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Bureau of Land Management
Gunnison Field Office
210 West Spencer Street
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SW Gunnison Bark Beetle Salvage

Final Environmental Assessment

DOI-BLM-CO-S060-2015-0004 EA

March 2016

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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) Gunnison Field Office (GFO) to address the potential environmental effects of the SW Gunnison Bark Beetle Salvage Project. The information in this EA will be used to inform the decision on a course of action for the proposed 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: SW Gunnison Bark Beetle Salvage

Management Units:

- #13 – BLM Category 'I' Livestock Grazing Allotments
- #15 – Riparian Areas Containing Important Fishery Streams
- #16 – General Resource Lands

Legal Description (New Mexico Principal Meridian, Colorado):

- High Mesa Project Area
    - T. 46 N., R. 6 W., sections 1 through 3 and 10 through 12.
    - T. 47 N., R. 6 W., sections 26, 27, and 33 through 36.
- Blue Mesa Project Area
    - T. 46 N., R. 4 W., sections 1 through 11.
    - T. 46 N., R. 5 W., sections 1 through 3.
    - T. 47 N., R. 4 W., sections 19 and 29 through 33.
    - T. 47 N., R. 5 W., sections 15, 16, 22, 24, 26, 27, and 34 through 36.
- Indian Creek Project Area
    - T. 45 N., R. 2 W., section 6.
    - T. 45 N., R. 3 W., sections 1 through 3.
    - T. 46 N., R. 2 W., sections 19, 30, and 31.
    - T. 46 N., R. 3 W., sections 23 through 26 and 34 through 36.

1.2 Background

Insect and disease activity is occurring in 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 them 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 2012a). 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 [USDA] 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 normal periods, when endemic levels of beetles are present, 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 and led to the current epidemic (BLM 2012a).

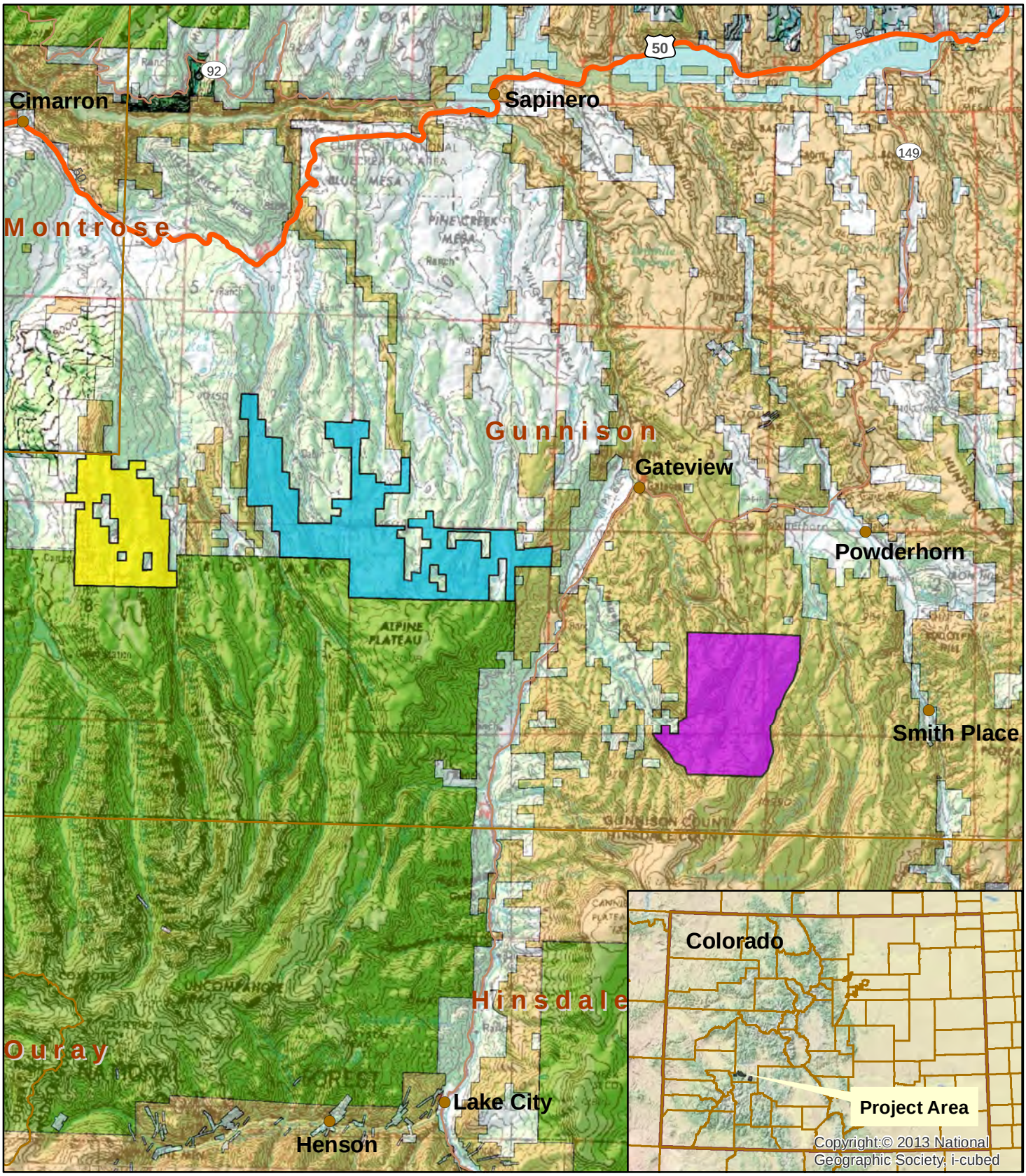
The Colorado State Office of the BLM issued its Bark Beetle Strategic Plan in 2012. The purpose of this plan is to identify the issues, goals, objectives, and actions needed to effectively manage the bark beetle epidemic in Colorado (BLM 2012a). Several of these goals, objectives, and actions are listed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

On lands managed by the GFO, spruce beetle is killing nearly 99 percent of large Engelmann spruce in infested stands. Three specific areas in the southwestern portion of the GFO have been identified as having extensive infestations of spruce beetle and are suitable for management actions to address the infestations. Together, these areas cover approximately 8,700 acres. These three areas are shown in Figure 1-1 and are described briefly here.

1.2.1 High Mesa

Elevation Range: 10,600 to 11,200 feet
Aspect: Predominantly north- and east-facing slopes
Acres: 1,417
Forest Type: Mature Engelmann spruce

This high mesa top is surrounded by steep canyons. Timber harvest last occurred here in 1986. Access is provided along well-constructed, gravel roads (County Roads 864 and 864A), which are maintained by Gunnison County. The project area is generally accessible from June to November, depending on snow conditions. Identified stands are predominantly Engelmann spruce with intermingled aspen (*Populus tremuloides*) and subalpine fir (*Abies bifolia*) in the understory and on northeast slopes. Recent aerial photos and fieldwork have identified spruce beetle activity on the southern end of the project area. Extensive spruce forest coverage makes it likely that the beetle will spread further north across the project area.



SW Gunnison Bark Beetle Salvage EA
Figure 1-1 Regional Context
Bureau of Land Management
Gunnison Field Office

Date: 5/28/2015

Legend

- High Mesa Project Area
- Blue Mesa Project Area
- Indian Creek Project Area
- BLM
- Private
- State
- USFS

0 1.25 2.5 5 7.5 10 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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1.2.2 Blue Mesa

Elevation Range: 9,600 – 11,100 feet
Aspect: predominantly north and east slopes
Acres: 4,791
Forest Type: mature Engelmann spruce

This area is topographically diverse with mixed ownership, variable timber types, and large meadows. The most recent timber harvest occurred here in 1974. A well-constructed gravel road, maintained by Gunnison County (County Road 867), passes through Arrowhead Ranch, a residential subdivision, and provides access to this area. The project area is generally accessible from May until late November, depending on snow depth and levels of plowing provided for the subdivision and USFS timber sales. Forest stands are comprised predominantly of Engelmann spruce with intermingled aspen and subalpine fir in the understory and on northeast slopes. Active spruce bark beetle populations are scattered across USFS and BLM ownerships.

1.2.3 Indian Creek

Elevation Range: 9,200 to 11,500 feet
Aspect: west-, north-, and east-facing slopes
Acres: 2,246
Forest Type: mature Engelmann spruce

This area is immediately adjacent to the BLM's Powderhorn Wilderness. The most recent timber harvest occurred here in 1977. Access is provided along a county-maintained, well-constructed, gravel road (County Road 58). The project area is generally accessible from May to late November, depending on snow depth. Stands have been identified as predominantly Engelmann spruce with intermingled aspen and subalpine fir in the understory and on northeast slopes. Blue spruce is common along perennial Indian Creek. There are also active spruce bark beetle populations in the Powderhorn Wilderness. Figure 1-2 illustrates the level of spruce beetle infestation in the analysis area.

Figure 1-2 Spruce Beetle Infestation in the Analysis Area

1.3 Purpose and Need

The purpose of the SW Gunnison 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 trees, while minimizing adverse effects to other resources, can accomplish this purpose. The need for the proposed project is driven by the epidemic levels of spruce beetle infestation in the project area.

1.4 Decision(s) to Be Made

The BLM will decide whether to implement the proposed project based on the information and analysis contained in this EA, which discloses the potential environmental consequences of implementing the proposed action and the alternatives to that action. 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; (4) implement some combination of components from the different alternatives; or (5) 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 (as per 43 CFR 1610.5, BLM 1617.3). For the Gunnison Resource Management Plan (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 the proposed action alternatives (Section 2.1.2) 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: Gunnison Resource Management Plan

Date Approved: 02/05/1993

Decision Number/Page: Standard Management Direction, page 2-2

Decision Language: Soils and Water Resources. Best management practices will be employed to reduce soil erosion and water quality deterioration and will be required in all plans involving surface disturbance. Roads and other developments will be maintained in good condition to minimize erosion.

Decision Language (as amended by the Standards for Public Land Health)**: Vegetation**. Vegetation resources will be managed to maintain or improve the vigor, production, and diversity of desirable plants within alpine, sagebrush/mixed mountain shrub, and woodland types at a level to support a variety of resource uses, including, but not limited to, livestock grazing, wildlife habitat, and recreation.

Decision Number/Page: Standard Management Direction, page 2-4

Decision Language: Riparian Zones. No commercial timber harvesting will occur in riparian areas, or in a 30-foot area either side of riparian areas, unless riparian or wildlife values will be improved. Logging decks or staging areas will not be permitted within riparian areas or in a 30-foot area either side of riparian areas. Trees cut adjacent to

riparian areas will be felled in a direction away from the riparian area, or in such a manner as to minimize riparian area disturbance. During the preparation of all plans for surface disturbing activities on public lands, affected wetlands will be inventoried, classified, and considered.

Decision Language: Special Status Plant and Animal Species and Habitat. Measures to protect these species and associated habitat will be required in all plans for surface disturbing activities. Section 7 consultation will be conducted with the United States Fish and Wildlife Service (USFWS) regarding potential impacts to federally listed species.

Decision Number/Page: Standard Management Direction, page 2-6

Decision Language: Non-game Wildlife Habitat. Measures and stipulations in Table A-6, Appendix A of the Resource Management Plan (RMP), designed to prevent disturbance to raptors through their post-fledging period, will be considered in all plans involving surface disturbance.

Decision Number/Page: Standard Management Direction, page 2-12

Decision Language: Forest Management. Suitable commercial forestlands and woodlands will be managed for sustained yield production within the allowable cut restrictions and guidelines determined by the Timber Production Capability Classification (TPCC). Special emphasis will be placed on harvest of over-mature and pest-killed trees.

