraging opportunities for snowshoe hare become re-established in the potential treatment areas. Alternative B would not cause adverse cumulative effects to Canada lynx in the draft Waugh Mountain LAU, and would benefit the species in the long-term. Non-federal actions are not anticipated to adversely affect the condition of lynx habitat in the draft LAU, nor are they likely to adversely affect individual Canada lynx.

3.11.2.2.2.2 Northern Goshawk

Alternative B, in conjunction with past and ongoing timber harvests in the analysis area (Section 3.2 and Table 3-1), would contribute to a decrease in the overall availability of mature forest habitat for this species. In the potential treatment areas, this loss would be primarily caused by the continuing spruce-beetle infestation, rather than directly by the salvage harvest, as beetle killed trees contribute little to the quality of goshawk habitats. Project design standards requiring surveys and implementation of buffers around nests would maintain suitable habitat where it is currently in use by goshawks and prevent disturbance of nesting goshawks.

3.11.2.2.2.3 Townsend's Big-eared Bat

Alternative B, in conjunction with past, present, and reasonably foreseeable actions in the analysis area (Section 3.2 and Table 3-1), would contribute to a potential decrease in tree roosting habitat; however,

much of this loss would eventually occur when trees begin to fall because of the continuing spruce-beetle infestation, regardless of whether or not this alternative is implemented. The more open canopy and increase in understory diversity created by this alternative and other past and ongoing timber harvests may benefit the Townsend's big-eared bat by increasing the abundance of its primary prey.

3.11.2.2.3 Alternative C – Maximum Reduction of Spruce Beetle Habitat and Timber Output

3.11.2.2.3.1 Canada Lynx

Cumulative effects to lynx from Alternative C would be essentially the same as those for Alternative B because the proposed treatments would affect the same amount of habitat. While treatments would be slightly more intense, the long-term cumulative effects would only differ from Alternative B in the amount of time before the treated stands regenerate and again provide suitable habitat for lynx and snowshoe hare. Alternative C would not cause adverse cumulative effects to Canada lynx in the draft Waugh Mountain LAU, and would benefit the species in the long-term. Non-federal actions are not anticipated to adversely affect the condition of lynx habitat in the draft LAU, nor are they likely to adversely affect individual Canada lynx.

3.11.2.2.3.2 Northern Goshawk

Alternative C, in conjunction with past and ongoing timber harvests in the analysis area (Section 3.2 and Table 3-1), would contribute to a decrease in the overall availability of mature forest habitat for this species. In the potential treatment areas, this loss would be caused in part by the continuing spruce-beetle infestation. Beetle killed trees contribute little to goshawk habitats; however, green trees that are removed by this alternative may be important components of goshawk habitat. Given the uncertainty in the progress of the spruce beetle infestation, it is difficult to predict how many green trees would be removed by this alternative, and how those trees would contribute to the quality of goshawk habitat. Project design standards requiring surveys and implementation of buffers around nests would maintain suitable habitat where it is currently in use by goshawks and prevent disturbance of nesting goshawks.

3.11.2.2.3.3 Townsend's Big-eared Bat

Cumulative effects to the Townsend's big-eared bat from Alternative C would be essentially the same as those for Alternative B. The green trees that may be harvested by this alternative are not expected to provide roosting opportunities for this species. The increase in intensity of harvest, combined with other past and ongoing timber harvests, may lead to a more open understory, providing more improvement to foraging habitat for Townsend's big-eared bat than Alternative B.

3.11.2.3 *Plan Conformance Review*

The RMP requires that conflicts between wildlife habitat (including special status species) and other uses be resolved in favor of achieving vegetation management goals (Decisions 3-15 and 6-14). Wildlife objectives have been incorporated into each action alternative through the use of project design standards.

Both action alternatives for the project would conform to Public Land Health Standard 4 with respect to special status species because project design features (Sections 2.1.4.3, 2.1.4.7, and 2.1.4.8) would be implemented. Populations and habitats for special status species would be maintained or enhanced by sustaining healthy, native plant and animal communities. For example, in the long-term, habitats for Canada lynx and Townsend's big-eared bats would be improved. Habitats for the goshawk would be maintained to the extent they are currently occupied, notwithstanding any loss of habitat that may be caused by the current spruce beetle infestation.

3.12 Special Status Plants

This section discusses current conditions for special status plant species in the analysis area as well as potential changes to those conditions from the proposed alternatives.

3.12.1 Affected Environment

Special status plants are those plants found on public lands administered by the BLM whose survival is of concern because of their (1) limited distribution, (2) low number of individuals or populations, and (3) potential threats to habitat. The BLM uses the term "special status plants" to include: (1) plants listed, or proposed for listing, as endangered or threatened under the Endangered Species Act; and (2) BLM sensitive plants. Sensitive plants are those species that are not federally listed as endangered or threatened or proposed for federal listing, but which are designated by the BLM State Director for special management consideration (BLM 2015a).

The Colorado Natural Heritage Program (CNHP) maintains a list of BLM sensitive plant species by Field Office. There are 11 special status plant species included on the CNHP list for the RGFO, all of which are BLM sensitive species. No plants listed, or proposed for listing, as endangered or threatened under the Endangered Species Act are included on the RGFO's list. Table 3-12 includes the species name, plant description/habitat, and whether there is potential for the species to be affected by project activities for each of these 11 species.

Table 3-12 Special Status Plant Species

Scientific Name, Common Name	Description/Habitat	Potential to be Affected by Project Activities
Aquilegia chrysantha var. *rydbergii* Rydberg's Golden Columbine	A perennial up to 120 cm in height with yellow and white flowers, blooming in June. Elevation 5,089 to 8,232 feet. Habitat is in canyons and foothills along streams or in rocky ravines. Often found near the base of boulders on the canyon sides and floor, it may also grow on seep-fed rocky ledges in riparian areas.	None. No suitable habitat would be affected by the proposed project activities. Generally limited to lower elevations in canyon habitat (CNHP 2015b).
Arabis crandallii (*Boechera crandallii*) Crandall's Rockcress	Perennial up to 40 cm in height with white-pinkish flowers, blooming May to June. Elevation 8,176 to 10,607 feet. Habitat is limestone chip-rock and stony areas, often among sagebrush, ridges, and steep hill slopes and open, sometimes windswept places.	None. Plants typically grow in habitat not likely to be affected by proposed activities (CNHP 2015c).
Asclepias uncialis spp. *uncialis* Dwarf Milkweed	Small plant up to 4 cm in height with purple flowers, blooming April to May. Elevation 4,000 to 6,500 feet. Habitat is shortgrass prairie on sandstone derived soils and gravelly or rocky slopes.	None. Plants typically grow in habitat not likely to be affected by proposed activities (CNHP 2015d).
Eriogonum brandegeei Brandegee Wild Buckwheat	A mat-forming perennial with flowering stalks up to 25 cm in height with cream-colored flowers, blooming June to August. Elevation 5,715 to 8,648 feet. Habitat in Fremont County limited to lower members of the Morrison Formation in heavy clay soils.	None. No suitable habitat would be affected by the proposed project activities (CNHP 2015e).

Table 3-12 Special Status Plant Species

Scientific Name, Common Name	Description/Habitat	Potential to be Affected by Project Activities
Eriogonum coloradense Colorado Wild Buckwheat	A densely matted perennial 6 to 10 cm in height with white to pinkish flowers, blooming July to August. Elevation 8,714 to 14,258 feet. Habitat a variety of geomorphic landforms, usually on talus, fell fields, rock shoots, and ridges, but also on roadsides.	None. Endemic to other counties outside of Fremont County. Known occurrences from high elevation sites (CNHP 2015f).
Nuttallia chrysantha (*Mentzelia chrysantha*) Golden Blazingstar	A stout biennial up to 60 cm in height with bright yellow flowers, blooming July to September. Elevation 4,751 to 6,854 feet. Habitat is barren slopes and road cuts of limestone, Smoky Hill member of the Niobrara shale, or alkaline clay. Associated with pinyon-juniper communities.	None. No suitable habitat would be affected by the proposed project activities (CNHP 2015g).
Nuttallia densa (*Mentzelia densa*) Royal Gorge Blazingstar	A perennial subshrub up to 30 cm in height with yellow flowers, blooming July to August. Elevation 5,400 to 7,684 feet. Habitat is dry open areas in washes, roadsides, naturally disturbed sites, and steep rocky slopes. Associated with pinyon-juniper communities.	None. No suitable habitat would be affected by the proposed project activities (CNHP 2015h).
Packera pauciflora Few-flowered Ragwort	A perennial herb up to 40 cm in height with yellow and orange flowers blooming July to August. Elevation 8,868 to 10,410 feet. Habitat is meadows and wet places with high pH.	None. Limited distribution in Colorado plus no suitable habitat would be affected by the proposed project activities (CNHP 2015i)
Penstemon degeneri Degener Beardtongue	A perennial herb 25 to 40 cm in height with dark blue to violet flowers, blooming June to July. Elevation 5,991 to 9,449 feet. Habitat is open pinyon-juniper woodlands and montane grasslands, in rocky soils with igneous bedrock. The plants grow mainly near the rim of canyons, and also in cracks of large rock slabs, in full sun or shade. Associated with Gambel oak and pinyon-juniper communities.	None. No suitable habitat would be affected by the proposed project activities (CNHP 2015j)
Sisyrinchium pallidum Pale Blue-Eyed Grass	A grass-like plant with pale blue flowers blooming June to July. Elevation 7,900 to 9,500 feet. Habitat is wet meadow, fens, and margins of streams.	None. No suitable habitat would be affected by the proposed project activities (CNHP 2015k).
Trichophorum pumillum Little Bulrush	An obligate wetland species up to 10 cm in height flowering June to July. Elevation 9,300 to 11,000 feet. Habitat is rich fens and willow-dominated wetlands.	None. No suitable habitat would be affected by the proposed project activities (CNHP 2015l).

3.12.2 Analysis of Effects

This section describes the anticipated direct, indirect, and cumulative effects of implementing each of the alternatives on special status plants, and compares and contrasts these effects between alternatives.

3.12.2.1 *Direct and Indirect Effects*

The analysis area for direct and indirect effects to special status plants was the project area (Figure 2-1).

3.12.2.1.1 Alternative A – No Action

Under the No Action Alternative, there would be no salvage activities within the project area. Suitable habitat for special status plants would remain undisturbed and individuals or populations would not be affected because none is present. Outside the potential treatment areas, some suitable habitat could be affected in the future by tree fall from high wind events and rotting. Stand structure would remain in its current condition until trees start falling because of these natural events. The forest canopy would become more open over time and sun-tolerant species would benefit, while plant populations requiring shade and cooler ground temperatures would most likely decline. This change would occur regardless of whether salvage of beetle-killed trees is implemented or not.

3.12.2.1.2 Alternative B – Proposed Action – Salvage of Dead and Dying Spruce

The plants listed in Table 3-13 are not expected to occur in the project area and would not be affected by the activities proposed under this alternative. All wetland and riparian habitat would be avoided during salvage activities, thereby eliminating concerns for wetland and riparian dependent plant species.

3.12.2.1.3 Alternative C – Maximum Reduction of Spruce Beetle Habitat and Timber Output

The plants listed in Table 3-13 are not expected to occur in the project area and would not be affected by the activities proposed under this alternative. All wetland and riparian habitat would be avoided during salvage activities, thereby eliminating concerns for wetland and riparian dependent plant species.

3.12.2.2 *Cumulative Effects*

The analysis area for cumulative effects to special status plants was the project area (Figure 2-1).

3.12.2.2.1 Alternative A – No Action

The No Action Alternative would not contribute to cumulative effects to special status plants because there would be no direct or indirect effects.

3.12.2.2.2 Alternative B – Proposed Action – Salvage of Dead and Dying Spruce

Alternative B would have no cumulative effects to special status plants because there would be no direct or indirect effects. Other ongoing activities, such as continued recreation and livestock grazing, may be currently affecting special status plants. These activities, however, would continue regardless of the proposed project.

3.12.2.2.3 Alternative C – Maximum Reduction of Spruce Beetle Habitat and Timber Output

Alternative C would have no cumulative effects to special status plants because there would be no direct or indirect effects. Other ongoing activities, such as continued recreation and livestock grazing, may be currently affecting special status plants. These activities, however, would continue regardless of the proposed project.

3.12.2.3 *Plan Conformance Review*

The RMP states that special status plant species and communities will be inventoried and monitored as necessary to provide information for proper management. Management of uses in areas with special status plants will comply with the Endangered Species Act. Surveys will be conducted in areas slated for management activities. Both action alternatives would conform to the RMP because no special status plants would be affected.

With respect to special status plant species, both action alternatives for the project would conform to Public Land Health Standard 4 because no special status plants would be affected. Populations and habitats for special status plant species would be maintained or enhanced by sustaining healthy, native plant and animal communities.

3.13 Cultural Resources

This section discusses current condition and potential changes from the proposed alternatives for cultural resources.

3.13.1 Affected Environment

A Class I cultural resource inventory (file search and literature review) was completed for the project as the initial step in consultation between the BLM and the State Historic Preservation Office (SHPO) (Metcalf 2015). The study area for this inventory was the project area (Figure 2-1). The primary information for the Class I inventory was provided by the BLM in geographic information system (GIS) format. Other records consulted include the Office of Archaeology and Historic Preservation (OAHP) GIS data and the on-line Compass database, General Land Office plats and patent records, historic United States Geological Survey (USGS) topographic maps, and inspection of historic aerials of the project area.

There have been 48 previous inventories entirely or partially within the Class I study area. Many of these studies overlap one another and inventory has been at various levels of intensity. Intensive inventory, including the sample acreage of a previous Class II study, has been completed on approximately 1,050 acres (3.3 percent) of the Class I survey area. An additional 41 acres has been inventoried at a reconnaissance level, though some of that acreage overlaps with intensive inventories. Of the 48 inventories, 21 overlap the area of potential effect (APE) of the current project, which consists of the potential treatment areas shown in Figure 2-1.

Ten cultural resources were found within the Class I study area during these inventories, including eight sites and two isolated finds. The sites include five prehistoric sites and three historic sites. Most of the prehistoric sites are open lithic scatters, although one site is a prehistoric quarry. The historic resources include two segments of the South Park to Cañon City Road, a wagon road that was used and abandoned by 1875. One site is a historic open architectural site. The site consists of a small, collapsed, conical wooden structure reminiscent of Native American structures, such as wickiups. The isolated finds include both historic and prehistoric types. None of the eight sites has been recommended or evaluated as eligible for inclusion on the National Register of Historic Places (NRHP). However, two of the eight are evaluated as "needs data." Until further investigation clarifies the eligibility (or non-eligibility) of these two sites, they are managed as if they are historic properties (that is, eligible for the NRHP).

A site-probability analysis (Metcalf 2015) was conducted to estimate the potential for occurrence of cultural resources in the project area and potential treatment areas. Table 3-13 shows the results of the site probability analysis in relation to the project area and potential treatment areas. Estimates of high, medium, and low potential were developed based on elevation, slope, and vegetation--variables that

would not be skewed by the spatial parameters of the Class I study area or the limited extent of earlier surveys. An attempt was made to correlate these variables with known cultural resources; however, the small number of known resources and uneven distribution of inventories constrained the value of this effort. Despite the uneven distribution of previous inventory and the small number of known cultural resources in the study area, site density appears to be greater at lower elevations in open settings. Metcalf (2015) concluded that the probability of finding cultural resources in the APE is likely low because the potential treatment areas are located in forested areas at relatively high elevation (for the study area).