Harvest of commercial timber on slopes greater than 35% will be restricted to cable or helicopter methods only. Timber sales will be designed to allow sufficient elk hiding cover along logging roads and all clear cuts. Emphasis will be given to the maintenance and protection of watershed, soil, and vegetative resources in all timber sales. Timber harvests will be designed and implemented to help improve or maintain non-game wildlife habitat. The conditions and standards in Appendix A of the RMP will be incorporated into all plans for timber harvests in order to improve non-game habitat. Sale area design and layout will include measures to blend harvest areas into the surrounding landscape and increase scenic variety. No commercial timber harvesting will occur in riparian areas, or in a 30-foot area either side of riparian areas, unless riparian or wildlife values will be improved. Logging decks or staging areas will not be permitted within riparian areas, or in a 30-foot area either side of riparian areas. Trees cut adjacent to riparian areas will be felled in a direction away from the riparian area, or in such a manner as to minimize riparian area disturbance. No timber harvesting will be allowed from April 16 to June 30 in elk calving areas to prevent disturbance to calving elk.

Decision Number/Page: Standard Management Direction, page 2-14

Measures designed to protect, interpret, or otherwise enhance cultural resources will be included in all plans for surface disturbing activities. Avoidance will be the preferred method of protection.

Name of Plan: Standards for Public Land Health (as amended to the GFO RMP)

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. Accordingly, scoping was conducted to determine the potential issues associated with a 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 188 unique addresses including representatives of federal, tribal, state, and local governments; colleges and universities; media; interested groups and individuals; nearby landowners; and grazing permittees. Supporting information, including four maps, was posted to the GFO web site. A copy of the public announcement mailing and the mailing

list are located in the administrative record. Two responses were received, generating 16 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 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 particular resource be addressed. The issues developed during scoping were combined with IDT input to develop the issue statements in this EA. The issue statements, in turn, will be used to guide the level of analysis for each resource discussed in this 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.

Fourteen preliminary issues were identified for consideration based on public comments received during scoping. Internal discussion among the IDT led to the identification of 25 additional issues, bringing the total number of identified issues to 39. Of these 39 issues, three related to the specifics of any timber sales that may be offered after a decision is reached on the project. These issues are not discussed further in this EA because they were determined to be not relevant to the decision or were beyond the scope of the project. Five 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 regarded potential action alternatives. Both of these alternatives are considered in Chapter 2 of the EA. Additional discussion on the remaining 29 issues is provided in the following sections.

1.6.2.1 *Issues Dismissed from Detailed Analysis*

The following 11 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
- National Historic Trails
- Noise
- Environmental Justice
- Realty Authorizations / Lands
- Cadastral Survey
- Recreation
- Access and Transportation

1.6.2.2 *Issues Analyzed in Detail*

The remaining 18 issues were 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 CWA. In addition, Executive Order 11990 requires protection of wetlands. 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, because of disturbance from project activities, or indirectly from 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, through disturbance from project activities, or indirectly because of changes in habitat.

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 cultural resources within the project area.

1.6.2.2.12 Visual Resources

Activities associated with the proposed project may alter the existing Visual Resource Management (VRM) classes, as prescribed in the RMP.

1.6.2.2.13 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 that dead trees 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.

1.6.2.2.14 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. The proposed project may also benefit the local and regional work force by providing work in the form of timber sale or service contracts.

1.6.2.2.15 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 to meet this purpose.

1.6.2.2.16 Rangeland Management

Activities associated with the proposed project may alter the existing vegetation from its present condition. Some treatment areas may require rest from grazing (for example, plantations, or areas where aspen regeneration is targeted). These actions may alter the availability of forage on range allotments.

1.6.2.2.17 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.

1.6.2.2.18 Wilderness, Wilderness Study Areas, and Lands with Wilderness Characteristics

The Indian Creek Project Area is adjacent to the Powderhorn Wilderness. About 15 percent of the Indian Creek Project Area is Wilderness Study Area (WSA) and about 80 percent is mapped as lands with wilderness characteristics. While project activities would avoid Wilderness and Wilderness Study Areas, the potential for indirect effects needs to be assessed, as do potential effects to lands with wilderness characteristics.

1.6.3 Public Comment on the Draft EA

The public comment period on the Draft EA began with release of the Draft EA and notification of interested parties on June 12, 2015. A 30-day comment period was provided, ending on July 13, 2015. Four comment letters were received from individuals, agencies, or organizations during the public comment period. Each comment letter was reviewed by the IDT. The IDT then developed responses to all substantive comments. In some cases, the comments led to minor revisions to the Draft EA, which are reflected in this Final EA. The comment content analysis and responses to comments is located in Appendix C. The comment letters have been placed in the administrative record.

2.0 Chapter 2 – Proposed Action and Alternatives

This chapter describes the alternatives considered as potential means 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 project, failed to meet the purpose and need, were poorly defined, or were unlikely to be implemented. Five alternatives were developed and considered. Two of these (the Proposed Action and No Action Alternatives) were identified for detailed study based on the issues. The other three alternatives were considered but eliminated from detailed study because they are not substantially different from the proposed action or failed to meet the purpose and need.

2.1 Alternatives Analyzed in Detail

This section describes the features of the two 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 other aspects of this alternative. The description of the Proposed Action Alternative is followed by a list of project design standards that are applicable to this alternative.

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. 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 fire suppression, 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

This alternative is the initial proposal developed to meet the purpose and need for the project. This EA has been prepared at the programmatic level; some site-specific details of the potential treatment areas and the treatments that would be implemented are unknown. For example, detailed information on the stands to be treated, such as expected harvest volume, is not known. The BLM would collect additional site-specific data before any project activities are implemented and review the analysis contained in this EA. BLM resource specialists would compare the anticipated effects disclosed in this EA with the site-specific data and complete a Determination of NEPA (National Environmental Policy Act) Adequacy (DNA). If the EA adequately analyzed the effects of the proposed action and conformance with the RMP, project activities would proceed. The BLM may also determine that new information (site-specific data) indicates the need for supplemental or new NEPA analysis.

Numerous project design standards (Section 2.1.3) have been developed for resource protection and to enable a meaningful analysis of the potential effects of this alternative. The analysis of effects in Chapter 3 assumes that these measures would be implemented, as applicable, and that they would be effective. The extent of the project discussed here and throughout the EA is the best available estimate; however, the actual extent of implementation may vary based on any number of factors such as feasibility of the proposed treatment or the need to protect various resources.

The GFO is proposing to salvage dead, dying, and high-risk spruce in portions of the project areas infested with spruce beetle. These areas are shown in Figures 2-1, 2-2, and 2-3. Treatments are expected to begin in 2016 and continue for a number of years, depending on funding and workforce availability, and other factors such as weather. The BLM would identify each year's treatment areas based on the spread of spruce beetles, stand mortality, and treatment economics, placing a priority on areas near roads, trails, and critical infrastructure. The methods to be used in implementing the project are described below.

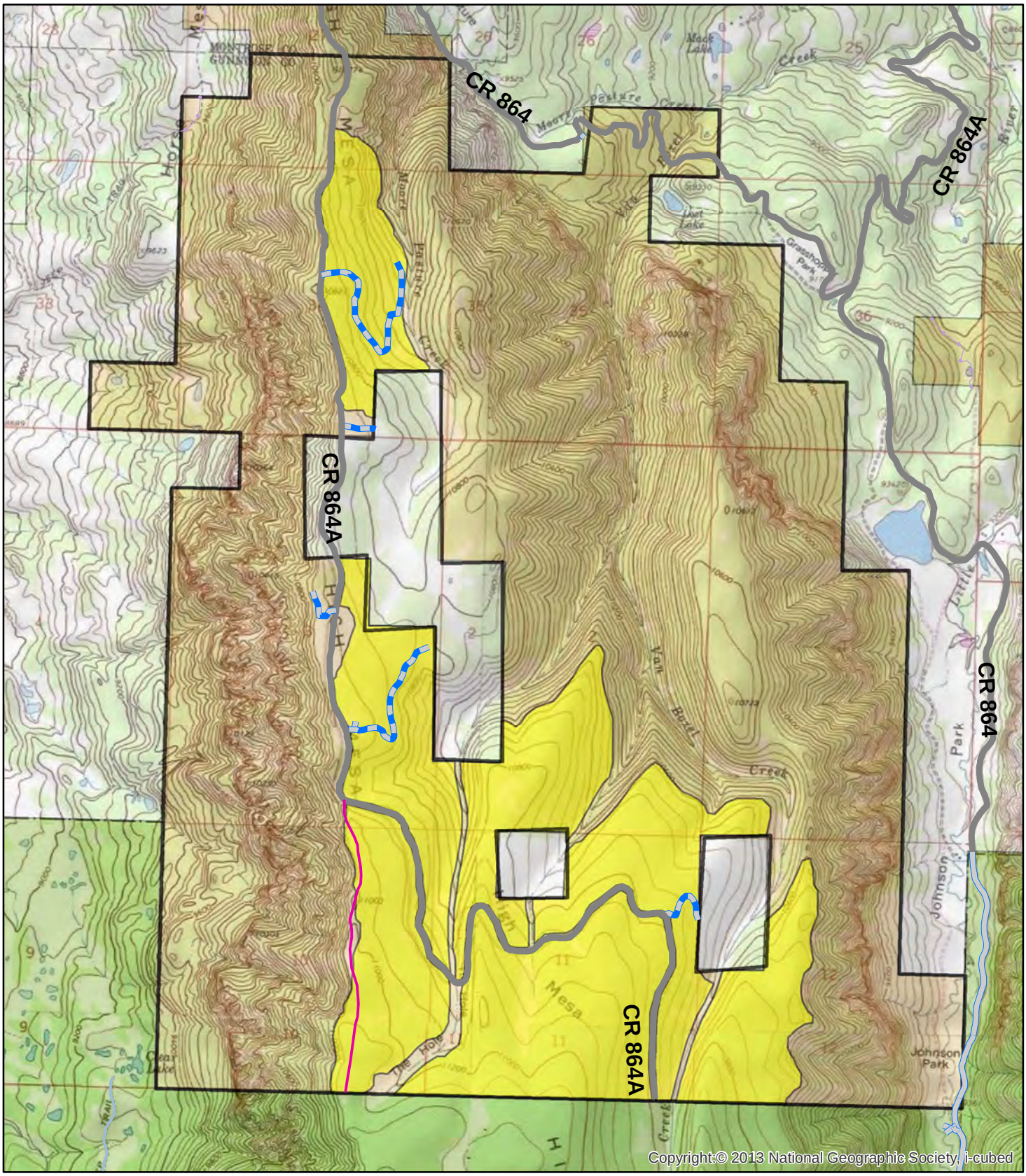
Dead or beetle-infested spruce would be removed in potential treatment areas to the extent feasible. Potential treatment areas would be concentrated in areas where 50 percent or more of the large trees are dead or under attack by the spruce beetle. Other trees species that are not dead or beetle-infested (for example, aspen and subalpine fir) would be retained, except where individual trees impede treatment operations or pose a hazard. Advanced regeneration of spruce that is not dead or infested with spruce beetles would be retained to the extent feasible. Post-harvest, the treated stands would resemble land treated with a regeneration harvest method, such as a seed-tree cut or overstory removal, because the targeted stands are dominated by spruce and because mortality of spruce in infested stands is nearly 99 percent.

This alternative 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 trees would also accelerate spruce regeneration by initiating it 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.

The primary method used to accomplish this treatment would be implementation of one or more 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, trails, and other infrastructure, would be a part of this project. Uninfected trees would be left in the potential treatment areas to provide a future seed source, maintain forest vertical diversity, maintain age-class diversity, provide protection for regeneration, and provide future genetic variability. These patches 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 to facilitate treatment activities or reduce risk to public health and safety; however, green, uninfected trees would not be targeted for treatment.

This alternative is expected to reduce future fuel loading 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.



SW Gunnison Bark Beetle Salvage EA
Figure 2-1 High Mesa Project Location
Bureau of Land Management
Gunnison Field Office

Date: 5/28/2015

Legend

- High Mesa Project Area
- High Mesa Potential Treatment Areas
- BLM
- Private
- USFS
- Admin Route- Private Access
- County Road
- Passenger Car Road
- Primitive Road (high clearance)
- Single Track (foot/horse)
- Single Track Mechanized
- Unmaintained Road (dirt/gravel)

N W E S

0 0.25 0.5 1 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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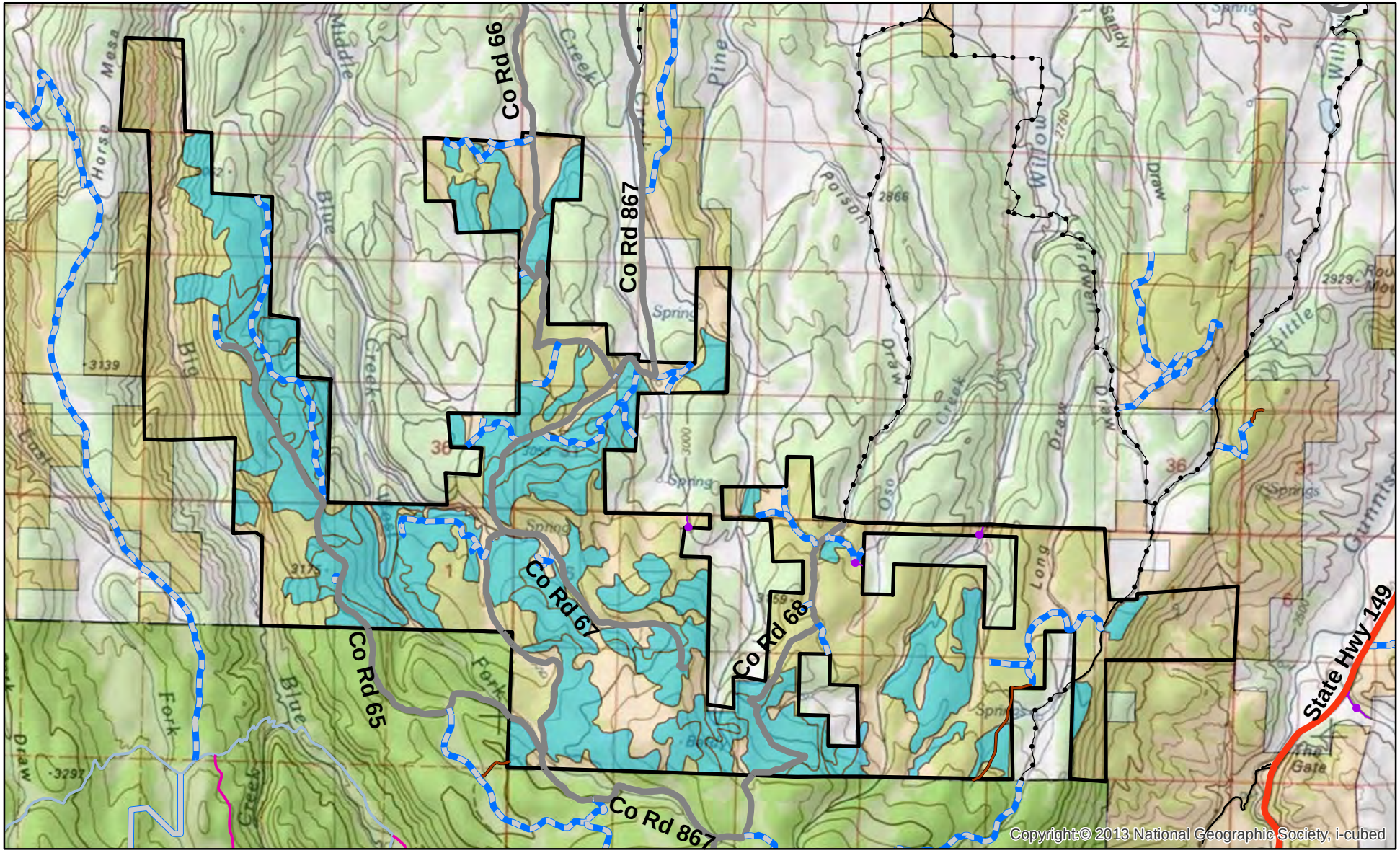

SW Gunnison Bark Beetle Salvage EA
Figure 2-2 Blue Mesa Project Location
Bureau of Land Management
Gunnison Field Office

Date: 5/28/2015

N
W E
S

Legend

- Blue Mesa Project Area
- Blue Mesa Potential Treatment Areas
- BLM
- Private
- USFS
- ATV Trail
- Admin Route- Private Access
- County Road
- Highway
- Passenger Car Road
- Primitive Road (high clearance)
- Private Road
- Single Track (foot/horse)
- Single Track Motorized
- Unmaintained Road (dirt/gravel)

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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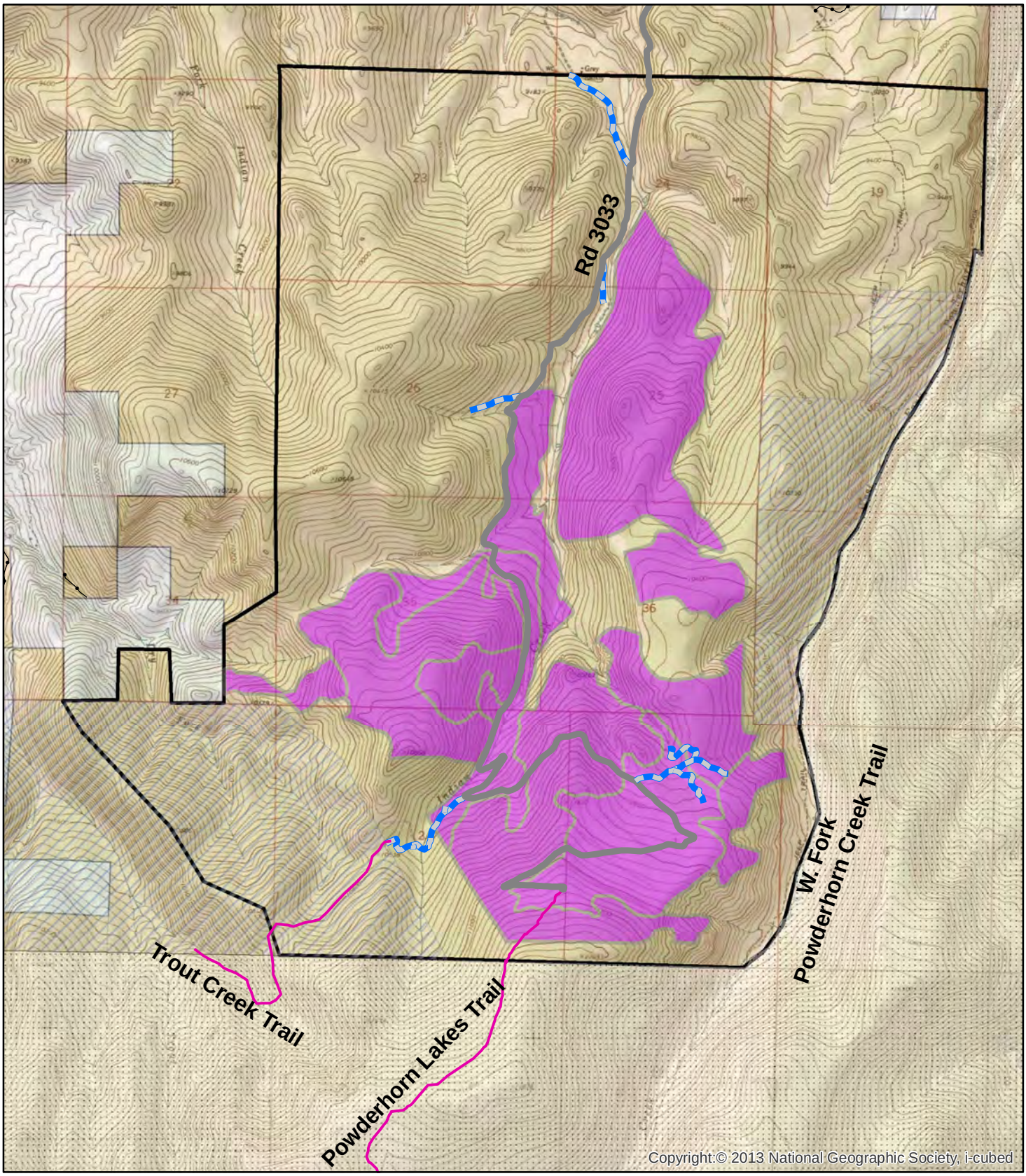

SW Gunnison Bark Beetle Salvage EA
Figure 2-3 Indian Creek Project Location
Bureau of Land Management
Gunnison Field Office

Date: 8/28/2015

N
W E
S

Legend

- Indian Creek Project Area
- Indian Creek Potential Treatment Areas
- Wilderness Area
- Wilderness Study Area
- Admin Route- Private Access
- County Road
- Primitive Road (high clearance)
- Single Track (foot/horse)
- BLM
- Private

0 0.375 0.75 1.5 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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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, as determined by regeneration monitoring, 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.

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, which 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 that such use does not occur.

2.1.3 Project-Design Standards

The following project design standards would be used to protect important forest resources and infrastructure.

2.1.3.1 *Cultural Resources*

- Surveys of the appropriate intensity (as determined by the GFO Archaeologist) would be conducted before any ground-disturbing activities begin to avoid damage to cultural resources. Any eligible or potentially eligible cultural resource sites would be protected. Protection would be accomplished through avoidance during project layout and implementation, as well as through project-implementation monitoring, in coordination with the GFO Archaeologist (if necessary).

- If subsurface cultural values are uncovered during operations, all work near the resource would cease and the Authorized Officer with the BLM would be notified immediately. The operator would take any additional measures requested by the BLM to protect discoveries until they can be adequately evaluated by the GFO Archaeologist. Within 48 hours of the discovery, the Office of Archaeology and Historic Preservation (OAHP) and consulting parties would be notified of the discovery and consultation would begin in order to determine appropriate mitigation. The BLM, in cooperation with the operator, would ensure that the discovery is protected from further disturbance until mitigation is completed. Operations would resume at the discovery site upon receipt of written instructions and authorization by the Authorized Officer.

- Pursuant to 43 CFR 10.4(g), the Authorized Officer would be notified by telephone, with written follow-up confirmation, immediately upon the discovery of human remains, funerary items, sacred objects, or objects of cultural patrimony on federal land. Further, pursuant to 43 CFR 10.4 (c) and (d), all activities near the discovery that could adversely affect the discovery would stop. A reasonable effort would be made to protect the human remains, funerary items, sacred objects, or objects of cultural patrimony for a period of thirty days after written notice is provided to the Authorized Officer, or until the Authorized Officer has issued a written notice to proceed, whichever occurs first.

2.1.3.2 *Cadastral Survey*

- To the extent practicable, all survey monuments, witness corners, reference monuments, bearing trees, and line trees would be located and protected by the BLM, or other qualified individuals, during project layout and protected against unnecessary or undue destruction, obliteration, or damage, in accordance with 43 CFR 3809.420; 108 Stat. 1796, 2146; and 18 U.S.C. 1858. If, in the course of project implementation, any monuments, corners, or accessories are destroyed, obliterated, or damaged, the operator would immediately report the matter to the Authorized Officer. The Authorized Officer would prescribe, in writing, the requirements for the restoration or reestablishment of monuments, corners, and bearing and line trees.

- Where the conditions of the Public Land Survey are categorized as Moderate Risk in the latest Geographic Coordinate Database (GCDB) inventory, field notes, plats, and coordinate locations would be provided for monuments recovered or established during more recent surveys. Project leaders would flag monument locations so they can be readily identified and protected during project implementation.

- Where the conditions of the Public Land Survey are categorized as Low Risk in the latest GCDB inventory, identification and protection of monuments and land boundaries would be determined on a case-by-case basis through discussion between the BLM Cadastral Surveyors and the project leaders to identify the necessary course of action.