Table 3-13 Estimated Potential for Cultural Resources

Estimated Resource Potential	Potential Treatment Areas (acres)	Project Area (acres)
Low	2,845	21,434
Medium	55	6,951
High	0	1,044
Total	2,900	29,429

3.13.2 Analysis of Effects

This section describes the anticipated direct, indirect, and cumulative effects of implementing each of the alternatives on cultural resources, and compares and contrasts these effects between alternatives.

3.13.2.1 *Direct and Indirect Effects*

The analysis area for direct and indirect effects to cultural resources was the APE, which is equivalent to the potential treatment areas shown in Figure 2-1.

3.13.2.1.1 Alternative A – No Action

No direct effects to historic properties would occur under Alternative A. Cultural resources would continue to be in jeopardy of damage or loss caused by wildfire. An indirect effect would be the continued build-up of fuel in the analysis area over time, increasing the likelihood of high-severity wildfire. The large amount of beetle-killed spruce would exacerbate this risk. A wildfire could damage or destroy fire-susceptible or combustible materials associated with cultural resources. In addition, sites would be under slightly greater threat of damage from fire suppression equipment and tactics. Other indirect effects of such a fire could include erosion of archaeological deposits on slopes destabilized by the loss of vegetation. Any damage or loss of cultural resources would be permanent and irreparable because these resources are non-renewable.

3.13.2.1.2 Alternative B – Proposed Action – Salvage of Dead and Dying Spruce

Alternative B has the potential to affect cultural resources directly through damage or destruction caused by proposed activities; however, survey requirements, along with specific site protection and management requirements would ensure the protection of eligible properties. These project design standards (Section 2.1.4.1) have been effective on past projects in preventing adverse effects to cultural resources and would continue to be used to avoid effects for current and future activities. Once the surveys are completed, the potential to encounter or disturb unknown cultural resources would be low, especially considering the low potential for resources to be present in the APE. With the mitigation measures in place, no adverse effects to eligible properties are anticipated. Direct effects to any currently unknown

eligible properties may include non-significant changes to the setting caused by the vegetation treatments. An indirect effect would be a reduction in the risk of a high severity wildfire. Although the risk of such a fire would not be eliminated, it would be lessened by the reduction in fuel load. Reduced fuels would make the cultural resources less vulnerable to damage or destruction by intense wildfires and associated fire suppression tactics. Fires that burn at a lower intensity are also less likely to create the type of erosion that could damage or displace archaeological deposits. Some damage or destruction of cultural resources that are deemed officially ineligible to the NRHP could be caused by the proposed activities; these effects would be considered non-significant.

3.13.2.1.3 Alternative C – Maximum Reduction of Spruce Beetle Habitat and Timber Output

Alternative C would have essentially the same effects on cultural resources as Alternative B because the same potential treatment areas form the basis for this alternative and because the same project design standards (Section 2.1.4.1) would be implemented. This alternative may cause more extensive ground disturbance within the potential treatment areas; however, the project design standards are expected to be equally effective at preventing adverse effects to eligible properties.

3.13.2.2 *Cumulative Effects*

The analysis area for cumulative effects to cultural resources was the project area (Figure 2-1).

3.13.2.2.1 Alternative A – No Action

Alternative A would indirectly contribute to the cumulative effects through buildup of fuels and increased risk of damage to cultural resources from high-intensity fire and fire suppression. No other cumulative effects to cultural resources are anticipated from this alternative.

3.13.2.2.2 Alternative B – Proposed Action – Salvage of Dead and Dying Spruce

Alternative B would have no adverse cumulative effects on eligible properties because effective design standards (Section 2.1.4.1) would be implemented during all project activities. Minimal cumulative effects to eligible properties through non-significant changes to the setting for those properties are possible, but difficult to assess considering the limited knowledge of resources in the analysis area. Alternative B may contribute to a reduction in the risk of a high severity wildfire, although this reduction may be offset by continued spruce beetle mortality and subsequent fuel increases in portions of the analysis area not treated by this or other planned projects. Past actions may have damaged or destroyed officially ineligible resources. Similarly, the proposed project and future projects may damage or destroy ineligible resources; cumulatively, these effects would be considered non-significant.

3.13.2.2.3 Alternative C – Maximum Reduction of Spruce Beetle Habitat and Timber Output

Alternative C would have essentially the same cumulative effects on cultural resources as Alternative B.

3.13.2.3 *Plan Conformance Review*

Alternatives A, B, and C would be consistent with applicable laws, policies, and regulations regarding cultural resources, including the RMP for the RGFO. Specifically, the BLM would meet its responsibilities under section 106 of the NHPA, including completion of consultation with the Colorado SHPO/OAHP.

3.14 Public Health and Safety

This section discusses current conditions in terms of public health and safety, as well as potential changes to those conditions from the proposed alternatives.

3.14.1 Affected Environment

With respect to the project area and proposed treatments, concerns related to public health and safety can arise from multiple situations. The potential for these situations to occur depends on the nature and frequency of the public use of the area. The project area and potential treatment areas are located away from high-use recreation areas and travel ways (Section 3.19). No formal trails are present in the potential treatment areas; however, BLM roads, county roads, and user-created trails do provide public access to the project area (Figure 2-1). These routes allow access for dispersed recreational use by the public for hunting, firewood gathering, hiking, mountain biking, snow machines, and all-terrain vehicles (ATVs). Members of the public engaged in these activities may be affected if their use coincides with the proposed action.

3.14.2 Analysis of Effects

This section describes the anticipated direct, indirect, and cumulative effects of implementing each of the alternatives on public health and safety, and compares and contrasts these effects between alternatives.

3.14.2.1 *Direct and Indirect Effects*

The analysis area for direct and indirect effects to public health and safety was the project area (Figure 2-1).

3.14.2.1.1 Alternative A – No Action

Under the No Action Alternative, there would be no vegetation treatments within beetle-infested spruce stands. Public use of the project area would not be interrupted. As spruce trees continue to decline and die, there would be an increase in falling branches and trees, potentially causing a risk to the public. The timing and frequency of falling dead trees is unpredictable. It may take from 20 years (Mielke 1950) up to 40 years for all dead trees to fall, with an average of up to 8 percent of the dead trees falling per year (Harmon et al. 2005). Though the rate of deterioration and collapse of dead trees is gradual, injuries and even deaths have been recorded in Colorado from falling trees killed by bark beetles (Adamson 2015). Falling trees may affect the safety of users on roads, trails, or within the forest interior. Falling trees are likely to restrict access by creating natural fences that would be hard to travel through. The No Action Alternative would not decrease the potential for these effects to public health and safety.

3.14.2.1.2 Alternative B – Proposed Action – Salvage of Dead and Dying Spruce

Alternative B would remove dead, infested, and high-risk spruce trees. This would be accomplished through multiple sales and harvests implemented over several years. During that time, the public would be exposed to harvesting operations including falling trees, yarding operations, slash piling and burning, and traffic from equipment and logging trucks. The public would be made aware of harvest operations through signage and public notice. Where public safety cannot be reasonably ensured, portions of the project areas, including public roads, may be temporarily closed to public use.

The proposed treatments would remove the majority of standing spruce trees. Some snags would be left standing to provide wildlife habitat. Live trees remaining after harvest, including spruce and other

species, would be subjected to natural processes such as wind throw and attack from insects and disease. Though the proposed action would greatly reduce the number of standing dead trees within the potential treatment areas, it would not entirely remove the potential of trees falling in the future and the associated risk posed to the public. Future access would not be impeded by the falling timber creating brush fences in the treated areas.

3.14.2.1.3 Alternative C – Maximum Reduction of Spruce Beetle Habitat and Timber Output

Effects to public health and safety following implementation of Alternative C would be similar to Alternative B. This alternative would remove more spruce trees than Alternative B, thereby potentially increasing the length of harvest, number of haul-truck trips, and amount of slash treatment. Alternative C may also increase the potential for the public to interact with the harvest activities, but this is not expected to be appreciably different from Alternative B. More spruce would be removed, potentially reducing the number of dead trees that would remain in the potential treatment areas--assuming those trees would be killed by the continuing spruce beetle infestation. By removing these trees, the future risk to public health and safety from falling trees would be reduced more by Alternative C than by Alternative B; however, this risk would not be entirely eliminated.

3.14.2.2 *Cumulative Effects*

The analysis area for cumulative effects to public health and safety was the project area (Figure 2-1), and surrounding BLM, USFS, state, and private lands.

3.14.2.2.1 Alternative A – No Action

The project area lies within a matrix of federally managed (BLM and USFS), state, and private lands. Alternative A would increase the cumulative effects of the risks posed to the public from beetle-infested stands. The majority of spruce stands within the landscape would not be treated and would continue to be affected by bark beetles. The public would continue to use the area for recreation. Should the potential treatment areas become undesirable from a safety, aesthetic, or other standpoint, there would be other opportunities for the public to use public lands. The project area lies within a landscape largely affected by bark beetle. Taking no action would neither create a particularly dangerous scenario for the public, nor would the untreated stands be considered inherently more risky than the surrounding landscape of untreated beetle infestation. In the future, accumulations of falling trees may limit access to portions of the project area.

3.14.2.2.2 Alternative B – Proposed Action – Salvage of Dead and Dying Spruce

Other forest treatments planned by the BLM, USFS, and state would pose the same potential safety conflicts with the public, but they would occur on a small fraction of the available land. Furthermore, any potential safety risks would be temporary. Alternative B would create areas largely free of standing dead trees, providing opportunities for users who consider these treated stands to be a safer alternative to using surrounding untreated stands.

3.14.2.2.3 Alternative C – Maximum Reduction of Spruce Beetle Habitat and Timber Output

Cumulative effects from Alternative C are expected to be the same as for Alternative B.

3.14.2.3 *Plan Conformance Review*

The proposed project is subject to and has been reviewed for conformance with the Royal Gorge RMP. Public health and safety is not a specific managed value; however, Decisions 3-63, 6-69, and 6-72, pertaining to the health and safety of recreational users, are applicable. The project would conform to these decisions.

3.15 Economics

This section discusses current conditions in terms of economics, as well as potential changes to those conditions from the proposed alternatives.

3.15.1 Affected Environment

The project area lies between the cities of Salida, in Chaffee County, and Cañon City, in Fremont County. Basic employment and household income information for the area is shown in Table 3-14. From 2010 to 2013, Fremont County population decreased 0.8 percent to 46,451 while Chaffee County population increased 3.9 percent to 18,510 (US Census Bureau 2013).

Table 3-14 Employment and Income

	Fremont County	Canon City	Chaffee County	Salida
Worker Population (over 16)	40,116	13,748	15,498	4,418
Civilian Labor Force	15,484	6,140	8,816	2,633
Unemployed	1,316	485	662	226
Mean Household Income	$51,391	$48,038	$60,923	$51,954

Source: U.S. Census Bureau 2013

Industries supporting the workforce are similar for both Fremont and Chaffee Counties. Educational services; health care and social assistance; arts, entertainment, and recreation; accommodation and food services; retail trade; and construction provide the majority of employment. Public administration provides a larger employment pool in Fremont County than in Chaffee County (US Census Bureau 2013).

Cañon City supports a tourism industry centered on the outdoor recreation and sightseeing opportunities of the Royal Gorge Region. Attractions include the Royal Gorge Bridge, Royal Gorge Route Railroad, whitewater rafting, and other recreation along the Arkansas River, as well as downtown attractions. Salida also offers many outdoor recreational opportunities, including ghost towns, which attract tourists.

The RGFO forestry program collects between $70,000 and $100,000 annually through timber and special forest product sales. Each permit or contract issued by the RGFO increases local jobs and adds to the local economy. Local jobs in the region include cattle grazing, timber harvesting, and hunting outfitter/guides. There are 10 small sawmills within 100 miles of the project area. Montrose Forest Products, the largest sawmill in the state, is located less than 200 miles from the project area. All of these sawmills have purchased or had timber delivered by an independent contractor from BLM sales in the past 10 years. Eleven known independent logging contractors have purchased or expressed interest in purchasing BLM timber sales.

Additionally the RGFO forestry program works with many small local companies and individuals, meeting local needs and demand for forest products. The RGFO issues special forest product permits to

more than 30 small local companies or individuals within the local area. Forest products sold by the RGFO include pinyon nuts, fencing materials (for example, posts, rails, and stays), native seed, transplants, craft wood, and fuelwood.

3.15.2 Analysis of Effects

This section describes the anticipated direct, indirect, and cumulative economic effects of implementing each of the alternatives, and compares and contrasts these effects between alternatives.

3.15.2.1 *Direct and Indirect Effects*

The analysis area for direct and indirect economic effects was the counties most likely to be affected: Fremont and Chaffee Counties.

3.15.2.1.1 Alternative A – No Action

Under the No Action Alternative, there would be no vegetation treatments in beetle-infested spruce stands. The local economy would continue to be affected by factors influencing industry, income, and population. There is the potential for lost economic benefits to the under a no action scenario. The potential treatment areas are currently in a condition that allows for the safe removal of merchantable timber. If not harvested now, it is expected that mortality would continue and the value of the trees would decrease over time. Eventually, the wood would deteriorate to the point that economically viable harvest would be impossible. Furthermore, as the stands deteriorate, mechanical harvesting becomes increasingly unsafe.

The No Action Alternative is not expected to affect the behavior or extent of future wildfires (Section 3.18). Though there is no substantial infrastructure or residential area at immediate risk should a fire occur in the project area, there are other economic considerations. The cost of fire suppression and post-fire environmental repairs (for example, soil-erosion control) would be greater. This would be a source of economic stimulus, but this is not the desired outcome.

3.15.2.1.2 Alternative B – Proposed Action – Salvage of Dead and Dying Spruce

Alternative B would remove dead, infested, and high-risk spruce trees. This would be accomplished through multiple sales and harvests implemented over several years. Annual timber sales would be offered and awarded to bidding contractors. It is likely these contractors would be from within the region. Crews could include workers from within the county or surrounding area. The source of the contractor(s) and the crews is not known, so it is not possible to estimate the project's effects on the local economy. However, previous BLM-offered timber sales have been contracted with local businesses, and that is expected to continue.

It is expected that timber-harvest operations would offer a short-term positive effect on the local economy from the purchase of goods and services. These effects are not expected to exceed the capabilities of the local economy. For example, it is not anticipated that project activities would create a temporary workforce greater than available housing vacancies can support.

The proposed action would reduce the intensity and spread of any wildfires within the potential treatment areas, which may also reduce the potential spread and effects of a wildfire moving through the project area as a whole. Reduced effects from wildfire would have corresponding reduced costs of suppression and post-fire rehabilitation.

3.15.2.1.3 Alternative C – Maximum Reduction of Spruce Beetle Habitat and Timber Output

Economic effects from implementation of Alternative C would be similar to those of Alternative B. Alternative C would remove more spruce trees than Alternative B, thereby potentially extending the duration of harvests and increasing the number of jobs created by the activity. This may increase or extend the positive effects on the local economy compared with Alternative B.

3.15.2.2 *Cumulative Effects*

The analysis area for cumulative economic effects was Fremont and Chaffee Counties.

3.15.2.2.1 Alternative A – No Action

Leaving the proposed potential treatment areas untreated would not have a cumulative economic effect, as harvesting and timber processing are not major components of the local economy. USFS, BLM, state, and private land managers, would proceed with other timber-harvest operations that would continue to support the forest product industry and other sectors of the local economy.