2.1.3.3 *Monitoring*

Monitoring is an important component of the proposed action. It would be used to document the effectiveness each of the project design standards as well as to validate the analysis of effects in this EA. Monitoring activities relevant to this project are listed below:

- Monitoring of general implementation of the project (sale and road design, contract preparation, contract administration, and implementation of project design standards) would be completed by qualified BLM personnel and reviewed by Field Office staff as needed. Contract administration would be conducted on a regular basis and as needed to obtain acceptable contract performance.

- Photo-documentation would be used as a part of the monitoring program. Photo points would be established in potential treatment areas and adjacent untreated areas. Photos would be taken before, during, and after treatment, in a manner that shows the general condition of the stand around the photo point, as well as any particular items of interest, including, but not limited to, temporary roads, landings, skid trails, areas of retained advanced regeneration, snags, and coarse woody debris.

- Monitoring of noxious weeds is discussed in Section 2.1.3.4.

- Monitoring of livestock use is discussed in Section 2.1.3.6.

- Monitoring of special status animal and plant species is discussed in Section 2.1.3.7.

- Monitoring of closed temporary roads is discussed in Section 2.1.3.8.

- Monitoring of best management practices (BMPs) designed to protect watersheds is discussed in Appendix B.

- Monitoring of wildlife is discussed in Section 2.1.3.13.

- In the event that monitoring shows the project design standards are not meeting their goals, or that the effects of the project are substantially different than discussed in this EA, BLM Field Office staff would alter implementation of the project or develop additional project design standards to ensure adequate resource protection.

2.1.3.4 *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.

2.1.3.5 *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.

2.1.3.6 *Range Management*

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

- The objective for this project is to ensure the successful regeneration of trees to sustain a dominant forest-cover type. The following management techniques may be employed:

    - Transfer active permits within active treatment areas to vacant allotments.

    - Split allotments into smaller pastures; rest or rotate livestock within pastures.

    - Locate timber projects in ways that best utilize natural barriers.

    - Implement additional herding and salting operations.

    - Continue implementing an aspen-regeneration monitoring program to collect browse characteristics.

- Increase range monitoring following vegetation treatments to identify the need to employ range management techniques.

2.1.3.7 *Special Status Animal and Plant Species*

- Surveys would be conducted to identify occurrences of special status animal and plant species. Any identified locations of special status species would be protected. Protection would be accomplished by avoidance during project layout and implementation, and through project-implementation monitoring (in coordination with the GFO Wildlife Biologist and Botanist), if necessary. Since it may take several years to fully implement the project, re-survey for special status animals may be required on an annual basis.

- Where feasible, maintain screening cover for lynx and other wildlife on strategically located portions of the landscape between potential treatment areas, roads, and meadows. This screening cover would consist of live trees, snags, and coarse woody debris (including jackstraw piles), and should include tree-retention strips a minimum of 200 feet in width, unless topographic breaks occur between potential treatment areas, roads, or meadow openings.

- Damage to understory vegetation and dense horizontal cover would be minimized in order to benefit snowshoe hare and lynx. This would be accomplished by designating skid trail locations away from dense understory areas, and spacing skid trails at least 100 feet apart where feasible. Landings would be placed in areas without advanced tree regeneration, if available, to protect the understory.

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

2.1.3.8 *Transportation*

- A transportation plan would be developed and incorporated into any timber sale contracts. This plan would include a discussion of measures that would be taken to minimize risks to the public and timber sale contractor during hauling, dust abatement, and winter hauling. The portion of the plan addressing winter hauling would include details on snow plowing, use restrictions, and other measures that would be taken to reduce conflict with winter users, including snowmobilers.

- Roads constructed for temporary access into potential treatment areas would be designed based on the principles of temporary road construction. In general, these roads would be 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. All temporary fills and culverts would be removed immediately. At any drainage crossings, channel morphology would be restored to the best condition possible based on consultation with and approval by a BLM hydrologist, riparian specialist, or fisheries biologist. 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. To the extent possible, agency and contractor personnel would use existing roads and trails rather than developing new roads and trails.

- Closed temporary roads would be monitored to ensure the closure methods are effective and the public is not using these roads.

2.1.3.9 *Treatment Operations*

- All live, uninfested trees would be retained – particularly advanced regeneration – except for trees that need to be removed for operational, safety, or silvicultural purposes. It may be necessary to remove live trees in order to access dead trees for salvage or to address safety concerns.

- 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 maintain 60 percent or higher cover on areas of exposed soil, including skid trails and landings. Landings and heavily used skid trails may be seeded to promote reestablishment 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. Slash piles would not be located in the Water Influence Zone (WIZ) (see Appendix B for definitions of the WIZ). Machine piles would be constructed to minimize the incorporation of dirt into the piles. Piles may be allowed to cure for a season to minimize emissions from burning green material.

- Slash piles would be constructed to minimize the amounts of large-diameter woody debris, per the technical specifications for all contracts where hand or machine piling is required. The contractor 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.

- Fueling of machinery would take place at designated fueling sites. Machinery would not be fueled in the WIZ. No more fuel than is necessary for daily operations would be stored on site. Any spills in volumes in excess of 5 gallons would be reported to the BLM project administrator and appropriate cleanup measures would be taken.

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

- 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 could consist of visually tracking smoke plumes by persons on the ground, or in aircraft, and by installing PM10/2.5 particulate monitors at sensitive sites.

- Burn prescriptions would be prepared by a qualified Burn Boss and approved before implementation of burning activities. The Burn Boss would be asked to participate in all potential 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.

2.1.3.10 *Visual Resources*

- 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.

- Openings in the canopy would have a natural appearance with edges that are uneven rather than linear. The shape would be irregular, as they are in existing natural openings, and would avoid straight-line edges. The edges of the stands would be varied and random, designed to soften and blend with the native vegetative mosaic. Existing, healthy, dominant trees, such as aspen, would be used to shape the edges of potential treatment areas. Existing landscape features, such as natural meadows or openings and rock outcrops, would be blended with potential treatment areas when possible. This would create freeform vegetative shapes that mimic natural patterns. Clearing edges would be irregular and freeform, with feathered and undulating edges where possible.

- Potential treatment area boundaries would be minimally marked, as needed for the contractor.

- Root wads uprooted by the contractor that are visible in the foreground of an open-system road would be buried, burned, or otherwise removed from sight by the contractor.

- Where possible, clearing size and form of landings would mimic the surrounding vegetative mosaic as seen from middle ground and background views (distances greater than one-half mile). Landings would be irregularly shaped, like the existing natural openings, and would avoid straight-line edges.

2.1.3.11 *Watersheds*

- On slopes greater than 35 percent, timber harvest would be restricted to cable or helicopter methods to prevent soil erosion on steep slopes.

- Additional project design standards for watersheds, including protection of soil and water resources, are located in Appendix B.

2.1.3.12 *Wilderness and Wilderness Study Areas*

- No project activities would take place in Wilderness or Wilderness Study Areas.

- To prevent any project activities from entering the Powderhorn Wilderness, a buffer between potential treatment areas and the Wilderness boundary would be established. Where the boundary has been marked on the ground, or where survey by the BLM or other qualified individuals is completed to establish the boundary before potential treatment area layout, a minimum 200-foot buffer would be applied. Where the boundary is not marked or surveyed, a minimum 500-foot buffer would be applied during potential treatment area layout.

- To prevent any project activities from entering the Powderhorn Wilderness Study Area, a buffer between potential treatment areas and the Wilderness Study Area boundary would be established. Where the boundary has been marked on the ground, or where survey by the BLM or other qualified individuals is completed to establish the boundary before potential treatment area layout, a minimum 100-foot buffer would be applied. Where the boundary is not marked or surveyed, a minimum 200-foot buffer would be applied during potential treatment area layout.

- Straight lines would not be used when creating potential treatment area boundaries along the boundaries of Wilderness or WSAs.

2.1.3.13 *Wildlife*

- When activities are planned during the nesting season (May 15 to July 15), a walk-through survey for migratory bird nests would be conducted by BLM in treatment areas before project implementation. If migratory bird nests are detected, they would be flagged and nest trees would not be removed between May 15 and July 15 in order to ensure completion of the nesting season. During the nesting season, surveys would be repeated every 7 to 14 days to ensure any newly established nests are detected.

    - If implementation of migratory bird nest surveys is not feasible before operations, all harvest, road construction, and other habitat-altering activities would cease from May 15 through July 15 to avoid the core period of migratory bird season, unless nesting habitat is altered through tree mortality to a point where it is determined by the biologist to be low quality to unsuitable habitat. After completing an initial nesting bird survey, work can be conducted through the migratory bird season.

    - Pile burning and slash piling (including hand or mechanical piling of existing material) may be implemented during the nesting season on a case-by-case basis, with concurrence by a BLM wildlife biologist.

- Timber sales would be designed to allow sufficient elk hiding cover along logging roads and all clear cuts.

- To prevent disturbance to calving elk, no timber harvesting would be allowed from April 16 to June 30 in elk-calving areas, as identified by Colorado Parks and Wildlife (CPW).

- Potential treatments would maintain 90 to 225 snags per 100 acres, measuring at least 10 inches in diameter at breast height (DBH), where biologically feasible. Snags would be maintained in locations away from structures, roads, and trails so that they do not create safety hazards to the public. Where possible, snags would be retained in groups, associated with residual green trees where available, to reduce the risk of wind-throw.

- Potential treatments would maintain 10 to 20 tons per acre of coarse woody debris within potential treatment areas.

- Potential treatments would maintain large-diameter downed logs, in various stages of decomposition, within potential treatment areas. There would be 50 linear feet-per-acre of downed logs, made up of 10 inches diameter or larger (at the large end) lodgepole pine and aspen logs, or 12-inch diameter or larger Engelmann spruce, subalpine fir, or Douglas-fir logs.

- Surveys for raptors would be conducted to identify locations of individuals or populations of these species and allow for the implementation of protection measures as appropriate. Since it could take several years to fully implement the project, re-survey for raptors may be required on an annual basis.

- The conditions and standards in Appendix A of the RMP (reproduced below, as applicable to the proposed project) would be incorporated into all plans for timber harvests to improve non-game habitat.

NON-GAME MANAGEMENT IN TIMBER MANAGEMENT AREAS
(Appendix A, Gunnison RMP)

  - Manage timber resources to improve or maintain habitat for timber dependent non-game wildlife.

  - Within all timber types, maintain a 200-acre block of undisturbed forest around all goshawk nests to meet nesting requirements. Maintain two slash piles and five logs 20 inch or greater diameter at breast height (DBH) per acre for small mammals, black bears, and pine martens.

  - Maintain a variety of all ecosystem timber types and all five forest structural stages that would maintain viable populations of non-game wildlife as identified in the Managing Forest Lands for Wildlife Handbook.

- Measures and stipulations in Table A-6, Appendix A of the RMP (reproduced below as Table 2-1), designed to prevent disturbance to raptors through their post-fledging period, would be applied during project implementation.

Table 2-1 Gunnison RMP Mitigation for Birds of Prey Habitat

Species	Habitat Type[1]	Types of Surface Disturbance Restrictions on Public Lands Within or Surrounding Nests, Roosts, or Habitat[2]	
		Public Lands Where No Surface Disturbance Would Occur Yearlong	Public Lands Where Seasonal Restrictions for Surface Disturbance Would Apply
Ferruginous Hawk	Nesting	⅛-mile radius of nest	3/1-6/31, between ⅛- and ¼-mile radius
Golden Eagle	Nesting	⅛-mile radius of nest	2/15-7/15, between ⅛- and ¼-mile radius
Prairie Falcon	Nesting	⅛-mile radius of nest	3/15-7/31, between ⅛- and ¼-mile radius
Peregrine Falcon	Nesting	⅛-mile radius of nest	3/15-7/31, between ⅛- and ¼-mile radius
Bald Eagle	Nesting Active/Inactive	⅛-mile radius of nest	11/15-7/31, between ⅛- and ½-mile radius

Table 2-1 Gunnison RMP Mitigation for Birds of Prey Habitat

Species	Habitat Type[1]	Types of Surface Disturbance Restrictions on Public Lands Within or Surrounding Nests, Roosts, or Habitat[2]	
		Public Lands Where No Surface Disturbance Would Occur Yearlong	Public Lands Where Seasonal Restrictions for Surface Disturbance Would Apply
	Roost Diurnal/Nocturnal	⅛-mile radius of nest	11/15-3/15, between ⅛- and ½-mile radius
	Crucial Winter	⅛-mile radius of nest	11/15-3/15, between ⅛- and ½-mile radius
Northern Goshawk[3]	Nesting	⅛-mile radius of nest	3/1-7/31, between ⅛- and ½-mile radius
Other Raptors	Nesting	⅛-mile radius of nest	2/15-7/15, between ⅛-and ¼-mile radius

Notes: [1] Diurnal and Nocturnal = daytime and nighttime, respectively.