3.15.2.2.2 Alternative B – Proposed Action – Salvage of Dead and Dying Spruce

The proposed action would have a beneficial cumulative effect to the economy. Timber harvests in response to spruce beetle and mountain pine beetle epidemics have provided employment opportunities and supplied the timber industry with wood products. The project would contribute to ongoing and future projects that would support the timber industry.

3.15.2.2.3 Alternative C – Maximum Reduction of Spruce Beetle Habitat and Timber Output

Cumulative economic effects from Alternative C are expected to be similar to, but of slightly greater magnitude than for Alternative B.

3.15.2.3 *Plan Conformance Review*

The proposed project is subject to and has been reviewed for conformance with the Royal Gorge RMP. Economics is not a specific managed value; however, the potential economic effects from the proposed project would not conflict with decision objectives for other managed values.

3.16 Forest Management

This section discusses forest management in the context of current conditions influenced by spruce beetle infestation, management options for infested stands, and potential changes to those conditions caused by the proposed alternatives.

3.16.1 Affected Environment

Colorado's forests have a well-documented history of spruce-beetle outbreaks. Schmid and Frye (1977) compiled data and information produced following a 1940s spruce beetle outbreak in the White River National Forest. Since then, spruce beetle has been present at normal endemic levels for many years; beginning in the early 2000s, however, the acreage infested by spruce beetle has steadily increased (CSFS 2015a). For three successive years (2012 through 2014), spruce beetle has been Colorado's most widespread forest pest, affecting 485,000 acres – an increase of 22 percent from 2013 (CSFS 2015b). These recent outbreaks have generated further study of the effects of spruce beetle. Jenkins and others

(2014) assembled a review of spruce-beetle-related literature published since Schmid and Frye's work in the late 1970s. These papers, the literature cited therein, and other studies provide a large body of knowledge regarding the ecology and management of spruce beetle. The intention here is not to present an extensive review of this literature. Rather, select information is highlighted that pertains to forest management conditions within the project area, specifically, information relating to spruce-beetle susceptibility, management options, and the potential effects of management decisions.

3.16.1.1 *Beetle Risk*

A combination of fire suppression, less active forest management leading to large even-aged stands, and extended periods of drought and warmer temperatures can promote outbreak-level populations of spruce beetle (Section 1.2). Hazard- or risk-rating systems have been developed to aid in the identification of stands most susceptible to outbreak, as summarized by Fettig and others (2007). The accuracy and applicability of these systems are subject to the shortcomings of such predictive models; however, there is consensus on characteristics of high-risk stands. Dry sites with a high density of large spruce trees are more susceptible to spruce-beetle outbreak. Wind throw events are also correlated with increasing susceptibility (USFS 2011; Fettig et al. 2007).

A rating was determined for spruce stands within the project area using the widely accepted risk-rating system developed by Schmid and Frye (1976). This system uses physiographic location, average diameter greater than 10 inches, basal area, and proportion of spruce in the canopy. Stand data available for the project area are limited (Section 3.5), but it is possible to estimate a risk rating. Risk ratings were assigned as follows: Medium rating for physiographic location, Medium for diameter greater than 10 inches (stand average 14.3 inches), Medium for basal area (stand average 135.4 square feet), and High for proportion of spruce in the canopy. These individual ratings lead to an overall outbreak rating of Medium: 9 on a scale of 4 to 12.

While this assessment is largely an academic exercise because the stands are already infested, it aids in understanding the potential treatment areas in the context of the outbreak. Beetle populations are above normal endemic levels and have the potential to increase. Stand conditions are such that continued infestation is likely, and currently uninfested trees are likely to become infested.

3.16.1.2 *Management Options*

Various silvicultural methods have been proposed to prepare stands for a developing outbreak. Spruce beetles preferentially attack larger trees, and beetle population spread increases with larger stem density in stands. Treatments, therefore, are designed to reduce tree density and increase age class and species diversity. Evidence supports the effectiveness of these methods for treating spruce stands to increase beetle resistance (Temperli et al. 2014; Hansen 2010). However, these treatments are not shown to be completely successful in outbreak-level situations. Furthermore, treatments would have to be applied on a large scale, in advance of a beetle outbreak, to be effective at any appreciable scale.

For stands like those in the project area – that is, in early stages of infestation – sanitation treatments may be used. Sanitation is the identification and removal of infested and susceptible trees to reduce the local population and spread of beetles. Potential shortcomings of sanitation treatments of outbreaks of mountain pine beetle have been noted (Fettig et al. 2014); these shortcomings are applicable to spruce beetle outbreaks as well. The success of a sanitation treatment depends upon the successful removal of all infested trees to reduce beetle pressure following treatment. The multi-year life cycle of spruce beetle and the extent of the affected area make complete sanitation impractical, if not impossible. Furthermore, the surrounding landscape supports elevated populations of spruce beetles. Continued spread from nearby infestations will occur, and likely lead to reintroduction of beetles to the sanitized stand. While the

treatment would yield stand conditions that are less desirable to the beetle (that is, lower density, with smaller trees), beetle-proofing by sanitation is not a certainty.

Once a stand experiences mortality, treatment options include salvage operations. Salvage of dead spruce has little effect on beetle populations, so emphasis is placed on capturing the economic value of the dead trees before deterioration advances. As a practical matter, salvage is often coupled with sanitation when treating stands with a mix of susceptible, infested, and dead trees (Jenkins 2014).

The use of insecticides, pheromone traps, and trap trees has been shown to reduce beetle populations on a small scale (individual trees or small groups of trees), but is not effective at the scale of the current outbreak (across the landscape). These methods could be used to reduce beetles in the potential treatment areas; however, they would not address the need to reduce fuels and potential fire behavior created by the current infestation. Additionally, these methods are not practical on a large scale and would require funding and repeated treatments that are beyond the scope of this project. These methods have been eliminated as viable options for managing the current spruce beetle outbreak (Section 2.2.1).

3.16.2 Analysis of Effects

This section describes the anticipated direct, indirect, and cumulative effects of implementing each of the alternatives on forest management, and compares and contrasts these effects between alternatives.

3.16.2.1 *Direct and Indirect Effects*

The analysis area for direct and indirect effects by and to forest management was the project area (Figure 2-1).

3.16.2.1.1 Alternative A – No Action

Under the No Action Alternative, no forest management would be applied to beetle-infested spruce stands. Affected spruce trees would continue to decline in vigor, and likely eventually die. Non-spruce trees and spruce advanced regeneration would be released as the overstory opens (Section 3.5). Forest management options would decrease over time. As spruce-beetle infestations proceed, the percentage of live trees would diminish and treatment options would emphasize salvage more than sanitation. Deterioration of dead spruce would limit future forest management as timber merchantability decreases. Hazard trees would be addressed largely on a reactive basis: that is, once dead trees have been identified or have become a hazard. Harvest operations would become more difficult to implement safely as the proportion of dead trees increases.

3.16.2.1.2 Alternative B – Proposed Action – Salvage of Dead and Dying Spruce

Alternative B would remove dead, infested, and high-risk spruce trees using a sanitation/salvage treatment. This would have a similar effect to Alternative A, in that the outcome would be a near-complete removal of overstory spruce, based on stand characteristics and observations of spruce beetle effects in the surrounding landscape. The main difference between Alternative A and Alternative B would be how long it would take the spruce overstory to be removed. The spruce overstory would be removed quickly by the proposed treatments in Alternative B, compared with the long-term loss of the overstory in Alternative A. There are some pure stands of spruce that are expected to return to spruce after the overstory dies or is removed.

At this stage of infestation, sanitation/salvage treatments under the proposed action would not maximize the economic value of the stands' potential. Smaller diameter (less than 9 inches DBH) spruce would be

retained where practical. Beetles have been observed infesting trees 5 to 7 inches in DBH. Though spruce less than 9 inches DBH are considered to be at lower risk from spruce beetle, diameters of 5 inches (Samman and Logan 2000) and even 3.5 inches (Temperli et al. 2014) are susceptible to infestation. Leaving the 8-to-9-inch size class would allow smaller-diameter trees to weather future beetle attacks, of which the outcome is unknown. Survivorship of this size class would influence future management ability to promote spruce as a substantial stand component. In addition to targeting infested spruce, areas of mountain pine beetle and Douglas-fir beetle infestation would also be harvested as part of the sanitation treatment.

Harvest operations may damage or kill understory trees and seedlings. Treatments would be designed to minimize this effect to the extent practicable. Existing spruce understory trees and seedlings, rather than new seedling establishment, are what would perpetuate spruce following the removal of the dominant spruce overstory. Nonetheless, treated stands would not be dominated by spruce for many decades. The RGFO would use funds generated by the timber sales to ensure reforestation of harvested areas, but does not have the funding or workforce to ensure reforestation outside of harvested areas. Forest management of treated stands following the removal of spruce could include promoting aspen or Douglas-fir. Long-term goals of returning the potential treatment areas to spruce-dominated stands would have to be thoughtfully approached, and future management may or may not include perpetuating spruce. Whether the potential treatment areas are managed for spruce dominance, other tree species dominance, or wildlife habitat, each of these future management options would be most easily facilitated by timely sanitation/salvage treatments. The proposed action would also allow for the proactive removal of existing and potential hazard trees.

3.16.2.1.3 Alternative C – Maximum Reduction of Spruce Beetle Habitat and Timber Output

Forest management under Alternative C would be more intensive than Alternative B because a greater number of smaller-diameter spruce sawtimber would be removed. As discussed under Alternative B, this size class can be susceptible to infestation; therefore, removal is a viable and justified forest management approach. Based on available inventory data, 8- to 10-inch-diameter spruce comprises a large proportion of the spruce component in the potential treatment areas. Removing this smaller size class would more than double the total number of stems removed in some stands. This would increase the level of harvest intensity and associated activities (for example, slash treatments, skidding, and hauling), depending on stand-specific conditions. Economic value would be maximized by the extraction of all merchantable timber within potential treatment areas.

As with Alternative B, seedlings and advanced regeneration would be protected to the extent practicable, but the more intense nature of this alternative would likely injure or kill a larger number of young trees, both spruce and non-spruce. Post-treatment management would be directed by the remaining composition and structure of the stand.

3.16.2.2 *Cumulative Effects*

The analysis area for cumulative effects to forest management was the project area (Figure 2-1) and surrounding BLM, USFS, state, and private lands.

3.16.2.2.1 Alternative A – No Action

The project area lies within a matrix of federally managed (BLM and USFS), state, and private lands. Large-scale forest management is difficult because of inaccessible stands, disparate management direction, and discontinuous ownership. Consequently, the large majority of infested stands have not been treated or salvaged within the project area, and under the No Action Alternative, the spruce-beetle

infestations would continue unchecked. Alternative A would add to the cumulative effects of past or ongoing activities in the area. The majority of spruce stands would not be treated and would continue to be affected by bark beetles. Future decisions on forest management would be driven by stand conditions as they develop under the influence of bark beetles.

3.16.2.2.2 Alternative B – Proposed Action – Salvage of Dead and Dying Spruce

Forest management has occurred in the past, but detailed records of this management are incomplete. It is documented that in the late 1950s and into the early 1960s there was large scale harvesting in the project area. The BLM is implementing several forest-management projects, primarily designed to improve age-class diversity and to salvage beetle-infested spruce when located within existing treatment plans. Approximately 400 acres have been treated, or are slated for treatment, by various land managers (including the BLM), leaving the large majority of affected spruce stands untreated. Future forest management would be dictated by the level of spruce population that survives the current beetle outbreaks. Stands affected by active management (as with Alternatives B and C) or no action (as with Alternative A) would provide a variety of management options. The cumulative effects of Alternative B, in the broader context of spruce decline from bark beetle and the relatively small proportion of treated spruce, would not be significant.

3.16.2.2.3 Alternative C – Maximum Reduction of Spruce Beetle Habitat and Timber Output

Cumulative effects from Alternative C are expected to be the same as those for Alternative B. A larger proportion of spruce would be removed, but this is not expected to cumulatively affect the distribution of spruce. Forest management across the surrounding landscape (as presented in Alternative B) includes a variety of treatments, and Alternative C would be consistent with appropriate management options in use. In the context of ongoing projects and the continued beetle outbreak in Colorado, these cumulative effects would not be significant.

3.16.2.3 *Plan Conformance Review*

Forest and woodland management objectives in the RGFO RMP call for management for sustained yield, including allowing a portion of forested lands to be intensively managed (Decisions 3-13, 3-14, 6-12 and 6-13). The proposed project is consistent with the managed values targeted by these decisions.

3.17 Rangeland Management

This section discusses current condition and potential changes from the proposed alternatives for rangeland management.

3.17.1 Affected Environment

All or portions of 17 grazing allotments lie within the project area (Table 3-15). Of these, portions of 10 allotments lie within potential treatment areas (Table 3-16). Most of the allotments would be minimally affected (less than 10 percent of each total allotment area is within potential treatment areas). Waugh Mountain (53 percent of the total allotment area within potential treatment areas), Owens Creek (24 percent), and Gribble Creek (12 percent) may be more substantially affected.

Table 3-15 Range Allotments

Allotment	Total Acres	In Project Area		In Potential Treatment Areas	
		Acres	Percent	Acres	Percent
Badger Creek	43,731	1,095	3	220	1
Fear Canyon	926	520	56	--	--
Fern Creek	950	915	96	72	8
Green Mt. North	2,148	43	2	--	--
Gribble Park	9,919	5,298	53	1,215	12
Jack Hall	1,758	882	50	87	5
Mill Creek Common	3,378	2,543	75	94	3
Mullock Gulch	246	243	99	--	--
N. Tallahassee Creek	6,523	2,109	32	195	3
N. Waugh	1,591	1,591	100	83	5
One Creek/Cat Gulch	3,858	3,848	100	354	9
Owens Creek	90	76	84	22	24
Poncha Park	9,948	67	1	--	--
Reinke Ridge	328	328	100	--	--
Schoolhouse Gulch	1,298	694	53	--	--
Stoney Face Common	1,228	1,193	97	--	--
Waugh Mountain	1,047	1,047	100	558	53
Total	88,967	22,492		2,900	

3.17.2 Analysis of Effects

This section describes the anticipated direct, indirect, and cumulative effects of implementing each of the alternatives on rangeland management, and compares and contrasts these effects between alternatives.

3.17.2.1 *Direct and Indirect Effects*

The analysis area for direct and indirect effects to rangeland management was the project area (Figure 2-1).

3.17.2.1.1 Alternative A – No Action

Under Alternative A, there would be no vegetation treatments in beetle-infested spruce stands. Herbaceous growth has been found to increase following mountain pine beetle (McCambridge et al. 1982) and Douglas-fir beetle (McMillin and Allen 2003) infestations. As spruce stands decline, a similar herbaceous response could occur, thereby increasing forage production in affected stands. Grazing would continue as permitted on existing allotments, regardless of the condition of the affected stands and the resulting understory. The increase in forage following the reduction in forest canopy may not be available to cattle grazing because of falling spruce trees creating brush fences. Fences, cattle guards, gates, and other range improvements would be repaired by the grazing permittee or BLM range staff if damaged by falling trees.