[2] If habitat is located within planned surface disturbance site(s), specific inventories would determine if habitat would be affected and appropriate mitigation determined at that time.

[3] The northern goshawk was not included in Table A-6 of the RMP, but has been added here for the purposes of this project.

2.2 Alternatives Considered but Not Analyzed in Detail

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

2.2.1 Expanded Project Area, Including Regeneration of Green Spruce

A scoping comment suggested an alternative that expands the project area to all lands in the spruce/fir cover type, where such lands are suitable for any method of treatment. The purpose of this alternative would be to maximize the effectiveness of the project on the landscape and use agency time and resources more efficiently. The 8,700 acres identified for potential treatment by the Proposed Action Alternative is based on the maximum extent of the spruce/fir cover type on operable ground within a larger 24,900-acre analysis area. Further expansion of the analysis area or potential treatment areas is not possible in the spruce/fir cover type in this geographic portion of the GFO. Therefore, this alternative has been eliminated from further analysis because it is the same as the Proposed Action.

2.2.2 Prioritizing Protection of Public Safety/Infrastructure

A scoping comment suggested an alternative that prioritizes protection of public safety and infrastructure from wildfire and post-fire effects to watersheds. The suggested geographic scope of treatments would be broad. Aggressive fuel reduction and the creation of firebreaks were suggested as management actions. In the spruce/fir cover type where the spruce beetle infestation is occurring, all 8,700 acres of operable ground in the larger 24,900-acre analysis area have been proposed for treatment. Part of the purpose and need for the project is to reduce the threat to public safety and infrastructure posed by beetle-killed trees. Another part is to reduce the risk of severe wildfires and subsequent erosion and watershed damage. Post-harvest, the public safety and wildfire risks in the potential treatment areas would be substantially reduced because most of the spruce would be removed. In some areas outside of the potential treatment areas, the cover type is different (for example, aspen, or open meadows) and does not pose a risk for severe wildfire. Other areas outside the potential treatment areas have steep slopes or other operability constraints. Further expansion of the analysis area or potential treatment areas is not possible in the

spruce/fir cover type in this geographic portion of the GFO. Therefore, this alternative has been eliminated from further analysis because it is essentially the same as the Proposed Action.

2.2.3 Focusing Treatment in the Highest Priority Areas

Comments received during scoping and public review of the Draft EA suggested that treatments be focused in the highest-priority areas, where they would be the most effective in reducing the risk to public health and safety, as well as critical infrastructure. Reducing the risk to public health, safety, and infrastructure is one purpose of the proposed project. The Proposed Action would address this purpose. Another purpose of the project is to reduce the risk of severe wildfire and subsequent damage to watersheds. Achieving this objective requires an approach that considers the entire landscape, not just high-priority corridors along roads, trails, and at other sites used by the public. The spruce beetle epidemic is widespread across the analysis area, not just in high-priority areas. Unlike the Proposed Action, this alternative would fail to meet this purpose of the project. The Proposed Action would reduce the threat to public health and safety, including critical infrastructure in high priority areas, as well as reducing the threat to watersheds posed by future severe wildfires. This alternative has been eliminated from further analysis because it fails to meet the entire purpose and need for the proposed project.

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, that would be 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 taking place 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
Vegetation Treatments	X	X	X

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

Action	Period		
	Past	Present	Future
Wildfire	X	X	X

3.2.1 Invasive, Non-native Species Management

Herbicides have been applied to existing noxious weed infestations in the analysis area, mainly along roads and at other areas of soil disturbance related to past management activities. Treatment of known infestations and survey for new infestations of noxious weeds would continue.

3.2.2 Livestock Grazing

The majority of suitable BLM land in the analysis area has been and continues to be permitted for livestock grazing, as are nearby USFS lands. Range improvements, such as fences and stock tanks, have been constructed and maintained. The GFO is developing an EIS/ RMP amendment to assess livestock grazing on 16 allotments, including allotments within the Blue Mesa project area. The environmental analysis is in process. Depending on the decisions reached on this project, changes to the current level of livestock use or range improvements are possible 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. Other recreational uses include fishing, hiking, camping, off-highway vehicle (OHV) riding, snowmobiling, and woodcutting. 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 near the analysis area began more than 100 years ago, mainly by large landowners. Over the last several decades, residential use of private lands has increased substantially as large properties have been subdivided and people have built primary or secondary residences on small parcels. For example, the Arrowhead Ranch community to the north of the Blue Mesa project area contains several hundred small (generally one-acre) parcels, some of which contain residences while others are currently undeveloped. Continued development of primary and secondary residences on nearby private lands at an accelerated pace is expected in the future.

3.2.5 Transportation

Many of the main access routes in and around the analysis area likely date from the late 19th and early 20th centuries, when mining, ranching, and timber harvest became important activities in the Gunnison Basin. Many of these roads were constructed without proper drainage or erosion control and may not meet modern standards for logging trucks. 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.

In 2012, the GFO completed an EA (BLM 2012b) that addressed decommissioning of closed and unauthorized routes, in conformance with their 2010 Travel Management Plan. The 2012 EA described several types of actions that could be implemented to close roads and analyzed the effects of those actions. Closed or unauthorized routes in the analysis area may be decommissioned incidentally as part of the salvage project analyzed in this EA, but no routes have been specifically identified at this time. Any decommissioning would be implemented as described in the 2012 EA.

3.2.6 Vegetation Treatments

Timber harvest in the analysis area probably began in the late 1800s and early 1900s, when wood products were needed by surrounding communities. 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, USFS, state, and private lands in the analysis area, though no specific records of these harvests are known to exist. Table 3-2 lists the various past vegetation treatments for which records exist. In summary, most past treatments were thinning with removal projects that occurred in the 1970s and 1980s, and some patch cutting (small clear cuts) that occurred during the 1980s. Some of these past activities overlap with potential treatment areas for the proposed project. Nearby, the Grand Mesa, Uncompahgre, and Gunnison National Forest is analyzing potential commercial and non-commercial treatments to address spruce beetle infestations and sudden aspen decline on about 250,000 to 350,000 acres, including some USFS lands immediately south of the High Mesa and Blue Mesa project areas. Additional details on this project are not currently available.

Table 3-2 Past Vegetation Management Treatments

Treatment Type	Project Area					
	High Mesa		Blue Mesa		Indian Creek	
	Acres	Year	Acres	Year	Acres	Year
Clear cut	6	1985	19	1982	59	1992
	5	1986	36	1985		
			32	1988		
Project Area Subtotal (Acres)	12		88		59	
Analysis Area Total (Acres)	159					
Thinning and Piling			39	1964		
Analysis Area Total (Acres)	39					
Thinning with Removal	133	1985	207	1972	914	1971
	197	1986	451	1974	248	1972
			197	1979	376	1973
			256	1981		
			262	1985		
			330	1988		
			12	1994		
Project Area Subtotal (Acres)	330		1,714		1,538	
Analysis Area Total (Acres)	3,583					

Table 3-2 Past Vegetation Management Treatments

Treatment Type	Project Area					
	High Mesa		Blue Mesa		Indian Creek	
	Acres	Year	Acres	Year	Acres	Year
Pile Burn			136	1964, 1966		
Analysis Area Total (Acres)						136
Seeding Ground Broadcast			39	1965		
			206	1967		
			8	1972		
Analysis Area Total (Acres)						253
Tree Planting			1,251	1962, 1965, 1966, 1967, 1973, 1982	31	1978
Analysis Area Total (Acres)						1,282
Wildfire			150	1980, 1998		
			61	2003		
Analysis Area Total (Acres)						211
Fire Use					63	2005
Analysis Area Total (Acres)						63

Note: subtotals and totals may not add up exactly because of rounding.

3.2.7 Wildfire

The analysis area has not had any large-scale fires in recent years, unlike other parts of Colorado. Small fires, generally caused by lightning, occur occasionally and are suppressed. Notably, 211 acres were burned in several small fires in or near the Blue Mesa project area in 1980, 1998, and 2003. In 2005, 63 acres burned in the Indian Creek project area and adjacent Powderhorn Wilderness. This fire was allowed to burn under a fire-use prescription, rather than suppressed, because of its location and the low values at risk. With the mixed land ownership pattern and presence of rural residences, suppression is expected to continue to be the primary fire response in the future in the High Mesa and Blue Mesa project areas. Fire use may also be considered, in addition to suppression, in the Indian Creek project area.

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 High Mesa project area are classified as Wetterhorn-Vulcan-Ruby-Nutras with some rock outcroppings. The soil texture is classified primarily as loam. Soils in the Blue Mesa project area are classified as Youman-Shule-Powderhorn-Passar-Cochetopa with some rock outcroppings. The soils texture is also classified primarily loam. Soils in the Indian Creek project area are classified as

Wetterhorn-Vulcan-Ruby-Nutras. The soil texture is classified primarily as gravelly sandy loam. There are no hydric soils identified in the potential treatment areas; therefore, wetlands are unlikely to be present.

3.3.2 Analysis of Effects

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

3.3.2.1 *Direct and Indirect Effects*

Direct and indirect effects to soils were analyzed within the project areas (Figures 2-1, 2-2, and 2-3).

3.3.2.1.1 Alternative A – No Action

Alternative A would have no direct short-term effects on soils in the project areas. No vegetation treatments would be implemented under this alternative. Indirect effects include an increase in beetle mortality of spruce over time that may increase the risk of severe wildfire and subsequent erosion as compared to existing conditions. Erosion following severe wildfire would likely be much greater than any erosion that would be caused by Alternative B because of extensive areas of bare soils that would be generated by severe wildfires.

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. 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 2.1.3) include best management practices 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 (Sections 2.1.3.8, 2.1.3.9, and 2.1.3.11) would minimize the extent of bare ground and risk of soil erosion. Results of Water Erosion Prediction Project (WEPP) modeling show that there would be essentially no soil erosion leaving the treatment areas. The areas of concern for soil erosion would be the skid trails. Keeping skid trails on slopes of 20 percent or less and rehabilitation of those roads following treatment would minimize erosion from skid trails.

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).

3.3.2.2 *Cumulative Effects*

Cumulative effects to soils were analyzed within the project areas (Figures 2-1, 2-2, and 2-3), and the nearby surrounding matrix of BLM, USFS, state, and private lands.

3.3.2.2.1 Alternative A – No Action

There has been some 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 contribute to cumulative effects to soils because there would be no direct effects and because any indirect effects, such as increased fire risk, are speculative.

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

Alternative B, in conjunction with past vegetation treatments (Section 3.2) is expected to have minimal, non-significant cumulative effects on soils because project design standards and BMPs (Appendix B) 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.

3.3.2.3 *Plan Conformance Review*

Overall soil management objectives in the GFO RMP are to employ BMPs, which are required in all plans involving surface disturbance, to reduce soil erosion and water quality deterioration. Roads and other developments will be maintained in good condition to minimize erosion. The action alternative would implement appropriate BMPs (Appendix B) to minimize soil erosion and prevent adverse effects to watersheds; therefore, the proposed project would conform to the RMP.