3.17.2.1.2 Alternative B – Proposed Action – Salvage of Dead and Dying Spruce

Timber harvesting would have limited effects on grazing use or livestock movement. Potential conflicts between harvest activities and grazing would be addressed on a sale-by-sale basis. Fences, cattle guards,

gates, and other range improvements that are removed or damaged by harvest activities would be replaced or repaired. Post-treatment activities such as road rehabilitation and slash treatment may also conflict with grazing operations; however, these effects would be temporary. Following similar treatments in other areas managed by the RGFO, an increase in forage production has been observed (Williams 2015). Cattle are able to graze through residual slash, particularly as slash decomposes over time. This effectively expands forage areas and promotes better livestock distribution, thereby reducing pressure on more heavily used areas (Williams 2015). Any improvements to forage production or expansion of suitable grazing areas would be a secondary benefit of the project and are not a component of treatment design.

3.17.2.1.3 Alternative C – Maximum Reduction of Spruce Beetle Habitat and Timber Output

Effects to grazing under this alternative would be largely the same as those for Alternative B. This alternative would not affect a greater proportion of any grazing allotment; rather it would remove a larger number of trees. This could extend the duration of harvest activity and therefore extend any conflict between the project and grazing. It could also lead to a larger increase in forage production in treated stands.

3.17.2.2 *Cumulative Effects*

The analysis area for cumulative effects to rangeland management was the project area (Figure 2-1) and the surrounding BLM, USFS, state, and private lands.

3.17.2.2.1 Alternative A – No Action

Alternative A would not have any cumulative effects on rangeland management because it would not alter the availability, suitability, or continued use of lands in the analysis area for grazing. Falling boles may create brush fences, possibly reducing available forage and damaging grazing infrastructure.

3.17.2.2.2 Alternative B – Proposed Action – Salvage of Dead and Dying Spruce

Temporary effects to range improvements and livestock movements during treatment would not have any long-term cumulative effect on rangeland management. Forage availability may increase on allotments with a high proportion of potential treatment areas; however, in the context of the larger analysis area, with many unaffected or minimally affected allotments, this change would be insignificant. Treatment would allow for protection of fences, cattle guards, and developed springs in the potential treatment areas.

3.17.2.2.3 Alternative C – Maximum Reduction of Spruce Beetle Habitat and Timber Output

Cumulative effects from Alternative C are expected to be the same as for Alternative B, with the potential for a slightly larger increase in forage production on those allotments with the largest potential treatment areas. However, as with Alternative B, this would be insignificant in the context of the larger analysis area.

3.17.2.3 *Plan Conformance Review*

Each of the proposed alternatives is subject to and has been reviewed for conformance with the Royal Gorge RMP. Specifically, each of the alternatives would conform with Decisions 3-2, 3-3, 3-4, 3-5, 3-6, 3-7, 6-2, 6-3, 6-4, 6-5, 6-6, and 6-7 in the RMP as they pertain to livestock grazing.

3.18 Fuels / Fire Management

This section discusses fire and fuels in the context of current conditions influenced by spruce beetle outbreak, management of fuels, and the potential changes to fire and fuel conditions from the proposed alternatives.

3.18.1 Affected Environment

Spruce-fir forests typically occur at higher elevations on cool, moist sites with long return intervals of high-intensity fires. Active fire suppression has reduced fire's influence on the landscape, thereby allowing many spruce-fir stands to deviate from their natural condition. Stands have become more densely stocked and even-aged with an accumulation of downed woody fuel. The effect of modern spruce beetle infestations on potential fire behavior has been the subject of many recent studies (Jenkins 2014). Beetle killed trees added to wildfire intensity and severity and reduced the effectiveness of control efforts in the Royal Gorge wildfire and the South Fork Complex in 2013.

In a beetle outbreak scenario, the majority of mature overstory spruce is killed within a relatively short time. This creates a stand with a higher percentage of standing dead trees with dead canopy foliage. Over time, dead trees deteriorate and canopy foliage and finer materials are transferred to the forest floor, essentially relocating the entire canopy to the fuel bed. Increased seasonal drying and herbaceous growth from an opened canopy coupled with a larger fuel bed would suggest an increase in fire potential or intensity would follow a bark beetle epidemic.

3.18.1.1 *Beetle-Induced Changes*

As spruce beetles attack, changes to canopy foliage increase crown-fire potential. This is largely caused by changes in foliar chemistry and a decrease in moisture content (Page et al. 2014). The potential effect of these changes is relative to the proportion of affected canopy trees. Stands with a high proportion of canopy spruce in the same stage of decline have a higher crown-fire potential than stands with lower proportions of spruce (or stands where beetle effects have been more gradual over time). In either case, crown flammability decreases as foliage drops within two years after attack (Page et al. 2014).

Study of recent (early 2000s) spruce-beetle outbreaks has confirmed an increase in fine fuels from the canopy and an increase in live herbaceous and shrub fuels (Jorgensen and Jenkins 2011). Larger (10-hour and 1,000-hour) fuels were comparable in normal endemic and post-epidemic stands, though beetle-affected stands did contain a larger amount of 100-hour fuels.

As bark beetle outbreaks increase fire potential, an increased incidence of fire would be expected. A 1940s spruce-beetle outbreak in Colorado has allowed for study of post-outbreak fire occurrence. Analysis of 159 fires within a 268 square mile area of the White River National Forest indicates that there is not a significant correlation between beetle outbreaks and subsequent fires (Bebi et al. 2003). Long-term modeling using data from 1990s spruce beetle outbreaks in Utah also indicates extreme fire behavior is not an inevitable outcome (DeRose and Long 2009).

Studies (for example, Jenkins et al. 2008) show that beetle outbreaks alter fuel conditions and some measures of potential fire behavior; however, historic outbreaks have not lead to an increase in fire frequency. The degree to which a spruce-beetle outbreak influences potential fire behavior appears to be more strongly linked to a particular stand's composition, structure, and site conditions. Bark-beetle outbreaks in spruce-dominated stands, followed by drought and severe fire weather conditions, timed with an ignition, could produce large areas of extreme fire. Controlling beetle populations and weather

conditions is beyond the ability of land managers. However, options exist to reduce the fuel component, and thereby the potential for fire-producing conditions.

3.18.1.2 *Fire History*

Based on field reconnaissance and historical observation, there is evidence of previous fire activity within the project area. Evidence of past fire activity, including charred stumps, logs, and wood, can be found scattered throughout the project area. It is difficult to know exactly when these fires occurred or how big they were. Data are available for all fires that were reported in Wildland Fire Management Inventory (WFMI) from 1980 to the present. Within the project area, there have been nine recorded fires (Table 3-16). Several of these fires occurred within or near the potential treatment areas. With the mixed-land ownership pattern and presence of rural residences, full suppression is expected to continue to be the primary fire response, unless conditions support alternative suppression actions where fire can be managed to achieve resource objectives.

Table 3-16 Fire History

Year	Fire Name	Size Class[1]	Cause Category
1988	Waugh Mountain	A	Human
1988	County 1	B	Natural
1996	E. Badger	A	Human
1998	Loco Mtn.	B	Natural
2000	Burris Mtn.	B	Natural
2001	E. Badger	A	Human
2007	Waugh Mountain	A	Natural
2007	Waugh II	A	Natural
2009	Rock	A	Natural

[1] A=0 to 0.25 acres; B= 0.26 to 9.9 acres

3.18.1.3 *Fuel Models and Fire Behavior*

As described by Scott and Burgan (2005), three fuel models predominate the potential treatment areas: TU1, TU5, and TL3. These fuel models are estimated using vegetation type and structure, and typical fuel loads.

Fuel model TU1 (Low Load Dry Climate Timber-Grass-Shrub) characterizes areas with a timber overstory and an understory of mixed grasses, shrubs, and litter, which are the primary carriers of fire. Spread rate is low and flame length is low. Under most conditions, direct attack on the fire is possible and resistance to control is low. However, under adverse fire-weather conditions, or where ladder fuels are present, torching or crowning is possible and resistance to control would increase.

Fuel model TU5 (Very High Load, Dry Climate Timber-Shrub) characterizes areas with heavy forest litter with a shrub or small tree understory. Spread rate and flame length are moderate. Fire behavior is expected to be moderate to high, and crown-fire initiation is possible.

Fuel model TL3 characterizes conifer stands where conifer litter is the primary carrier of fire, with few grasses, shrubs, or coarse fuels. Spread rate is very low and flame length is low. Direct attack is usually

possible and resistance to control is low, except where ladder fuels increase the risk of torching or crowning.

There are smaller areas with different vegetation types and structures within the project and potential treatment areas. These areas have different fuel-model types and it is difficult to predict how they would influence fire dynamics within the potential treatment areas. However, it is likely that the fuel models and anticipated fire behaviors characterizing the potential treatment areas would change with the influence of bark-beetle activity. The types of vegetation present and the corresponding fuel models are predictive of a period of increased flammability and fire behavior with spruce decline.

3.18.2 Analysis of Effects

This section describes the anticipated direct, indirect, and cumulative effects to fire and fuels from implementation of each of the alternatives, and compares and contrasts the effects between alternatives.

3.18.2.1 *Direct and Indirect Effects*

The analysis area for direct and indirect effects to fuels and fire management was the project area (Figure 2-1).

3.18.2.1.1 Alternative A – No Action

Under the No Action Alternative, no forest treatments of bark-beetle infested stands would be implemented. As infested spruce decline in health, they would deteriorate and contribute to an increased risk of severe fire behavior. The duration of this risk period is unknown, and would be related to the pace of spruce decline, site conditions, and climatic conditions. Should a fire occur during this period of increased fire risk, extreme fire behavior could preclude successful suppression. Safe firefighting is continually assessed throughout fire operations by considering values at risk and exposure to firefighters. Fire with a high rate of spread or active crown fire could occur, creating conditions that limit some options for fire suppression tactics. Fires may become larger than they would if stands were treated. With spruce decline, undesirable fuel conditions could develop. The ability to implement future fuel treatments would likely be hindered by dead or declining spruce. Conditions may be unsafe or impractical for implementation of fuel reduction treatments in the future.

3.18.2.1.2 Alternative B – Proposed Action – Salvage of Dead and Dying Spruce

Alternative B would remove dead, infested, and high-risk spruce trees. The existing fuel bed and activity slash would be piled and burned, or scattered. Treatment activities would reduce stem density, basal area, canopy cover, crown-bulk density, and ladder fuels. Each of these changes would alter potential fire behavior. By opening up stands and removing fuel accumulations, fires would be more likely to remain as surface fires and less likely to cause torching or crown fire. The extent to which treatments affect fire behavior would be driven by the retained forest's structure, size of openings, and, over time, regeneration. Though the objective of the treatments is not solely to promote or prevent certain fire behaviors, the treatments are expected to reduce extreme fire behavior compared to the No Action alternative.

Sufficient woody debris would be left to meet soil stability and wildlife habitat in the form of surface debris and snags. Spruce trees are currently in the early stage of infestation, and have yet to either significantly desiccate or contribute fine fuels to the forest floor. Sanitation/salvage and fuel reduction treatments would occur before or during this period of highest fire risk.

Post-treatment fuel models and fire behavior would be characterized by fuel model rating SB1 – Low Load Activity Fuel (Scott and Burgan 2005). The primary carrier of fire would be dead and down activity fuel, primarily in the one- to three-inch diameter class. Fuel depth would be less than one foot. Spread rate would moderate with a low flame length. Sufficient slash would be removed or treated to maintain or reduce current surface fire behavior. Post-treatment vertical fuels would be made up of spruce generally less than 9-inches DBH, with the possibility of some larger spruce that are not attacked by spruce beetle, the non-spruce forest component (overstory and understory), and the remaining slash. Herbaceous and shrub regeneration would also contribute to the fuel profile. Crown-fire potential would be reduced following removal of the spruce overstory, though not completely eliminated. Smaller spruce (8- to 9-inches DBH) and advanced regeneration would be retained and be susceptible to bark beetle attack. Areas with good stocking of this size class may provide the necessary conditions for a crown fire. With the removal of the dominant spruce overstory, crown fire would be predicted to be smaller in extent and less likely to spread.

3.18.2.1.3 Alternative C – Maximum Reduction of Spruce Beetle Habitat and Timber Output

Alternative C would remove a greater volume of potential fuels than Alternative B by removing a greater number of smaller-diameter spruce sawtimber. Activity slash treatments would be similar in nature but greater in extent because of the larger number of trees removed. This would correspond to a greater number of piles or a larger slash treatment effort. Post-treatment fuels within the stands (that is, not in piles) would be similar to those under Alternative B. With the near-complete removal of spruce, post-treatment fuel models would be the same as under Alternative B (primarily SB-1) though the potential for torching or crown fire would be reduced compared with Alternative B.

3.18.2.2 *Cumulative Effects*

The analysis area for cumulative effects to fuels and fire management was the project area (Figure 2-1), and surrounding BLM, USFS, state, and private lands.

3.18.2.2.1 Alternative A – No Action

The project area lies within a matrix of federally managed (BLM and USFS), state, and private lands. Alternative A would add to the cumulative effects of past or ongoing activities in the area, primarily through fire suppression and bark-beetle activity. The majority of spruce stands would not be treated and would continue to be affected by bark beetles. The resulting fuel accumulations and the potential for fire would be widespread. Though the potential for a large-scale fire would increase, it is not a certainty. However, should a fire occur, Alternative A could contribute to an increase in the spread and intensity, posing difficulties for suppression and contributing to the extent of the effects from severe fire.

3.18.2.2.2 Alternative B – Proposed Action – Salvage of Dead and Dying Spruce

Alternative B would influence the cumulative effects through forest management activities and the resulting changes to fire management and fuels. Bark-beetle treatments by the BLM and others have occurred and would continue. Fire potential in these treatment areas would be controlled by slash treatments, and are expected to lead to an overall reduction in severe fire behavior. The proposed project would increase the number of potential areas treated in this manner. With respect to fire, the interaction between these treated areas and the surrounding untreated landscape is unknown. The project would increase the areas made more resistant to severe fire behavior and contribute to the reversal of the cumulative effects of historical fire suppression and less-active forest management.

3.18.2.2.3 Alternative C – Maximum Reduction of Spruce Beetle Habitat and Timber Output

Cumulative effects from Alternative C are expected to be nearly the same as those for Alternative B. A larger proportion of spruce would be removed and this may cumulatively affect fire management and fuels. Treated stands would have even lower basal areas, densities, and ladder fuels than with Alternative B, and correspondingly decreased expected fire behavior. In the broader landscape, these stands may contribute more substantially to limiting the spread of an advancing fire.

3.18.2.3 *Plan Conformance Review*

Each of the proposed alternatives is subject to and has been reviewed for conformance with the Royal Gorge RMP. The RMP specifies that all BLM lands will be managed for total fire suppression, but allows that prescribed fire could be used as a management tool to enhance other resources. Changes to fire suppression are not contemplated by any of the alternatives. Each of the action alternatives considers the possible use of prescribed fire as a management tool in appropriate situations and would be consistent with the RMP.

3.19 Recreation

This section discusses current recreation conditions and potential changes to recreation associated with the proposed alternatives.

3.19.1 Affected Environment

The project area is within the Royal Gorge Extensive Recreation Management Area (ERMA). BLM recreation management in ERMAs is custodial in nature, and limited to actions that address issues related visitor health and safety, resource protection, and user conflicts.

The Recreation Opportunity Spectrum (ROS) categories in the project area are (1) Roaded Natural, along county road corridors, (2) Semi-Primitive Motorized, along unimproved roads and trails, and (3) Semi-Primitive Non-Motorized, in areas at least one-half mile from motorized routes. County roads passing through the area, and a network of existing routes on public lands, provide relatively good access. The primary recreational activities in the project area are dispersed uses such as hunting, horseback riding, hiking, driving for pleasure, ATV riding, and four-wheeling. Many visitors are from the local area, including residents of nearby rural subdivisions. Recreational use of the area is relatively low, with the highest use occurring during the fall hunting seasons. The project area is located in CPW's GMU 58, which covers much of the south end of South Park and extends south to the Arkansas River. Approximately 40 percent of the project area is comprised of public land. Recreational use is expected to increase as population increases in the local area and region.

3.19.2 Analysis of Effects

This section describes the anticipated direct, indirect, and cumulative effects of implementing each of the alternatives on recreation, and compares and contrasts these effects between alternatives.

3.19.2.1 *Direct and Indirect Effects*

The analysis area for direct and indirect effects to recreation was the project area (Figure 2-1).

3.19.2.1.1 Alternative A – No Action

Under the No Action Alternative, existing recreational opportunities would be maintained. The high density of dead trees may cause some users to avoid the potential treatment areas out of concern for safety (Section 3.14); however, the possibility of this effect is difficult to predict. In the long-term, access into areas of extensive timber mortality may become more difficult because of heavy accumulations of fallen trees.

3.19.2.1.2 Alternative B – Proposed Action – Salvage of Dead and Dying Spruce

Alternative B would not alter the long-term availability of recreational opportunities in the project area. In the short term, visitors would likely choose to avoid areas with active timber sales because of the noise and disruption of salvage operations. Some activities under this alternative are likely to take place during the fall hunting seasons. At these times, game would likely be displaced from active treatment areas and hunters are expected to look elsewhere in the GMU for hunting opportunities. These effects would be limited to the active treatment areas and close environs. Overall, recreational opportunities would be minimally affected because of the large amount of surrounding public lands that would not be part of the proposed project. In the long-term, recreational access would be better in treated areas compared with untreated areas because the large number of dead trees would eventually rot and fall over. The accumulation of fallen trees could become so thick in untreated areas that access for foot or stock travel is blocked.

3.19.2.1.3 Alternative C – Maximum Reduction of Spruce Beetle Habitat and Timber Output

The effects of Alternative C on recreation would be essentially the same as those of Alternative B, except that harvest activities may continue for a longer time in any particular potential treatment area because of the higher volume of trees that would be harvested.

3.19.2.2 *Cumulative Effects*

The analysis area for cumulative effects to recreation was all of GMU 58, which includes the project area (Figure 2-1), and the surrounding BLM, USFS, state, and private lands.

3.19.2.2.1 Alternative A – No Action

Alternative A would have no cumulative effects on recreation because it would have no direct or indirect effects.

3.19.2.2.2 Alternative B – Proposed Action – Salvage of Dead and Dying Spruce

The short term, local disruption of recreational use during treatment operations would be minimal, causing only insignificant cumulative effects within the larger context of other public lands that would not be affected by the proposed action. Over the long-term, no measurable cumulative effects are expected from Alternative B.

3.19.2.2.3 Alternative C – Maximum Reduction of Spruce Beetle Habitat and Timber Output

The cumulative effects of Alternative C would be the same as those for Alternative B.

3.19.2.3 *Plan Conformance Review*

Each of the proposed alternatives is subject to and has been reviewed for conformance with the Royal Gorge RMP. Specifically, each of the alternatives would conform to Decisions 3-64, 3-65, 6-70, and 6-71 in the RMP, as they pertain to recreation.

3.20 Lands with Wilderness Characteristics

This section discusses lands with wilderness characteristics, including current conditions and potential changes associated with the proposed alternatives

3.20.1 Affected Environment

Section 201 of FLPMA requires the BLM to maintain an inventory of all public lands and their resources and other values, including wilderness characteristics. In 2012 and 2013, the RGFO conducted an assessment in accordance with BLM Manual 6310, Conducting Wilderness Characteristics Inventory on BLM Lands. The BLM reviewed earlier wilderness inventories, as well as lands identified through GIS analysis that had not been inventoried in the past, in order to identify lands with potential wilderness characteristics outside existing Wilderness and Wilderness Study Areas (WSAs). In order for an area to qualify as lands with wilderness characteristics, it must possess sufficient size, naturalness, and outstanding opportunities for either solitude or primitive and unconfined recreation. In addition, the area may also possess supplemental values, such as ecological, geological, or other features of scientific, educational, scenic, or historical value.

Eighty-nine landscape units, covering approximately 257,316 acres of public lands, were identified for inventory by the review. Forty of these units, covering 77,757 acres, were found to possess wilderness characteristics. Of those, one unit, Waugh Mountain (COF-020-041), is located within the project area and covers approximately 5,128 acres. Two potential treatment areas (17 and 18, Figure 2-1), covering 594 acres, are located in the northern portion of the Waugh Mountain unit.

The Waugh Mountain unit was previously inventoried for wilderness characteristics in 1979. That inventory concluded the unit did not possess potential for wilderness because roads and past evidence of logging activity affected the naturalness of the unit. Since that inventory, several decades have passed, and evidence of logging activity, while still visible, has become less apparent. Several BLM roads define the area boundary (including Road 5795) or are cherry-stemmed into the area (Roads 5860 and 5861).

BLM Roads 5860 and 5861 have been mechanically built to access vegetation-improvement projects. BLM Road 5860 offers dispersed camping and recreational access to Waugh Mountain. Along BLM Road 5860, human-made feature such as campfire rings, user-created off-highway vehicle (OHV) routes, and evidence of timber harvesting are visible. BLM Road 5860 also provides access to a privately owned communication site, operated under special-use permit, near the top of Waugh Mountain. These disturbances are concentrated near BLM Road 5860 and do not have a substantial effect on the overall naturalness of the unit.

A linear area of ground disturbance is found at the end of BLM Road 5860 and loops around Waugh Mountain. This linear “cut” was made in the 1950s by the BLM for access to timber stand-improvement projects. The route has grown in and is hard to follow on the ground. The stumps and debris that remain from logging are visible, but vegetation has grown over these areas as well. Overall, the linear disturbance does not affect the naturalness of the unit.

The northern half of the Waugh Mountain unit has moderate recreational use, as it is accessible to the public by vehicle on BLM Roads 5860 and 5861. The mountainous landscape draws recreational users, who are likely to encounter other users along the roads. Although the Waugh Mountain unit experiences moderate use along motorized routes, solitude opportunities still exist within the unit. Thick vegetation provides excellent audible and visual screening. High topographic relief and ample size allow portions of the Waugh Mountain unit to provide outstanding opportunities for solitude.

3.20.2 Analysis of Effects

This section describes the anticipated direct, indirect, and cumulative effects to lands with wilderness characteristics that may be caused by implementation of each of the alternatives, and compares and contrasts effects between alternatives.

3.20.2.1 *Direct and Indirect Effects*

The analysis area for direct and indirect effects to lands with wilderness characteristics was the project area (Figure 2-1).

3.20.2.1.1 Alternative A – No Action

Under the No Action Alternative, beetle-killed trees would not be salvaged. Hazard trees would not be removed along roads that provide access to BLM-administered lands, including those adjacent to or cherry-stemmed within the Waugh Mountain unit. Alternative A would have no effects on the wilderness characteristics of the Waugh Mountain unit. Beetle killed trees are likely to fall onto the open BLM roads, which would block access until they are removed by BLM staff or the public.

3.20.2.1.2 Alternative B – Proposed Action – Salvage of Dead and Dying Spruce

Alternative B includes salvage harvest on about 594 acres of lands with wilderness characteristics in the Waugh Mountain unit (about 12 percent of the unit). The majority of the Waugh Mountain unit (88 percent) would not be affected by this alternative and would retain its current state of naturalness and opportunities for solitude and primitive and unconfined recreation. Project activities on the remaining 2,306 acres proposed for treatment in the project area would not affect lands with wilderness characteristics.

If areas with wilderness characteristics are harvested, existing road traces would be reconstructed or maintained to allow access to the treatment areas by equipment. Temporary roads would also be constructed as needed for access. The naturalness of the treated areas would be reduced because of the presence of stumps, slash, slash piles (until they are burned), and other visual signs of the salvage harvest. This reduction of naturalness would extend into surrounding untreated lands for a short distance, until topography and residual vegetation provide screening. Following completion of the project, temporary roads and currently closed roads that are re-opened for the project would be closed and rehabilitated. Public use of these roads would not be allowed. Over time, the treatment areas and closed roads would revegetate and would begin to appear more natural. Nevertheless, several decades would be needed before the current naturalness of the area is again achieved.

During treatment operations, opportunities for solitude and primitive and unconfined recreation would be reduced in and near the treatment areas because of noise and visibility of project activities. Once treatments are completed, opportunities for solitude and primitive and unconfined recreation would return to the current level.

3.20.2.1.3 Alternative C – Maximum Reduction of Spruce Beetle Habitat and Timber Output

The direct and indirect effects of Alternative C on lands with wilderness characteristics are expected to be the same as those for Alternative B.

3.20.2.2 *Cumulative Effects*

The analysis area for cumulative effects to lands with wilderness characteristics was the RGFO.

3.20.2.2.1 Alternative A – No Action

Under the No Action Alternative, there would be no cumulative effects to wilderness characteristics because there would be no direct or indirect effects. Over time, the visibility of closed roads and past timber-management areas would continue to diminish and the natural appearance of the Waugh Mountain unit would increase. Outstanding opportunities for solitude and primitive and unconfined recreation would not be affected. Lands with wilderness characteristics outside the Waugh Mountain unit would not be affected.

3.20.2.2.2 Alternative B – Proposed Action – Salvage of Dead and Dying Spruce

Alternative B would contribute to cumulative evidence of management activities, such as temporary road building and timber harvest, in the Waugh Mountain unit. The naturalness of the unit would be further decreased for several decades until treated areas regain their current state. However, these effects would only be evident on a small portion of the unit, which represents less than one percent of the lands with wilderness characteristics on federal lands managed by the RGFO. BLM Manual 6310 identifies that an area can have wilderness characteristics even though every acre within the area may not meet all criteria. Therefore, the area containing all wilderness characteristics may be reduced in size, but not to an extent that the area as a whole would no longer possess wilderness characteristics. Furthermore, this alternative would not preclude future management options, should a decision be reached to emphasize wilderness characteristics in the unit.

3.20.2.2.3 Alternative C – Maximum Reduction of Spruce Beetle Habitat and Timber Output

The cumulative effects of Alternative C on lands with wilderness characteristics are expected to be the same as those for Alternative B.

3.20.2.3 *Plan Conformance Review*

Each of the proposed alternatives is subject to and has been reviewed for conformance with the Royal Gorge RMP. Under the RMP, there are no specific protections for wilderness characteristics outside Wilderness and WSAs. Therefore, each of the alternatives would conform to the RMP.

4.0 Chapter 4 – Consultation and Coordination

4.1 List of Preparers and Participants

The team that prepared this EA was staffed with members from the BLM and Bear Creek Environmental Consultants. The Bear Creek team provided contracted support to the BLM for the EA. The BLM provided technical direction and oversight to the Bear Creek team for all activities related to the content and preparation of this EA. Table 4-1 lists the members of the IDT, their titles, and their responsibilities for specific components of this EA.

Table 4-1 List of Preparers

Name	Title	Area of Responsibility
BLM Interdisciplinary Team		
Lara Duran	Wildlife Biologist	Terrestrial Wildlife, Migratory Birds, Special Status Animals, Special Status Plants
Dave Gilbert	Fisheries Biologist	Aquatic Wildlife
Kalem Lenard	Recreation	Recreation, Lands with Wilderness Characteristics
Matt Norden	Fire	Fuels / Fire Management
Glenda Torres	Fuels Specialist	Fuels / Fire Management
Molly Purnell	GIS Specialist	GIS Analysis
Ken Reed	Project Inspector/Project Manager/Forester	Vegetation, Public Health and Safety, Economics, Forest Management,
Rick Rotte	Realty Specialist	Realty Authorizations / Lands, Cadastral Survey
John Smeins	Hydrologist	Soils, Water Resources, Wetlands and Riparian Zones
Miles Spong	Forester	Vegetation, Forest Management
Michael Troyer	Archaeologist	Cultural Resources
Martin Weimer	NEPA Coordinator	NEPA Compliance
Jeff Williams	Range Management	Rangeland Management, Invasive, Non-Native Species
Bear Creek Interdisciplinary Team		
Jennifer Corbet	Writer / Editor	Quality Control, Editorial Review
Dan Fillipi	Botanist	Wetlands and Riparian Zones, Invasive Non-Native Species, Special Status Plants
Patrick Golden	Wildlife Biologist	Terrestrial Wildlife, Migratory Birds, Aquatic Wildlife, Special Status Animals
Sarah Jennings	Cultural Resource Specialist	Cultural Resources
Matt Kizlinski	Forester / Silviculturalist	Vegetation, Public Health and Safety, Economics, Forest Management, Rangeland Management, Fuels / Fire Management
Brad Piehl	Watershed Hydrologist	Soils, Water Resources
Katy Reagan	GIS Specialist	GIS analysis
Matt Schweich	Project Manager, IDT Leader	NEPA Compliance, Quality Control, Recreation, Lands with Wilderness Characteristics

4.2 Tribes, Individuals, Organizations, and Agencies Consulted

This section lists each of the tribes, individuals, organizations, and agencies notified of the proposed project during public scoping, those who provided comments during scoping (identified with an asterisk*), or who otherwise communicated with the BLM about this project

Tribes	
Apache Tribe of Oklahoma	Northern Arapaho
Cheyenne and Arapaho Tribes of Oklahoma	Northern Cheyenne
Cheyenne River Lakota	Oglala Lakota
Comanche Tribe of Oklahoma	Rosebud Sioux
Crow Creek Sioux	Southern Ute
Eastern Shoshone	Standing Rock Sioux
Jicarilla Apache	Ute
Kiowa Tribe of Oklahoma	Ute Mountain Ute
Interest Groups	
Ross Vincent, Sierra Club, Sangre De Cristo Group	Udi Lazimy, American Lands Alliance
Colorado Environmental Coalition	Rocky Mountain Field Institute
David Nickum, Colorado Trout Unlimited	Wilderness Society
Dennis Larratt, Chairman, Colorado Off-Highway Vehicle Coalition	Rocky Mountain Wild
Richard Hamilton, The South Park Coalition	Colorado Wildlife Federation
Gerrie Colette, Fremont County Historical Society	Wild Earth Guardians
Jane Ard-Smith, Conservation Chair, Pikes Peak Sierra Club Group	Western Resource Advocates
Jane Daniels, Executive Director, Colorado Preservation Incorporated	Pat Tucker, Habitat Partnership Program-Colorado State Council
Jean C. Smith, Upper Arkansas And South Platte Project	Frosty Roe, Habitat Partnership Program-Administrator
Juli Slivka, The Wilderness Society	Rocky Mountain Elk Foundation
Julie Mach, Conservation Manager, Colorado Mountain Club	Marty Holmes, Mule Deer Foundation
Margaret Demarco, Southern Rockies Ecosystem Project	Brandon Houck, National Wild Turkey Federation
Nick Payne, Theodore Roosevelt Conservation Partnership	Greater Arkansas River Nature Association
National Wildlife Federation, Rocky Mtn. Regional Center	Jeremy Cole, Fremont Cattleman's Association
SeEtta Moss, Arkansas Valley Audubon Society	Tim Canterbury, Front Range Grazing Board Of District Advisors