With respect to soils, the action alternative 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 would 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 11 sixth-level watersheds in the project area (Table 3-3). All project-area watersheds are tributaries to the Gunnison River. The total watershed area is 229,426 acres, and is greater than the project area because portions of the watersheds are located outside of the project area boundaries.

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.35 - The Basic Standards and Methodologies for Surface Water (5 CCR 1002-35). 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 3-4 lists the beneficial use classifications for each watershed in the project area.

Table 3-3 Watersheds

Sixth-level Watershed	Hydrologic Unit Code (HUC)	Watershed Area (acres)	Potential Treatment Areas?
Powderhorn Creek	140200020508	35,266	Yes
Trout Creek-Lake Fork	140200020607	24,601	Yes
Yeager Gulch-Lake Fork	140200020608	10,512	Yes
Indian Creek	140200020609	13,353	Yes
Willow Creek	140200020610	14,787	Yes
Outlet Lake Fork	140200020611	31,612	Yes
Little Blue Creek	140200020802	22,333	Yes
Big Blue Creek-Blue Creek	140200020803	13,271	Yes
Upper Cimarron River	140200020902	18,981	Yes
Headwaters Little Cimarron River	140200020903	27,422	Yes
Pine Creek	140200021001	17,288	Yes
Total		**229,426**	

Table 3-4 Beneficial Uses by Watershed

Watershed	Stream Segment Designation	Classification[1]
All streams in project area, except those listed below	26. All tributaries, including wetlands, which are tributary to the Gunnison River from County Road 32 to the inlet of Blue Mesa Reservoir, Blue Mesa Reservoir, Morrow Point Reservoir, Crystal Reservoir or the segments of the Gunnison River that interconnect those reservoirs, with the exception of Segments 1,2, 29a, 29b, and 30 through 32.	Aquatic Life Cold 1 Recreation U Water Supply Agriculture
Lake Fork of the Gunnison	29b. Main stem of the Lake Fork of the Gunnison, including all tributaries and wetlands, from a point immediately above the confluence with Eaton Creek, to Blue Mesa Reservoir. Cebolla Creek, including all tributaries and wetlands, from the Hinsdale/Gunnison County line, to Blue Mesa Reservoir, excluding the listings in Segment 29a.	Aquatic Life Cold 1 Recreation E Water Supply 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.
Recreation E - These surface waters are used for primary contact recreation or have been used for such activities since November 28, 1975.
Recreation U - These are surface waters whose quality is to be protected at the same level as existing primary contact use waters, but for which there has not been a reasonable level of inquiry about existing recreational uses and no recreation use attainability analysis has been completed. This shall be the default classification until inquiry or analysis demonstrates that another classification is appropriate.
Water Supply - Undetermined Use - 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 are not hazardous as drinking water for livestock.

3.4.1.2 *Water Yield*

Increases in water yields 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 about 8 to 13 years. The magnitude of water yield increases tends to decline following treatments 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 in order to realize and sustain increased water yields. The largest percentage of these watersheds in the project area that would be salvaged is 14.9 percent of Little Blue Creek; 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 flows. The consensus in the literature is that peak-flow changes from timber harvesting generally occur during drier seasons (Harr 1979). During the summer and fall, the trees are generally transpiring 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.

Road drainage systems may alter a stream's hydrograph, which shows rate of flow over time. 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 equilibrium. If the channel is moved out of 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 et al. (2010) also document 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) and most sediment that moved during larger storms originated from channels and logging roads (Rich and Gottfried 1976). Other studies have shown no change in total sediment production from various treatments, as 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 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, and vegetation treatments. The effects of these disturbances generally last only for a short time, perhaps one or two years. After that, the rapid regrowth of vegetation soon covers the surface with plant litter, and potential erosion is quickly reduced. One study, Robichaud and Brown (1999), reported that, after a fire, erosion rates dropped from almost 40 Mg per hectare (18 tons per acre), during the first year to 2.3 Mg per hectare (1 ton per acre) during the second year and 1 Mg per hectare (0.45 tons per acre) during the third year. However, some recent experiences in Colorado have shown that post-wildfire erosion can remain increased for longer periods. Portions of the area burned area during the Hayman Fire of 2002 are still experiencing increased erosion (B. Piehl, personal observation). 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 sixth-level watersheds in which potential treatment areas are located (Figure 3-1 and Table 3-3) were evaluated to determine the level of analysis they should receive. Five watersheds (Powderhorn Creek, Trout Creek-Lake Fork, Yeager Gulch-Lake Fork, Outlet Lake Fork, and Upper Cimarron River) have less than one percent of their areas proposed for treatment (Table 3-5). 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 six watersheds, with a higher extent of proposed treatment (Table 3-5), are carried forward for detailed analysis.

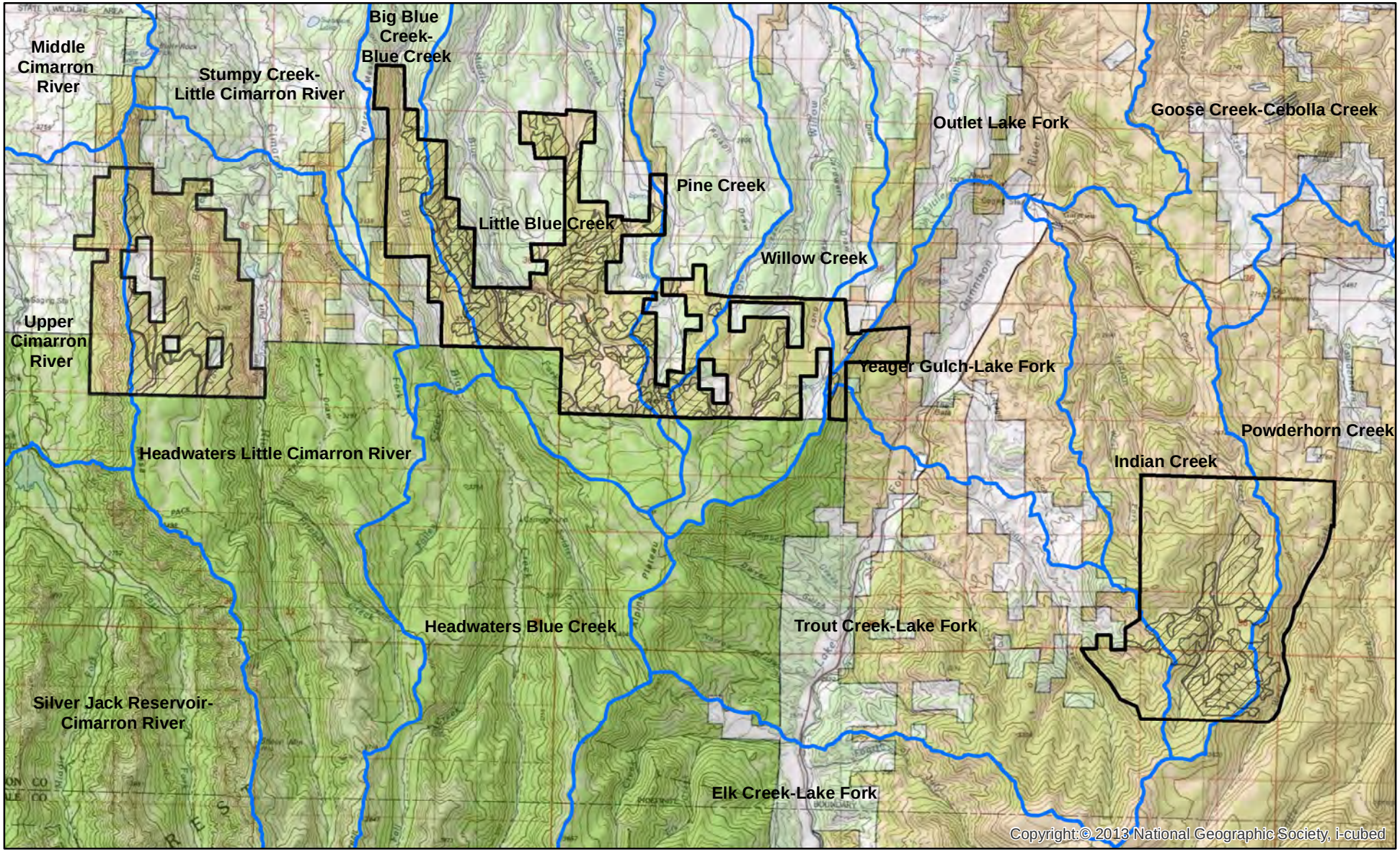
Table 3-5 Watersheds Analyzed

Sixth-level Watershed	Watershed Area (acres)	Potential Treatment Area (acres)	Percentage of Watershed (percent)	Carried Forward in Analysis?
Powderhorn Creek	35,266	196	0.6%	No
Trout Creek-Lake Fork	24,601	83	0.3%	No
Yeager Gulch-Lake Fork	10,512	32	0.3%	No
Indian Creek	13,353	1,974	14.8%	Yes
Willow Creek	14,787	693	4.7%	Yes
Outlet Lake Fork	31,612	33	0.1%	No
Little Blue Creek	22,333	3,321	14.9%	Yes
Big Blue Creek-Blue Creek	13,271	389	2.9%	Yes
Upper Cimarron River	18,981	16	0.1%	No
Headwaters Little Cimarron River	27,422	1,401	5.1%	Yes
Pine Creek	17,288	317	1.8%	Yes
Totals	229,426	8,455		

The three project areas vary in precipitation, with High Mesa averaging 28.7 inches per year, Blue Mesa averaging 20 inches per year, and Indian Creek averaging 17.5 inches per year. About 85 percent of this precipitation falls during the winter months as snow. The potential treatment areas range in elevation from 10,400 to 11,200 feet at High Mesa, 9,400 to 11,000 feet at Blue Mesa, and 9,200 to 11,400 feet at Indian Creek. 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 in the area are generally high gradient, linear (with little meandering) and often tightly confined. Table 3-6 provides the proportion of each watershed in several slope categories. Table 3-7 provides the length of roads and road density in each watershed.

Table 3-6 Percent of Watersheds by Slope Categories

Watershed	Slope Category				
	0 to 10%	11 to 20%	21 to 30%	31 to 40%	> 40%
Indian Creek	34%	49%	17%	<1%	<1%
Willow Creek	58%	41%	1%	<1%	<1%
Little Blue Creek	64%	30%	6%	<1%	<1%
Big Blue Creek-Blue Creek	39%	24%	23%	13%	<1%
Headwaters Little Cimarron River	75%	21%	3%	<1%	<1%
Pine Creek	38%	53%	9%	<1%	<1%
Average	**51%**	**37%**	**10%**	**2%**	**<1%**



SW Gunnison Bark Beetle Salvage EA
Figure 3-1 Watersheds
Bureau of Land Management
Gunnison Field Office

Date: 8/27/2015

N
W E
S

Legend

- Project Areas
- Potential Treatment Areas
- Watersheds
- BLM
- Private
- USFS

0 1.5 3 6 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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Table 3-7 Roads and Road Density

Watershed	Road Length (miles)	Road Density (miles per square mile)
Indian Creek	52.7	2.53
Willow Creek	29.9	1.29
Little Blue Creek	64.8	1.86
Big Blue Creek-Blue Creek	16.8	0.81
Headwaters Little Cimarron River	61.9	1.44
Pine Creek	16.2	0.60
Average		**1.49**

3.4.1.5.1 Existing Conditions – Indian Creek Watershed

The Indian Creek Watershed flows north into the Lake Fork Gunnison River, which then flows into Blue Mesa Reservoir. Indian Creek in the project area is a perennial stream. Elevations range from about 7,900 feet to more than 11,800 feet. The project area is in the southern portion of the watershed, which is the headwaters of the watershed at the highest elevations. The main stem of Indian Creek drains the project area. Water quality data collected in Indian Creek indicates that dissolved oxygen is quite high with a few exceptions, pH is neutral, and specific conductance averages close to 200 us/cm. Stream discharge monitoring in Indian Creek shows that discharge is quite low (typically less than one cubic foot per second) for the May to June period.