The Nature Conservancy	Alan Hamel, Arkansas Basin Roundtable, CWCB
Tom Sobal, Quiet Use Coalition	Jay Winner, Lower Arkansas Valley Conservancy District
John Stansfield, Central Colorado Wilderness Coalition	
Individuals	
Norm Birtcher, Montrose Forest Products *	Don McClain
McComb Lumber	Carl & Elizabeth Evans, Marantwo, LLC
Brad Dunmire, Pueblo Wood Products	John Baxter, Mountain Valley Lumber
Shawn Cheeseman, CRS Timber	Ron Pleasant, Pleasant Logging And Milling
Ron Conner, R&R Logging	Greg Wilkins, Wilkins Sawmill
Richard Drake *	West Range Reclamation
Ed Drake	Greg Anstine, Columbine Forestry Inc.
Eric Gray, Colorado Wood Co.	Mike Oswald, Stony Gulch Construction / Cotopaxi Cattle Company *
Harvey Gray, Old-Time Timber Works	Tim Matschee *
Rocky Smith *	Debbie Brown *
Brian Radcliffe *	
Local, State, And Federal Agencies	
Fremont County Commissioners	Paul Crespin, US Forest Service
Colorado Department Of Natural Resources - Executive Directors Office	Amy Ormseth, US Forest Service
Colorado Parks And Wildlife	Rick Romano, National Resource Conservation Service
John Grieve, Colorado State Forest Service	John Valentine, Colorado State Land Board
Damon Lange, Colorado State Forest Service	
Grazing Permittees	
Casey Everett, Everett Land & Cattle	Stephanie Smith, Smith & Williams
Devon A. Eicher	Howard & Ruth E. Eggleston
Duane Daskim, Stirrup Ranch LLC	David C. Bunker And Jim Flynn
Adjacent Landowners	
Black Family, Black Ranch Family Limited	Staley Credit Shelter Trust
Sharon K. Ranson	Frank J & Carolyn A Kovacich
Alice Marcheta Goodwin	Phillip Mendoza
South Gulch Ranch LLC	Stirrup Ranch LLC
Thomas S Goodwin	Cornell Family Living Trust
David A & Jackie Goodwin, Goodwin Family Trust	Kirk & Russell Poe
Dan & Linda Pierce	Wanda N Alderton
Dale S & Deborah L Davis	Sammie R Logan

Warren R & Glennda L Ross
Joan M Adair
Don J & Barbara E Embry
Charles E Afeman, Double C Ranch LLC
James J Jr & Sona S Grovenstein
Flynn Waugh Mountain Enterprises
Donald E & Martha A Ferkel
Flynn High Ranch Enterprises Partnership LTD LLLP
Edward L Flynn
Steven G & Catharine M Rabe
Louis J Montgomery *
Brian R Ophaug
Jeffrey R & Janet L Mancuso, Loco Mountain Ranch LLC
Richard L & Pamela J Lininger
Robert C & Greta J Dittmer
Nesterville Properties LLC
Ed Carter & Lori B Hyder-Carter
Ronald E & Alidra M Walker
Richard Dale Boyer, Boyer Family Ranch LLC
Noah Buddy Jr & Diane R Taylor
Barbara Gail Price
James L Gierhart
Thomas W Bereiter
John M & Kathleen Harris
Frank W Carochi
Dale D'ercole
Debra Thurman
Ronald W Drummond, Bruce A Drummond
Todd C & Eileen J Emmons
Zion Holdings LLC
William G & Virginia M Downing
James P & Beth A Sutter
Kimberly Renee Kennedy
Kerry D & Clara Middlemiss
William H & Judith A Moore, Moore Family Trust
Richard J & Harriet E Lubchenco
Earl Dean Baird
Baird Family Partnership Ltd
Sherry & Pedro Aguirre
Olson Family Partnership
Bobby Joe & Bonnie Jean Peters
David F & Brook L Watts
Timothy C & Denise K Ashley
Walter Edmond Quigley
Ronald Kyle Mc Dowell
Ashley M Kayser

5.0 Chapter 5 –References, Acronyms, and Glossary

This chapter lists all references used in preparing the document, defines all acronyms used in the document, and provides a glossary of all terms that may not be common knowledge to readers of the EA.

5.1 References

Adamson, T. 2015. Personal communication with K. Reed, BLM regarding incidents of falling beetle-killed trees and public health and safety. February 5, 2015. Adamson is a Forester with the BLM in Kremmling, Colorado.

Amaranthus, M.P., R.M. Rice, N.R. Barr, and R.R. Ziemer. 1985. Logging and Forest Roads Related to Increased Debris Slides in Southwestern Oregon. Journal of Forestry 83(4):229-233.

Baker, Jr., Malchus B., compiler. 1999. History of Watershed Research in the Central Arizona Highlands. General Technical Report RMRS-GTR-29. Fort Collins, CO: USDA Forest Service, Rocky Mountain Research Station.

Bebi, P., Kulakowski, D. and Veblen, T. 2003. Interactions between fire and spruce beetles in a subalpine Rocky Mountain forest landscape. Ecology 84(2): 362-371.

Bilby, R.E., K. Sullivan, and S.H. Duncan. 1989. The Generation and Fate of Road-Surface Sediment in Forested Watersheds in Southwestern Washington. Forest Science 35(2):453-468.

Bisson, P.A., R.E. Bilby, M.D. Bryant, C.A. Dolloff, G.B. Grette, R.A. House, M.L. Murphy, K.V. Koski, and J.R. Sedell. 1987. "Large Woody Debris in Forested Streams in the Pacific Northwest: Past, Present, and Future." In *Streamside Management: Forestry and Fisheries Interactions* (Institute of Forest Resources Contribution No. 57), edited by E.O. Salo and T.W. Cundy, 143-190. Seattle: University of Washington.

Bureau of Land Management. 2012. Colorado Bark Beetle Strategic Plan. Lakewood, CO: Bureau of Land Management.

Bureau of Land Management. 2014. Grand County Hazard Tree Removal Programmatic EA DOI-BLM-LLCON02000-2012-0031-EA.

Bureau of Land Management. 2015a. Definition of Special Status Plants. Retrieved on March 5, 2015, from http://www.blm.gov/ca/st/en/prog/ssp.html.

Bureau of Land Management. 2015b. Personal communication with BLM RGFO Noxious Weed Coordinator John Lamman. March 16, 2015.

Cannon, S.H., and S.L. Reneau. 2000. Conditions for Generation of Fire-related Debris Flows, Capulin Canyon, New Mexico. Earth Surface Processes Landforms 25:1103-1121.

Colorado Natural Heritage Program. 2005a. Ecological Systems of Colorado. Rocky Mountain Subalpine-Montane Riparian Shrubland. Retrieved March 19, 2015, from http://www.cnhp.colostate.edu/download/projects/eco_systems/pdf/RM_Subalpine-Montane_Riparian_Shrubland.pdf.

Colorado Natural Heritage Program. 2005b. Ecological Systems of Colorado. Rocky Mountain Subalpine-Montane Riparian Woodland. Retrieved March 19, 2015, from http://www.cnhp.colostate.edu/download/projects/eco_systems/pdf/RM_Subalpine-Montane_Riparian_Woodland.pdf.

Colorado Natural Heritage Program. 2005c. Ecological Systems of Colorado. Rocky Mountain Alpine-Montane Wet Meadow. Retrieved March 19, 2015, from

http://www.cnhp.colostate.edu/download/projects/eco_systems/pdf/RM_Alpine-Montane_Wet_Meadow.pdf.

Colorado Natural Habitat Program. 2015a. Bats of Colorado – Colorado Bat Working Group [Web page]. Retrieved April 8, 2015, from http://www.cnhp.colostate.edu/teams/zoology/cbwg/batList.asp#townsends.

Colorado Natural Heritage Program. 2015b. Colorado Rare Plant Guide. *Aquilegia chrysantha* var. *rydbergii*. . Retrieved on March 19, 2015, from http://www.cnhp.colostate.edu/download/projects/rareplants/guide.asp?id=17990.

Colorado Natural Heritage Program. 2015c. Colorado Rare Plant Guide. *Boechera crandallii*. . Retrieved on March 19, 2015, from http://www.cnhp.colostate.edu/download/projects/rareplants/guide.asp?id=23148.

Colorado Natural Heritage Program. 2015d. Colorado Rare Plant Guide. *Asclepias uncialis spp. uncialis*. Retrieved on March 19, 2015, from http://www.cnhp.colostate.edu/download/projects/rareplants/pdfs/23798.pdf.

Colorado Natural Heritage Program. 2015e. Colorado Rare Plant Guide. *Eriogonum brandegeei*. Retrieved on March 19, 2015, from http://www.cnhp.colostate.edu/download/projects/rareplants/guide_print.asp?id=21173.

Colorado Natural Heritage Program. 2015f. Colorado Rare Plant Guide. *Eriogonum coloradense.* Retrieved on March 19, 2015, from http://www.cnhp.colostate.edu/download/projects/rareplants/guide.asp?id=19370.

Colorado Natural Heritage Program. 2015g. Colorado Rare Plant Guide. *Nuttallia chrysantha.* Retrieved on March 19, 2015, from http://www.cnhp.colostate.edu/download/projects/rareplants/guide.asp?id=19348.

Colorado Natural Heritage Program. 2015h. Colorado Rare Plant Guide. *Nuttallia densa.* Retrieved on March 19, 2015, from http://www.cnhp.colostate.edu/download/projects/rareplants/guide.asp?id=16858.

Colorado Natural Heritage Program. 2015i. Colorado Rare Plant Guide. *Packera pauciflora.* Retrieved on March 19, 2015, from http://www.cnhp.colostate.edu/download/projects/rareplants/guide.asp?id=17508.

Colorado Natural Heritage Program. 2015j. Colorado Rare Plant Guide. *Penstemon degeneri.* Retrieved on March 19, 2015, from http://www.cnhp.colostate.edu/download/projects/rareplants/guide.asp?id=21773.

Colorado Natural Heritage Program. 2015k. Colorado Rare Plant Guide. *Sisyrinchium pallidum.* Retrieved on March 19, 2015, from http://www.cnhp.colostate.edu/download/projects/rareplants/pdfs/21615.pdf.

Colorado Natural Heritage Program. 2015l. Colorado Rare Plant Guide. *Trichophorum pumilum.* Retrieved on March 19, 2015, from http://www.cnhp.colostate.edu/download/projects/rareplants/pdfs/21527.pdf.

Colorado Parks and Wildlife. 2004. Mountain Lion Data Analysis Unit L-11 Management Plan. Game Management Units 48, 49, 50, 56, 57, 58, 59, 481, 500, 501, 512, 561, 581, 591. 13 pages.

Colorado Parks and Wildlife. 2008. Recommended Buffer Zones and Seasonal Restrictions for Colorado Raptors. Revised 02/2008. Denver, CO: Colorado Parks and Wildlife.

Colorado Partners in Flight. 2000. Colorado Land Bird Conservation Plan.

Colorado State Forest Service. 2014. 2013 Report on the Health of Colorado's Forests. Retrieved on December 10, 2014, from http://csfs.colostate.edu/pdfs/2013ForestHealthReport.pdf.

Colorado State Forest Service. 2015a. 2014 Colorado Forest Insect and Disease Update: A supplement to the 2014 Report on the Health of Colorado's Forests.

Colorado State Forest Service. 2015b. 2014 Report on the Health of Colorado Forests.

Council on Environmental Quality. 1997. Considering Cumulative Effects under the National Environmental Policy Act. Washington, DC: Council on Environmental Quality.

DeRose, J. and J. Long. 2009. Wildfire and Spruce Beetle Outbreak: Simulation of Interacting Disturbances in the Central Rocky Mountains. Ecoscience 16(1):28-28.

Donald, J.A., B.C. Wemple, G.E. Grant, and F.J. Swanson. 1996. Interaction of Logging Roads With Hillslope and Channel Processes During the February 1996 Flood in Western Oregon. In EOS Transactions, American Geophysical Union, AGU Fall Meeting. Washington, DC: American Geophysical Union 77(46):F273.

Elliot, W.J., Miller, I.S., Audin, L. editors. 2010. Cumulative Watershed Effects of Fuel Management in the Western United States. Gen. Tech. Rep. RMRS-GTR-231. Fort Collins, CO: USDA Forest Service, Rocky Mountain Research Station.

Epis, R. C., R. A. Wobus, and G. R. Scott. 1979. Preliminary Geologic Map of the Black Mountain Quadrangle, Fremont and Park Counties, Colorado, Open-File Report 79-652. USDI, US Geological Survey.

Fettig, C. J., K. D. Klepzig, R. F. Billings, A. S. Munson, T. E. Nebeker, J. F. Negron, and J. T. Nowak. 2007. The Effectiveness of Vegetation Management Practices for Prevention and Control of Bark Beetle Infestations in Coniferous Forest of the Western and Southern United States. Forest Ecology and Management 238(1-3):24-53.

Fettig, C., K. Gibson, A. Munson, and J. Negròn. 2014. Cultural Practices for Prevention and Mitigation of Mountain Pine Beetle Infestations. Forest Science 60(3):450-463.

Gergel, E.S., M.G. Turner. 2002. Landscape Ecology. Bibliographical reference and index. QL541.15.L35 L43.

Hansen, E., J. Negron, A. Munson, and J. Anhold. 2010. A Retrospective Assessment of Partial Cutting to Reduce Spruce Beetle-Caused Mortality in the Southern Rocky Mountains. Western Journal of Applied Forestry 25(2):81-87.

Harmon, M., B. Fasth, M. Yatskov, J. Sexton, and L. Trummer. 2005. The Fate of Dead Spruce on the Kenai Peninsula – A Preliminary Report. USDA Forest Service General Technical Report R10-TP-135.

Harr, R.D. 1979. Effects of Timber Harvest on Streamflow in the Rain-Dominated Portion of the Pacific Northwest. In *Proceedings of a Workshop on Scheduling Timber Harvest for Hydrologic Concerns*, Portland, OR: USDA Forest Service, Pacific Northwest Region and Pacific Northwest Forest and Range Experiment Station.

Holsten, E. H., R. W. Thier, A. S. Munson, and K. E. Gibson. 2000. *The Spruce Beetle.* U. S. Department of Agriculture, Forest Service, Forest Insect and Disease Leaflet 127. Retrieved from http://www.na.fs.fed.us/spfo/pubs/fidls/sprucebeetle/sprucebeetle.htm on February 11, 2015.

Jenkins, M., E. Hebertson, and A. Munson. 2014. Spruce Beetle Biology, Ecology, and Management in the Rocky Mountains: An Addendum to Spruce Beetle in the Rockies. Forests 5(1):21-71.

Jenkins, M. J., E. Hebertson, W. Page, and C. A. Jorgensen. 2008. Bark beetles, fuels, fires and implications for forest management in the Intermountain West. Forest Ecology and Management 254: 16-34.

Jorgensen, C., and M. Jenkins. 2011. Fuel complex alterations associated with spruce beetle-induced tree mortality in Intermountain spruce-fir forests. Forest Science 57: 232–240.

MacDonald, L.H., and J.D. Stednick. 2003. Forests and Water: A State-of-the-Art Review for Colorado. CWRRI Completion Report No. 196. Fort Collins, CO: Colorado Water Resources Research Institute, Colorado State University.

McCambridge, W., M. Morris, and C. Edminster. 1982. Herbage Production under Ponderosa Pine Killed by the Mountain Pine Beetle in Colorado. Research Note RM-416. Fort Collins, CO: USDA Forest Service, Rocky Mountain Forest and Range Experiment Station.

McMillin, J., and K. Allen. 2003. Effect of Douglas Fir Beetle (Coleoptera: Scolytidae) Infestations on Forest Overstory and Understory Conditions in Western Wyoming. Western North American Naturalist 63(4):498-506.

Megahan, W.F. and J. Hornbeck. 2000. Lessons Learned in Watershed Management: A Retrospective View. In Land Stewardship in the 21st Century: The Contributions of Watershed Management, 2000 March 13-16; Tucson, AZ, Proceedings RMRS-P-13, technical coordinators P.F. Folliott, M. B. Baker Jr., C. B. Edminster, M. C. Dillon, and K. L. Mora, 177-188. Fort Collins, CO: USDA Forest Service Rocky Mountain Research Station.

Megan, W., and W. Kidd. 1972. Effects of Logging and Logging Roads on Erosion and Sediment Deposition from Steep Terrain, Journal of Forestry 70:136-41.

Metcalf Archaeological Consultants, Inc. 2015. A Class I Analysis for the Proposed Bark Beetle Strategic Plan Implementation in the Bureau of Land Management, Royal Gorge Field Office, Fremont County, Colorado. Unpublished report.

Mielke, J. 1950. Rate of Deterioration of Beetle-Killed Engelmann Spruce. Journal of Forestry 48(12):882-888.

Moody, J.A., and D.A. Martin. 2001. Initial Hydrologic and Geomorphic Response Following a Wildfire in the Colorado Front Range. Earth Surface Processes Landforms 26:1049-1070.

Nature. 2014. Nature Climate Change Letter. Hydrological effects of forest transpiration loss in bark beetle-impacted watersheds. Retrieved March 4, 2015, from http://www.nature.com/nclimate/journal/v4/n6/full/nclimate2198.html?message-global=remove

Page, W. M. Jenkins, and J. Runyon. 2014. Spruce Beetle-Induced Changes to Engelmann Spruce Foliage Flammability. Forest Science 60(4): 691-702.

Poole, A. (Editor). 2015. The Birds of North America Online: http://bna.birds.cornell.edu/BNA/. Cornell Laboratory of Ornithology, Ithaca, NY.

Reid, L.M., and T. Dunne. 1984. Sediment Production from Road Surfaces. Water Resources Research 20(11):1753-1761.

Rice, R.M., and J. Lewis. 1986. Identifying Unstable Sites on Logging Roads. In Forest Environment and Silviculture, 18th IUFRO World Congress, Division 1, Volume 1, 239-247. Vienna, Austria: IUFRO Secretariat.

Rich, L.R., and G.J. Gottfried. 1976. Water Yields Resulting from Treatments on the Workman Creek Experimental Watersheds in Central Arizona. Water Resources Research 12:1053-1060.

Rich, L.R., H.G. Reynolds, and J.A. West. 1961. The Workman Creek Experimental Watershed. Station Paper, No. 65. Fort Collins, CO: USDA Forest Service, Rocky Mountain Forest and Range Experiment Station.

Robichaud, P.R., and R.E. Brown. 1999. What Happened After the Smoke Cleared: Onsite Erosion Rates After a Wildfire in Eastern Oregon. In Proceedings of the Annual Summer Specialty Conference (Track 2: Wildland Hydrology), 419-426. June 30 to July 2, 1999, Bozeman, MT. Herndon, VA: American Water Resources Association.

Rothacher, J. 1971. Regimes of Streamflow and Their Modification by Logging. In Proceedings of a Symposium, Forest Land Uses and Stream Environment, 40-54. Corvallis, OR: Oregon State University.

Samman, S., and J. Logan, Technical Editors. 2000. *Assessment and Response to Bark Beetle Outbreaks in the Rocky Mountain Area.* Report to Congress from Forest Health Protection, Washington Office, Forest Service, U. S. Department of Agriculture. General Technical Report RMRS-GTR-62. Ogden, Utah. USDA Forest Service, Rocky Mountain Research Station.

Schmid, J. and Frye, R. 1976. Stand Ratings for Spruce Beetles. USDA Forest Service, Rocky Mountain Research Station, Research Paper RM-309.

Schmid, J. M., and R. H. Frye. 1977. *Spruce Beetle in the Rockies.* General Technical Report RM-GTR-49. Fort Collins, Colorado. USDA Forest Service, Rocky Mountain Research Station.

Scott, J. H., and R. E. Burgan. 2005. Standard fire behavior fuel models: a comprehensive set for use with Rothermal's surface fire spread model. General Technical Report RMRS-GTR-153. United States Department of Agriculture, Forest Service, Rocky Mountain Research Station. Fort Collins, Colorado.

Shepperd, W.D., M.A. Battaglia. 2002. Ecology, Silviculture, and Management of Black Hills Ponderosa Pine. General Technical Report RMRS-GTR-97. Fort Collins, CO: USDA Forest Service, Rocky Mountain Research Station.

Smith, J.K., 2000. Wildland Fire in Ecosystems: Effects of Fire on Fauna. Gen. Tech. Rep. RMRS-GTR-42, Vol. 1. USDA Forest Service, Rocky Mountain Research Station.

Stednick, J., and R. Jensen. 2007. Effects of Pine Beetle Infestations on Water Yield and Water Quality at the Watershed Scale in Northern Colorado. Colorado Water Resources Research Institute.

Sullivan, K.O., and S.H. Duncan. 1981. Sediment Yield from Road Surfaces in Response to Truck Traffic and Rainfall. Research Report. Centralia, WA: Weyerhaeuser, Western Forestry Research Center.

Swanson, F.J., M.M. Swanson, and C. Woods. 1981. Analysis of Debris-Avalanche Erosion in Steep Forest Lands: An Example from Mapleton, Oregon, USA. In Erosion and Sediment Transport in Pacific Rim Steeplands, Symposium. IAHS-AISH Pub. 132, edited by T.R.H. Davies and A.J. Pearce, 67-75. Washington, D.C.: International Association of Hydrologic Sciences.

Swift, L.W. 1988. Forest Access Roads: Design, Maintenance, and Soil Loss. In Ecological Studies, Volume 66: Forest Hydrology and Ecology at Coweeta, edited by W. T. Swank and D.A. Crossley, Jr, 313-324. New York: Springer-Verlag.

Temperli, C., S. Hart, T. Veblen, D. Kulakowski, J. Hicks, and R. Andrus. 2014. Are Density Reduction Treatments Effective at Managing for Resistance or Resilience to Spruce Beetle Disturbance in the Southern Rocky Mountains? Forest Ecology and Management 334:53-63.

Thomas, J.W., C. Maser, and J.E. Rodiek. 1979. Wildlife Habitats in Managed Rangelands—The Great Basin of Southeastern Oregon: Riparian Zones. General Technical Report PNW-GTR-80. Portland, Oregon: USDA Forest Service Pacific Northwest Research Station.

Thomas, J.W., M.G. Raphael, R.G. Anthony. E.D. Forsman, A.G. Gunderson, R.S. Holthausen, B.G. Marcot, G.H. Reeves, J.R. Sedell, and D.M. Solis. 1993. Viability Assessments and Management Considerations for Species Associates with Late-Successional and Old-Growth Forests of the Pacific Northwest. USDA Forest Service, Portland, Oregon. 523 pages.

US Census Bureau. 2013. American Fact Finder. 2009-2013 American Community Survey 5-Year Estimates. Retrieved April 3, 2015 from http://factfinder.census.gov/.

USDA Forest Service. 2001. Forest Roads: A Synthesis of Scientific Information, General Technical Report PNW-GTR-509, edited by H. Gucinski, M.J. Furniss, R.R. Ziemer, and M.H. Brookes. Portland, OR: USDA Forest Service, Pacific Northwest Research Station.

USDA Forest Service. 2010. *Field Guide to Diseases and Insects of the Rocky Mountain Region*. General Technical Report RMRS-GTR-241. Fort Collins, Colorado. Rocky Mountain Research Station.

USDA Forest Service. 2011. Spruce Beetle: Windthrown Trees Can Set Up Outbreaks. Forest Health Protection – Rocky Mountain Region. Retrieved April 3, 2015 from http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5303039.pdf

US Fish and Wildlife Service. 2015. Personal communication with P. Golden, Bear Creek Environmental Consultants, regarding the list of threatened and endangered species that may occur in the project area, and/or may be affected by the proposed project]. April 7, 2015. Colorado Ecological Services Field Office, Lakewood, Colorado.

US Fish and Wildlife Service. 2014. Revised Designation of Critical Habitat for the Contiguous United States Distinct Population Segment of the Canada Lynx and Revised Distinct Population Segment Boundary; Final Rule. Federal Register 79(177) 54782-54846.

US Fish and Wildlife Service. 2009. A System for Mapping Riparian Areas in the Western United States. Arlington, VA: USFWS Division of Habitat and Resource Conservation.

Veblen, T., K. Hadley, M. Reid, and A. Rebertus. 1991. The Response of Subalpine Forests to Spruce Beetle Outbreak in Colorado. *Ecology* 72:213-231.

Wallace, C. A., A. D. Apeland, and J. A. Cappa. 2000. Geologic Map of the Jack Hall Mountain Quadrangle, Fremont County, Colorado. Colorado Geological Survey Open File Report 00-1. Denver, CO: Colorado Geological Survey.

Wallace, C. A., J. A. Cappa, and A. D. Lawson. 1999. Geologic Map of the Gribbles Park Quadrangle, Park and Fremont Counties, Colorado. Colorado Geological Survey Open File Report 99-3. Denver, Colorado.

Whittington, D., and G. Allen. 2008. Guidelines for Raptor Conservation in the Western United States. Washington, DC: USFWS, Region 9, Division of Migratory Bird Management.

Williams, J. 2015. Personal communication with M. Kizlinski, Bear Creek Environmental Consultants, regarding impacts of harvest activities on grazing allotments. April 1, 2015. Williams is a Range Management Specialist with the BLM in Canon City, Colorado.

5.2 Acronyms

Table 5-1 provides definitions for all acronyms used in this document.

Table 5-1 List of Acronyms

Acronym	Definition
ACEC	Area of Critical Environmental Concern
APE	Area of Potential Effect
ATV	All-Terrain Vehicle
BA	Biological Assessment
BLM	Bureau of Land Management
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CNHP	Colorado Natural Heritage Program
COR	Contracting Officer's Representative
CPF	Colorado Partners in Flight
CPW	Colorado Parks and Wildlife
CSFS	Colorado State Forest Service
CWA	Clean Water Act
DAU	Data Analysis Unit
DBH	Diameter at Breast Height
EA	Environmental Assessment
ERMA	Extensive Recreation Management Area
ESA	Endangered Species Act
FLPMA	Federal Land Use and Policy Management Act
GIS	Geographic Information System
GMU	Game Management Unit
IAP	Integrated Activity Plan
IDT	Interdisciplinary Team
LANDFIRE	Landscape Fire and Resource Management Planning Tools Project
LAU	Lynx Analysis Unit
LCAS	Lynx Conservation Assessment and Strategy
MBTA	Migratory Bird Treaty Act
NEPA	National Environmental Policy Act
NRCS	Natural Resource Conservation Service
NRHP	National Register of Historic Places
NWI	National Wetland Inventory
OAHP	Office of Archaeology and Historic Preservation
OHV	Off-Highway Vehicle
RGFO	Royal Gorge Field Office

Table 5-1 List of Acronyms

Acronym	Definition
RMP	Resource Management Plan
ROS	Recreation Opportunity Spectrum
ROW	Right-of-Way
SHPO	State Historic Preservation Office
SISS	Stand Initiation Structural Stage
SSURGO	Soil Survey Geographic Database
TECP	Threatened, Endangered, Candidate, and Proposed
USFS	United States Forest Service
USGS	United States Geological Survey
USFWS	United States Fish and Wildlife Service
VRM	Visual Resource Management
WEPP	Water Erosion Prediction Product
WFMI	Wildland Fire Management Inventory
WSA	Wilderness Study Area

5.3 Glossary

The following terms, which may not be common knowledge to all readers of this document, are defined as used in this EA.

Active crown fire

A crown fire in which the entire fuel complex becomes involved, but the crowning phase remains dependent on heat released from the surface fuels for continued spread.

Activity fuel

Surface fuel generated by vegetation management activities, such as slash.

Aspect

The compass direction that a particular sloped area faces.

Basal area

The cross-sectional area of all stems in a stand measured at breast height and expressed in square feet per acre.

Biological Assessment

An analysis conducted for major federal construction projects requiring an environmental impact statement, in accordance with legal requirements under Section 7 of the Endangered Species Act. The purpose of the assessment and resulting document is to determine whether the proposed action is likely to affect an endangered, threatened, or proposed species.

Canopy

The more or less continuous cover of branches and foliage formed collectively by the crown of adjacent trees and other woody growth.

Canopy cover

The extent to which the canopy blocks an open view of the sky. Typically expressed as a percentage.

Canopy fuel

Fuel present in the canopy, including all live and dead fuels above the surface fuel layer.

Checking

Cracking caused by drying.

Cherry-stem

A narrow corridor, for example along an open road, that is excluded from a surrounding special land designation; for example, lands with wilderness characteristics.

Council on Environmental Quality

An advisory council to the President established by the National Environmental Policy Act of 1969. It reviews Federal programs for their effect on the environment, conducts environmental studies, and advises the President on environmental matters.

Cover type

The vegetative species that dominates a site.

Critical habitat

Under the Endangered Species Act: (1) the specific areas within the geographic area occupied by a federally listed species on which physical and biological features are found that are essential to the conservation of the species and that may require special management or protection; and (2) the specific areas outside the geographic area occupied by a listed species that are determined to be essential for the conservation of the species.

Crown base height

The vertical distance from the ground to the bottom of the live crown of an individual tree, or the average distance in a stand.

Crown fire

A fire that spreads through the tree canopy in conjunction with, or independent of, surface fire.

Crown fire hazard

A physical situation (based on fuels, weather, and topography) with potential for causing harm or damage because of crown fire.

Cull log

Logs that are not suitable for use, for example as dimensional lumber, because of defects such as rot or crookedness.

Cultural (heritage) resources

The physical remains of human activity (such as artifacts, ruins, burial mounds, or petroglyphs) and conceptual content or context (such as a setting for legendary, historic, or prehistoric events or a sacred area of native people) of an area of prehistoric or historic occupation.

Cumulative effects

The combined effects resulting from sequential actions on a given area, including past, present, and reasonably foreseeable actions.

Direct attack

Fire suppression activities that take place immediately adjacent to the flaming front.

Direct effects

Effects that are caused by an action and occur at the same place and time.

Dominant

Trees that are the tallest in a stand.

Duff

Partially decomposed organic matter lying beneath the litter layer and above the mineral soil. It includes the fermentation and humus layers of the forest floor.

Ecosystem

A complete, interacting system of organisms considered together with their environment (for example; a marsh, a watershed, or a lake).

Eligible cultural resources (properties)

All cultural resources determined “officially eligible” to the NRHP by the Colorado SHPO, all cultural resources with a Colorado SHPO eligibility determination other than “officially not eligible”, and all unevaluated cultural resources.

Endemic

Naturally occurring in a particular location at typical levels.