The watershed is moderately shallow, with the majority of slopes in the 0- to 20-percent classification (Table 3-6). The Indian Creek Watershed has the highest road density in the project area, with 2.53 miles of road per square mile (Table 3-7). Several tributaries to Indian Creek have been evaluated by the BLM and were determined to be in properly functioning condition. However, one small tributary in the potential treatment areas has been evaluated as “functioning at risk,” but does not have an identified reason for that listing.

3.4.1.5.2 Existing Conditions – Willow Creek Watershed

The Willow Creek Watershed flows north into the Outlet Lake Fork Watershed, which drains into Blue Mesa Reservoir. Outlet Lake Fork, where Willow Creek enters, is an arm of Blue Mesa Reservoir at higher reservoir water levels. Willow Creek is a perennial stream in the project area, as is Long Draw, a headwaters tributary to Willow Creek. Elevations range from about 7,600 feet to more than 11,500 feet. The project area is in the southern portion, which is the headwater of the watershed at the highest elevations. The main stem of Willow Creek, East Fork Willow Creek, and Long Draw drain the project area near the potential treatment areas. No existing data document the conditions of the streams in this watershed on BLM lands. The USFS completed an assessment of all 6th-levelevel watersheds in 2011. The assessment documents the overall function of each watershed within the Watershed Condition Framework (USFS 2011). The Willow Creek Watershed was rated as “functioning at risk,” with an aquatic biota rating of “poor.” The watershed is relatively shallow, with nearly all slopes in the 0 to 20 percent classification (Table 3-6). The Willow Creek Watershed has a moderate road density with 1.29 miles of road per square mile (Table 3-7).

3.4.1.5.3 Existing Conditions – Little Blue Creek Watershed

Little Blue Creek flows into Big Blue Creek, which flows into Morrow Point Reservoir on the Gunnison River. Elevations range from about 8,200 feet to more than 11,500 feet. The project area is in the southern portion, which is the headwater of the watershed at the highest elevations. Little Blue Creek is a perennial stream in the project area. Middle Blue Creek, within the project area, transitions from intermittent at higher elevations to perennial near the potential treatment areas. Son-of-a-Gun Creek is an intermittent tributary to Little Blue Creek in the potential treatment areas. The watershed is moderately shallow with the majority of slopes in the 0- to 20-percent range (Table 3-6). The Little Blue Creek watershed has a moderate road density with 1.86 miles of road per square mile (Table 3-7). Blue Creek below the Little Blue Creek watershed is listed on the State of Colorado's Monitoring and Evaluation list for high levels of copper. Monitoring by the National Park Service has shown that this listing was based on an isolated sample and was likely caused by pesticide use near a pond on private lands in the Arrowhead community. Son-of-a-Gun Creek was evaluated by the BLM but no determination was made on properly functioning condition. The USFS rated this watershed as "functioning properly".

3.4.1.5.4 Existing Conditions –Big Blue Creek-Blue Creek Watershed

Big Blue Creek flows into Morrow Point Reservoir on the Gunnison River. Little Blue Creek is a major tributary that enters Big Blue Creek above Morrow Point Reservoir. Elevations range from about 7,200 feet to more than 11,400 feet. The watershed is narrow, with steep walls above the stream. The potential treatment areas are located on west-facing slopes near the upper elevations of this watershed. The main stem of Big Blue Creek is perennial and drains the project area. The watershed is moderately steep with more than one-third of the watershed located on slopes steeper than 20 percent (Table 3-6). The Big Blue Creek watershed has a relatively low road density with 0.81 miles of road per square mile (Table 3-7). Big Blue Creek is listed on the State of Colorado's Monitoring and Evaluation list for high levels of copper. One segment of Big Blue Creek was evaluated by the BLM and was determined to be "functioning at risk with an upward trend". The USFS rated this watershed as "functioning properly".

3.4.1.5.5 Existing Conditions – Headwaters Little Cimarron River Watershed

The Headwaters Little Cimarron River Watershed is the headwaters of Little Cimarron Creek, which flows into the Gunnison River downstream of Morrow Point Reservoir. Elevations range from about 8,400 feet to 13,400 feet. Van Boxel Creek and Moore Pasture Creek drain the area of the potential treatment areas. These streams are both perennial tributaries to the Little Cimarron River. The watershed is relatively shallow, with the majority of slopes less than 10 percent (Table 3-6). The Headwaters Little Cimarron River Watershed has a moderate road density with 1.44 miles of road per square mile (Table 3-7). The USFS rated this watershed as "functioning properly".

3.4.1.5.6 Existing Conditions – Pine Creek Watershed

Pine Creek flows into Morrow Point Reservoir on the Gunnison River. Within the project area, Pine Creek is a perennial stream. Elevations range from about 7,200 feet to 11,000 feet. The project area is in the southern portion, which is the headwater of the watershed at the highest elevations. The main stem of Pine Creek drains the project area. The watershed is moderately shallow with the majority of slopes in the 0 to 20 percent classification (Table 3-6). The Pine Creek Watershed has a relatively low road density, with 0.60 miles of road per square mile (Table 3-7). No watershed ratings have been completed by the BLM or USFS.

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*

Direct and indirect effects to water resources were analyzed within the six, sixth-level watersheds (Indian Creek, Willow Creek, Little Blue Creek, Big Blue Creek-Blue Creek, Headwaters Little Cimarron River, and Pine Creek) analyzed in detail.

3.4.2.1.1 Alternative A – No Action

Alternative A (No Action) would have no direct short-term effect on the water resources in the analysis area. No vegetation treatments would be implemented under this alternative. 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 would also likely 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.

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 remove 90 percent of the forest canopy.

Peak flow increases would not be measurable in the Willow Creek, Big Blue Creek-Blue Creek, Headwaters Little Cimarron River, and Pine Creek watersheds, because they are predicted to increase less than five percent compared with the existing conditions (Table 3-8). 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, peak-flow increases would be half of the change in effective forest cover (Elliot et al. 2010). 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 (Elliott et al. 2010).

The predicted increase in peak flows for the Indian Creek and Little Blue Creek Watersheds may exceed five percent. However, this analysis does not consider the changes to peak flows that have already occurred because of existing mortality of spruce trees. This mortality has likely already reduced interception of snow and changed deposition patterns of snow in a manner similar to salvage harvesting, but at a smaller scale. Therefore, the actual increases of peak flows are expected be less than those shown in Table 3-8.

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 generally not be measurable. The beneficial uses of streams in the watersheds analyzed would not be adversely affected from potential increases in peak flows and the Clean Water Act would not be violated.

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 (Elliot and Hall 2010). The

WEPP is a predictive tool used by the USDA Natural Resources Conservation Service (NRCS), 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, erosion is occurring so that best management practices can be selected to most effectively control soil loss and sediment yield.

Table 3-8 Peak Flow Analysis

Sixth-level Watershed	Watershed Area (acres)	Potential Treatment Area (acres)	Effective Treatment Area (acres)[1]	Effective Treatment Area (% of watershed)	Predicted Peak Flow Increase (%)[2]
Indian Creek	13,353	1,974	1,776	13.3%	6.7%
Willow Creek	14,787	693	623	4.2%	2.1%
Little Blue Creek	22,333	3,321	2,989	13.4%	6.7%
Big Blue Creek-Blue Creek	13,271	389	350	2.6%	1.3%
Headwaters Little Cimarron River	27,422	1,401	1,261	4.6%	2.3%
Pine Creek	17,288	317	285	1.6%	0.8%
Totals	**108,454**	**8,094**	**7,284**		

[1] Assuming 90 percent of the potential treatment areas would receive salvage treatments.
[2] Based on Elliot et al. (2010), the predicted peak flow increase would be 50 percent of the effective treatment area.

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 a skid-trail on the maximum slope of 35 percent. These modeling runs estimate the changes for hill slopes 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 from salvage operations. 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 2.1.3.8), 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 is a concern for increasing sediment yield. Several sections of existing roads would likely be used during implementation but most are located on moderate or lower erosion-hazard areas as defined by the NRCS Soil Survey Geographic Database (SURRGO). Roads that would be used for hauling and implementation activities would be reviewed in the field to ensure that adequate drainage and surfacing is present to minimize any potential sediment yield.

With the full implementation of the project design standards and BMPs (Appendix B), 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 wildfire hazard. 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.

3.4.2.2 *Cumulative Effects*

Cumulative effects to water resources were analyzed within the six, sixth-level watersheds that were analyzed in detail (Indian Creek, Willow Creek, Little Blue Creek, Big Blue Creek-Blue Creek, Headwaters Little Cimarron River, and Pine Creek Watersheds).

3.4.2.2.1 Alternative A – No Action

There has been some past forest management within the watersheds that encompass the analysis area. Past activities occurred long enough ago that that the landscape has recovered from a hydrologic-function perspective. Past road construction is the action that has had the biggest cumulative effect. However, the analysis area's streams appear to be in relatively good condition, with some exceptions. Sedimentation, 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, 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.

3.4.2.2.2 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). No information is currently available on the location or extent of these projects; therefore, the only known new effects would be the direct and indirect effects of the project analyzed in this EA, as described above.

3.4.2.3 *Plan Conformance Review*

Overall water-resource management objectives in the GFO RMP are to employ BMPs, required in all plans involving surface disturbance, to reduce soil erosion and water quality deterioration. Roads and other developments will be maintained in good condition to minimize erosion. The action alternative would implement appropriate BMPs for watershed protection (Appendix B). 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, the action alternative for the project would conform to Public Land Health Standard 5. Treatments would employ design standards and BMPs 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 insects as well as potential changes to those conditions from the proposed alternatives.

3.5.1 Affected Environment

Vegetation cover types in the analysis area, as determined by remote sensing, are predominantly spruce-fir and aspen forests (Table 3-9). The aspen stands are generally found at lower elevations on eastern aspects, while the spruce stands cover all aspects of higher elevations. Lesser amounts of mixed conifer stands and shrub lands are present at lower elevations as well. Within the potential treatment areas, Engelmann spruce is dominant with a lesser component of intermixed aspen (Table 3-10). The potential treatment areas are generally east- and north-facing with near 100-percent tree cover.

Past vegetation treatment involved thinning with removal in the 1970s and 1980s, and some patch cutting (clear cuts) in the 1980s. Some of these past activities overlap with the potential treatment areas. These treatments were largely designed to promote spruce dominance.

Table 3-9 Analysis Area Vegetation Types

Cover Type	Project Area (acres)			Analysis Area	
	Blue Mesa	High Mesa	Indian Creek	Acres	Percent
Spruce/Fir	6,678	4,161	4,453	15,292	61.4
Aspen	3,471	1,058	2,346	6,875	27.6
Douglas-fir/Mixed Conifer	332	73	923	1,328	5.3
Grassland	485	66	87	638	2.6
Shrub land	203	7	69	279	1.1
Non-vegetated	18	157	19	194	0.8
Lodgepole Pine	49	37	27	113	0.5
Riparian	36	13	27	76	0.3
Ponderosa Pine	51	-	13	64	0.3
Limber Pine	3	3	28	34	0.1
Pinyon/Juniper	1	-	-	1	0.0
Total	**11,327**	**5,575**	**7,992**	**24,894**	**100.0**

High populations of defoliating insects and bark beetles can cause substantial tree mortality; however, normal endemic populations rarely cause noticeable large-scale damage. The analysis area is experiencing an infestation of bark beetles. 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 analysis area is the spruce beetle. All of these bark beetles are endemic to the analysis area. Recent assessments of some of the potential treatment areas found bark beetles affecting nearly every spruce, and current mortality is near 100 percent (Brown 2014).