Environmental Assessment

A concise public document for which a federal agency is responsible that serves to: (1) briefly provide sufficient evidence and analysis for determining whether to prepare an environmental impact statement or a finding of no significant impact; (2) aid an agency's compliance with NEPA when no environmental impact statement is necessary; and 3) facilitate preparation of an environmental impact statement when one is necessary.

Epidemic

An event, such as an insect infestation, that occurs at a rate in excess of typical levels.

Fire behavior

The manner in which a fire reacts to fuel, weather, and topography.

Fire suppression

All work and activities connected with fire-extinguishing operations, beginning with discovery and continuing until the fire is completely extinguished.

Flame length

The height of flames at the flaming front.

Floodplain

The land bordering a stream, built up of sediments from overflow of the stream and subject to inundation when the stream is at flood stage.

Foraging habitat

Areas used by wildlife to obtain food.

Forb

An herbaceous plant other than a grass or grass-like plant.

Fuel load

The oven-dry weight of fuel per unit area, generally expressed in tons per acre.

Fuel management

Management activities undertaken to alter the amount of fuel in treatment areas.

Fuel model

A set of surface fuel bed characteristics (load, surface area to volume ratio by size class, heat content, and depth) organized for input to a fire model. Standard fuel models (Scott and Burgan 2003) have been stylized to represent specific fuel conditions.

Fuelwood

Wood used for conversion to some form of energy, for example, in residential use or in cogeneration plants.

Geographic information system

A type of computer program used to store and analyze geographic data.

Ground fuel

Fuels that lie beneath surface fuels, such as organic soils, duff, de-composing litter, buried logs, roots, and the below-surface portion of stumps.

Habitat capability

The estimated ability of an area to support wildlife, fish, or plant populations.

Habitat linkage

An area that facilitate movement of lynx beyond their home range, such as dispersal, breeding season movements, or exploratory movements. Linkage areas may incorporate topographic features that tend to funnel animal movements and may encompass areas of non-lynx habitat.

Hazard tree

A tree that poses a significant threat to a user or improvement. Hazard trees include dead, dying, or strongly leaning trees within striking distance of improvements or use areas.

Hazardous fuels

Accumulations of fuel that could contribute to uncontrollable fire behavior.

Herbicide

A chemical compounds used to kill undesirable vegetation.

Indirect attack

Fire suppression activities that take place some distance from the flaming front. This method is typically used when fire behavior is too intense for direct attack.

Indirect effects

Secondary effects that occur in locations other than the initial action or significantly later in time.

Infiltration

The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infrequent, high-severity fire regime

Regime in which fires kill or top-kill aboveground parts of the dominant vegetation, changing the aboveground structure substantially. Approximately 80 percent or more of the aboveground dominant vegetation either is consumed or dies because of fires. Applies to forests, shrub lands, and grasslands.

Interdisciplinary team

A group of individuals with different training assembled to solve a problem or perform a task. The team is assembled out of recognition that no one scientific discipline is sufficiently broad enough to analyze the entire range of resource issues. Through interaction, participants bring different points of view to bear on the problem.

Intermittent stream

A stream or a portion of a stream, that does not flow year-round but only when it (a) receives base flow solely during wet periods, or (b) receives groundwater discharge or protracted contributions from melting snow or other erratic surface and shallow subsurface sources.

Ladder fuel

Combustible material that provides vertical continuity between vegetation strata and allows fire to climb into crowns of trees or shrubs with relative ease.

LANDFIRE

The Landscape Fire and Resource Management Planning Tools Project (LANDFIRE) is a shared program between the wildland fire management programs of the U.S. Department of Agriculture Forest Service and U.S. Department of the Interior, providing landscape scale geo-spatial products to support cross-boundary planning, management, and operations. Additional information can be found at http://www.landfire.gov/index.php.

Large-scale wildfire

A wildfire, often covering large tracts of land, and substantially changing the ecosystems it affects.

Lentic

Referring to still bodies of water, such as lakes or ponds.

Litter

The top layer of the forest floor including freshly fallen leaves, needles, fine twigs, bark flakes, fruits, matted dead grass, and a variety of miscellaneous vegetative parts that are little altered by decomposition. Litter also accumulates beneath rangeland shrubs. Some surface feather moss and lichens are considered litter because their moisture response is similar to that of dead fine fuel.

Lop and scatter

A term used in treating fuels during and after harvesting is complete, where the unmerchantable portions of the tree (usually the smaller top of a tree and the limbs) are cut off and scattered about to reduce slash concentrations.

Lotic

Referring to moving bodies of water, such as streams or rivers.

Mitigation

Avoiding or minimizing effects by limiting the degree or magnitude of the action and its implementation; rectifying the effect by repairing, rehabilitating, or restoring the affected environment; reducing or eliminating the effect by preservation and maintenance operations during the life of the action.

Monitoring

The periodic evaluation, on a sample basis, of management practices to determine how well objectives have been met and how closely management standards have been applied.

Nesting habitat

Habitats used by wildlife (birds) for nesting.

Noxious weed

A plant specified by law as being especially undesirable, troublesome, or difficult to control.

Overstory

The dominant, upper layer in a forest canopy.

Peak flow

The highest annual flow in a stream.

Perennial streams

Streams that flow continuously throughout most years.

Piling and burning

A fuels treatment method comprised of piling fuel into piles that are burned. Piling may be accomplished by hand labor or with large machinery such as bulldozers, depending on terrain, accessibility, fuels, and other concerns.

Population viability

The ability of a population to persist through time.

Prescribed fire

Any fire ignited by management actions to meet specific objectives. An approved written burn plan must exist and NEPA requirements must be met before ignition. This term replaces management ignited prescribed fire.

Project design standards

Criteria that are used in developing a proposed action. These are intrinsic to an action, as opposed to mitigation, which is developed to reduce the effects of an action that is already complete.

Proposed action

In terms of NEPA, the project, activity, or action that a federal agency intends to implement or undertake and which is the subject of an environmental analysis.

Rate of spread

The relative speed with which a fire increases in size.

Recreation Opportunity Spectrum

Provides a framework for stratifying and defining classes of outdoor recreation environments, activities, and experience opportunities.

Regeneration

The process where trees reproduce themselves by either artificial (hand planting of small seedlings) or natural (by seed) means. Often used to refer to the young trees themselves.

Remote sensing

A process whereby satellite images or aerial photography is used to determine the extent or status of a particular resource. Remote sensing is often, but not always, verified by ground-based data collection.

Riparian area

A transition between the aquatic ecosystem and the adjacent upland terrestrial ecosystem. It is identified by soil characteristics and by distinctive vegetative communities that require free or unbounded water.

Salvage

A silvicultural activity that focuses on removal of dead or dying trees. The primary purpose of salvage is gain value (as timber products) from an excess of dead trees that would otherwise decay. A secondary purpose of salvage may be to reduce future accumulations of fuels, reduce the risk to public health and safety from falling trees, or promote regeneration of the stand.

Sanitation

A silvicultural activity that focuses on removal of defective or high-risk trees to improve the resilience or quality of a timber stand. For example, removal of trees at high risk of beetle infestation to reduce the potential for the entire stand to become infested.

Scoping

An early and open process designed to identify the environmental issues and significant factors to be addressed in the analysis process.

Section 7 Consultation

Under provisions of Section 7(a)(2) of the Endangered Species Act, a federal agency that carries out, permits, licenses, funds, or otherwise authorizes activities that may affect a listed species must consult with the US Fish and Wildlife Service to ensure that its actions are not likely to jeopardize the continued existence of any listed species.

Sensitive species

Those species for which population viability is a concern as evidenced by significant current or predicted downward trends in (a) population numbers or density, or (b) habitat capability that would reduce a species' existing distribution.

Seral

Referring to a particular stage in the successional process. For example, many aspen stands are early seral, the first forest to develop in an area following disturbance. In the absence of new disturbance, aspen will gradually be replaced by late seral species, such as spruce.

Slash

The residue left on the ground after felling and other silvicultural operations and/or accumulating there because of storms, fires, girdled, or poisoned trees.

Snag

A standing dead tree.

Soil compaction

The process by which the soil grains are rearranged, resulting in a decrease in void space and causing closer contact with one another, thereby increasing soil density.

Soil permeability

The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water move downward through saturated soil.

Stem density

The number of trees per unit area, typically trees per acre.

Surface fire

A fire spreading via surface fuels.

Surface fuel

The loose surface litter on the soil surface, for example, fallen leaves or twigs, needles, bark, cones, branches, grasses, shrub and tree reproduction, downed logs, stumps, seedlings, and forbs interspersed with or partially replacing the litter.

Temporary road

Those roads needed only for purchaser or permittee use. The BLM and the purchaser or permittee must agree to the location and clearing widths. Temporary roads are used for a single, short-term use; for example, to haul timber

from landings to existing, permanent roads, to provide access to build water developments, etc. Temporary roads are obliterated once the use for which they were developed is complete.

Torching

The transition of surface fire into the crown of a single tree, typically caused by ladder fuels, high flame lengths, or low crown base height. Torching often leads to crown fire behavior.

Understory

The trees and other woody species that grow under a more or less continuous cover of branches and foliage formed collectively by the upper portion of adjacent trees and other woody growth.

Watershed

A region or land area drained by a single stream, river, or drainage network.

Wetland

A transitional area between aquatic and terrestrial ecosystems that is inundated or saturated for periods long enough to produce hydric soils and support hydrophytic vegetation.

Wind throw

A disturbance event caused by high winds in which one or more trees are blown down. Some tree species, such as lodgepole pine, are particularly susceptible to wind throw when they have grown in a dense stand that is subsequently thinned.

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Appendix A Interdisciplinary Team Checklist

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This appendix contains the IDT checklist developed for the NW Fremont Bark Beetle Salvage EA.

Table A-1 IDT Checklist

Determination*	Resource	Rationale for Determination
Physical Resources		
NI	Air Quality / Greenhouse Gas Emissions	All prescribed burning would comply with applicable State of Colorado Air-Quality Guidelines, which would minimize any effects of the project on air quality. The project would have negligible effects on greenhouse gas emissions.
NI	Geology and Minerals, Energy Production	The project would not affect current or future availability or use of geological resources. Energy production is not a current use of the project area; nor would the project preclude future energy production.
PI	Soils	The project may affect soils.
PI	Water Resources (surface and ground water, hydrologic conditions, floodplains, water rights)	The project may affect water resources.
Biological Resources		
PI	Vegetation (excluding special status species)	The project may affect vegetation.
PI	Wetlands and Riparian Zones	The project may affect wetlands and riparian zones. Effects to, or conversion of, wetlands may be regulated under Section 404 of the Clean Water Act (CWA).
PI	Invasive, Non-Native Species	The project may affect invasive, non-native species.
PI	Terrestrial Wildlife (excluding special status species)	The project may affect terrestrial wildlife.
PI	Migratory Birds	The project may affect migratory birds. Effects to migratory birds are regulated under the Migratory Bird Treaty Act.
PI	Aquatic Wildlife (excluding special status species)	The project may affect aquatic wildlife.
PI	Special Status Animals	The project may affect special status animals. Potential effects to threatened, endangered, or proposed species requires completion of a Biological Assessment and concurrence from the U.S. Fish and Wildlife Service before implementation.
PI	Special Status Plants	The project may affect special status plants. Potential effects to threatened, endangered, or proposed species requires completion of a Biological Assessment and concurrence from the U.S. Fish and Wildlife Service before implementation.
Heritage Resources		
PI	Cultural Resources	The project may affect cultural resources.
NI	Native American Religious Concerns	Tribal consultation, CR-RG-15-125 NA, is ongoing. The comment period ended 5/15/15. No comments or concerns have been received to date.

Table A-1 IDT Checklist

Determination*	Resource	Rationale for Determination
NI	Paleontology	Surface geology of the project area is primarily Proterozoic igneous and metamorphic rocks overlain by Tertiary igneous rocks associated with the Thirtynine Mile volcanic field (Epis et al. 1979, Wallace et al. 1999, Wallace et al. 2000). Several small portions of the project area are underlain by Paleozoic sedimentary rocks, notably in the Jack Hall Mountain area; however, none of the potential treatment areas are located in these areas. Considering the lack of fossil-bearing rocks in the treatment areas, the potential for paleontological resources to be affected by the proposed project is low.
Human Resources		
NI	Visual Resources	The entire project area is mapped within Visual Resource Management (VRM) Class III. The objective for VRM Class III is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention, but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the dominant features of the landscape. Treatments proposed for Alternatives B and C would cause moderate levels of change to the landscape in the short term and low levels of change in the long term, once revegetation occurs. Project design standards incorporated into the action alternatives would limit these changes. These changes would meet VRM Class III objectives. All alternatives would conform to the RGFO RMP, including Decisions 6-65 and 6-68.
NI	Noise	Timber management and vehicle traffic would create short-term, transient, and localized increases in noise. Noise levels would depend on weather, topography, and vegetative screening. There would be no long-term effect on noise levels from any alternatives.
PI	Public Health and Safety	The project may affect public health and safety.
NP	Hazardous or Solid Wastes	There are no quantities of wastes, hazardous or solid, located on BLM-administered lands in the project area, and there would be no wastes generated by any of the alternatives.
PI	Economics	The project may affect economics.
NI	Environmental Justice	There are no minority or low-income populations in or near the project area. As such, none of the alternatives would have a disproportionately high and adverse human health or environmental effect on minority or low-income populations.
Resource Uses		
PI	Forest Management	The project may affect forest management.
PI	Rangeland Management	The project may affect rangeland management.
PI	Fuels / Fire Management	The project may affect fuels/fire management.

Table A-1 IDT Checklist

Determination*	Resource	Rationale for Determination
NI	Realty Authorizations / Lands	There are existing Rights-of-Way (ROWs) in the project area. The ROW holders have prior existing rights and would be notified before project implementation under either action alternative where the potential exists for project activities to affect their access to or use of these ROWs.
NI	Cadastral Survey	Corners, monuments, and other survey evidence would be preserved and not disturbed through the application of project design standards under either action alternative.
PI	Recreation	The project may affect recreation.
NI	Access and Transportation	Public use of some currently open roads may be restricted or prohibited for safety purposes during active treatment operations under either action alternative. Project design standards prohibit the use of temporary roads by the public; these roads would be closed and rehabilitated once the project is complete. In the long term, there would be no changes to the transportation network or public access.
NP	Prime and Unique Farmlands	There are no prime or unique farmlands in the analysis area.
NP	Wild Horses and Burros	No herd management areas are present in the analysis area; nor are any wild horses or burros known to be present.
Special Designations		
NP	Areas of Critical Environmental Concern (ACEC)	No ACECs are present in the analysis area.
NP	BLM Natural Areas	No BLM Natural Areas are present in the analysis area.
NP	Scenic Byways	No Scenic Byways are present in the analysis area.
NP	Wild and Scenic Rivers	No Wild and Scenic Rivers are present in the analysis area.
NP	Wilderness and Wilderness Study Areas	No Wilderness or Wilderness Study Areas are present in the analysis area.
PI	Lands with Wilderness Characteristics	The project may affect Lands with Wilderness Characteristics.

*NP = not present in the area affected by the proposed or alternative actions. These resources are not analyzed further in the EA.
NI = present, but not affected to a degree that detailed analysis is required. Analysis of these resources in the EA is limited to the discussion contained in this checklist.
PI = present with potential for relevant effects. Each of these resources is analyzed in detail in the EA.