Table 3-10 Potential Treatment Area Vegetation Types

Cover Type	Potential Treatment Areas (acres)				Potential Treatment Areas (percent)
	Blue Mesa	High Mesa	Indian Creek	Total	
Spruce/Fir	3,809	1,372	1,882	7,063	83.6
Aspen	856	29	267	1,152	13.6
Douglas-fir/Mixed Conifer	62	-	86	148	1.8
Grassland	30	7	3	40	0.5
Shrub land	2	-	-	2	0.0
Non-vegetated	8	2	2	12	0.1
Lodgepole Pine	23	1	6	30	0.4
Riparian	-	4	-	4	0.0
Ponderosa Pine	-	-	-	-	0.0
Limber Pine	-	-	1	1	0.0
Pinyon/Juniper	-	-	-	-	0.0
Total	**4,790**	**1,415**	**2,247**	**8,452**	**100.0**

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*

Direct and indirect effects to vegetation were analyzed within the project areas (Figures 2-1, 2-2, and 2-3).

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 uninfected trees may become infested as beetles continue to spread within and between stands. Smaller-diameter spruce may avoid infestation and be able to mature. Natural processes would drive vegetation composition. Examination of spruce stands, following a 1940s beetle outbreak in Colorado, provides some indication of the likely post-outbreak vegetation composition in the analysis area. One study indicated that the accelerated growth of existing seedlings after a beetle outbreak 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 have continued 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 those of 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 for many decades or even centuries.

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.

3.5.2.2 *Cumulative Effects*

Cumulative effects to vegetation were analyzed within the project areas (Figures 2-1, 2-2, and 2-3) and the surrounding matrix of BLM, USFS, state, and private lands.

3.5.2.2.1 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. The majority of spruce stands would not be treated, and would continue to be affected by bark beetles. The resulting vegetation composition would be determined by natural processes occurring 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 has certainly occurred in the past, but complete records of this management do not exist. The BLM is implementing several forest-vegetation-management projects, primarily designed to improve age-class diversity and salvage beetle-infested spruce. With approximately 25,000 acres affected in the GFO, the cumulative effects of Alternative B, in the broader context of spruce decline from bark beetle, would not be significant. Nearby, the Grand Mesa, Uncompahgre, and Gunnison National Forest is analyzing potential commercial and non-commercial treatments to address spruce beetle infestations and sudden aspen decline. Should treatment occur, it is expected that the majority of lands managed by these other entities would remain untreated. Cumulatively, treatments would create a mosaic of vegetation patterns, offering a variety of conditions to guide future vegetation management.

3.5.2.3 *Plan Conformance Review*

Standard management direction, per the GFO RMP, specifically emphasizes the harvest of over-mature and pest-killed trees. Harvest treatments would be executed with project design standards to protect nearby riparian areas. The project would also conform to decisions guiding Management Unit 13.

With respect to vegetation, the proposed action 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 United States Fish and Wildlife Service (USFWS) maintains an inventory of wetland habitat for 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 zones between wetland and upland habitat (USFWS 2009).

Riparian areas shown on NWI maps occur along Moore Pasture Creek and Van Boxel Creek in the High Mesa project area (Figure 2-1); Big Blue Creek, Middle Blue Creek, Poison Draw, and Long Draw in the Blue Mesa project area (Figure 2-2); and Indian Creek in the Indian Creek project area (Figure 2-3). As shown in Tables 3-9 and 3-10, wetlands and riparian areas are limited in extent in the project areas and 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*

Direct and indirect effects to wetlands and riparian areas were analyzed within the project areas (Figures 2-1, 2-2, and 2-3).

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. Mortality and wind throw of dead trees may change the hydrology of watersheds in the project area, potentially increasing runoff in affected watersheds and contributing to increased input of water to streams and wetlands (Nature 2014). Erosion following severe wildfire may cause substantially increased sediment input to streams and wetlands, potentially impairing their function.

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 analysis 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. Machinery would remain 100 feet from perennial and intermittent streams, riparian zones, and wetland areas, and 50 feet from ephemeral drainages to minimize rutting, diversion of stream flow, soil compaction, and damage to vegetation.

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). Because salvage activities would be limited to slopes of 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 would be 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. Some beetle-affected areas have actually shown no increase in runoff when the forest is of uneven-age class, as the varied understory effectively uses the increased moisture (Stednick 2007). This may be the case for some of the proposed salvage areas.

3.6.2.2 *Cumulative Effects*

Cumulative effects to wetlands and riparian areas were analyzed within the project area (Figures 2-1, 2-2, and 2-3).

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.

3.6.2.3 *Plan Conformance Review*

The RMP states that riparian areas will be managed to maintain, restore, or improve riparian conditions (hydrological, soil and vegetation) such that proper functioning conditions are achieved, and to enhance natural values. Riparian areas will be inventoried and prioritized where necessary to determine site-specific management strategies. Strategies, projects, or improvements will be included in activity plans and will be implemented by priority, as determined by the inventory results.

The functioning level of riparian habitat in the project area is largely unknown, but the proposed salvage efforts would generally not change functional values of the resource, as project activities would avoid riparian areas. The RMP requires use of a 30-foot buffer for project activities; however, the BMPs developed for this project require a minimum of 50 to 100 feet, depending on stream type (Appendix B). Wetland habitat is not directly addressed in the RMP; however, wetlands would be protected in accordance with the BMPs developed for this project (Appendix B). Specifically, a minimum buffer of 100 feet (500 feet for fens) would be implemented.

With respect to wetlands and riparian areas, the proposed action 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 Gunnison County includes 32 species. From this state list, the BLM GFO maintains a list of 28 noxious weed species that meet one or more of the following criteria:

- Aggressively invades or is detrimental to economic crops or native plant communities;
- Is poisonous to livestock; or
- The direct or indirect effect of this plant is detrimental to the environmentally sound management of natural or agricultural ecosystems.

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*

Direct and indirect effects to invasive, non-native species were analyzed within the project areas (Figures 2-1, 2-2, and 2-3).

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.

3.7.2.2 *Cumulative Effects*

Cumulative effects to invasive, non-native species were analyzed within the project areas (Figures 2-1, 2-2, and 2-3).

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.

3.7.2.3 *Plan Conformance Review*

The RMP states that a noxious weed program, and control of noxious weeds, will be initiated in cooperation with the local county weed district, county governments, and other affected interests. The proposed salvage project would comply with the RMP in that noxious weed infestations would be treated according to BLM standards, disturbed areas would be monitored following completion project activities, and appropriate treatments would be applied to any noxious weed infestations.

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 areas are important habitat for a variety of big game species such as mule deer (*Odocoileus hemionus*), Rocky Mountain elk (*Cervus canadensis*), and bighorn sheep (*Ovis canadensis*). The High Mesa project area is located in Game Management Unit (GMU) 65; the Indian Creek and Blue Mesa project areas are located in GMU 66. Big game populations are most affected by the quality and quantity of available winter range. Thermal cover in Gunnison County is not seen as a limiting factor for big game. The proposed action has the potential to improve overall winter range of the area by opening up the canopy and increasing understory forage.

Other game species include mountain lions (*Puma concolor*) and black bears (*Ursus americanus*), which have general harvest objectives designed to maintain existing populations. Small mammals include coyote (*Canis latrans*), red fox (*Vulpes vulpes*), Nuttall's cottontail (*Sylvilagus nuttallii*), pine marten (*Martes americana*), bobcat (*Lynx rufus*), pine squirrel *(Tamiasciurus hudsonicus*), yellow-bellied marmot (*Marmota flaviventris*), in addition to a variety of other small rodents. No raptor nests are known to be within the project area; the project areas would be surveyed for raptors before any project implementation. Several species of nesting owls may occur within the project areas.

3.8.1.1 *Mule Deer*

Mule deer occupy all ecosystems in Colorado, from grasslands to alpine tundra. They reach their greatest densities in shrub lands on rough, broken terrain, which provides abundant browse and cover. In the Rocky Mountains, fall and winter diets of mule deer consist of browse from a variety of trees and shrubs. During midwinter, deer move to lower elevations and forage on more protected south-facing exposures. Mule deer are found in the project areas in all habitat types. Highest densities are found in mountain shrub and mixed conifer communities, at approximately 7,500 feet in elevation. Mule deer frequently use wet hay meadows on private lands, especially in the spring. The High Mesa project area is within Data Analysis Unit (DAU) D-40, for which there are no population data available. The Blue Mesa and Indian Creek project areas are in DAU D-25. Deer densities are slowly increasing after they hit CPW's minimum population objective in 2008; the 2011 population estimate of 5,300 is slightly above the objective (CPW 2013). Small portions of the Blue Mesa and Indian Creek project areas are located in mule deer winter range.

3.8.1.2 *Elk*

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 areas. The High Mesa project area is located in DAU E-35, for which there are no population data available. The Blue Mesa and Indian Creek project areas are in DAU E-25. The 2001 population estimate of 7,830 elk exceeded the CPW objective of 3,500-4,500 (CPW 2001). The High Mesa project area is located in summer range. The Blue Mesa project area is also primarily in summer range, with a very small portion located in winter range, production area, and in a migration corridor. The Indian Creek project area is primarily in summer range, and approximately one-third is in winter range and production area.

3.8.1.3 *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. Vegetation succession has led to declines in bighorn sheep populations in recent years on some ranges. There is no mapped habitat in the High Mesa project area or the Blue Mesa project area. Bighorns may be present in the western half of the Indian Creek project area because it is within a mapped migration corridor. No population data are available and the project areas are not within a DAU for bighorns.

3.8.1.4 *Black Bear*

Black bears can survive in practically any habitat that offers sufficient food and cover. In Colorado, black bears are most common in montane shrub lands and forests, and subalpine forests at moderate elevations--especially in areas with well-developed stands of Gambel oak or berry-producing shrubs such as serviceberry and chokecherry. The animals also occupy habitats ranging from the edge of the alpine tundra to the lower foothills and canyon country. Black bears are retiring and secretive animals for the most part, typically staying close to rough topography or dense vegetation that provides escape cover. The High Mesa project area is located in DAU B-5, within which black bear populations are stable (CPW 2011). The High Mesa project area is in summer and fall concentration areas for black bear. The Blue Mesa and Indian Creek project areas are located in DAU B-12, for which there are no population data. These two project areas are not in mapped habitat use areas.

3.8.1.5 *Mountain Lion*

Mountain lions inhabit most ecosystems in Colorado. They are most common in rough, broken foothills and canyon country, often in association with montane forests, shrub lands, and pinyon-juniper woodlands. In Colorado, much of the best mountain lion habitat is at mid elevations, such as the foothills of the Front Range. In these habitats, resident deer herds may be relatively sedentary and lions rarely make significant seasonal shifts in home range. The High Mesa project area is in DAU L-22, for which no population estimates are available, but densities are high (CPW 2004a). The Blue Mesa and Indian Creek project areas are in DAU L-21, where the population range is estimated at 170 to 217 lions, with high densities in the project areas (CPW 2004b).

3.8.1.6 *Raptors*

The following raptor species are expected to occur regularly in the project areas: golden eagle (*Aquila chrysaetos*), prairie falcon (*Falco mexicanus*), red-tailed hawk (*Buteo jamaicencis*), Cooper's hawk (*Accipiter cooperii*), sharp-shinned hawk (*Accipiter striatus*), northern goshawk (*Accipiter gentilis*), and American kestrel (*Falco sparverius*). The following species rarely occur because of the small amount of suitable habitat within the project areas: ferruginous hawk (*Buteo regalis*), rough-legged hawk (*Buteo lagopus*), Swainson's hawk (*Buteo swainsoni*), northern harrier (*Circus cyaneus)*, osprey (*Pandion haliaetus*), and peregrine falcon (*Falco peregrinus*). Golden eagles are common in the region and nest in suitable habitats, primarily cliffs and rock outcroppings; no suitable nesting habitats are known within the project areas. Prairie falcons are widespread in the region, and use cliff and rock habitats. Red-tailed hawks are the most common broad-winged hawk in the region, and are expected to occur at all elevations and in most habitat types. The forest hawks, Cooper's hawk, goshawk, and sharp-shinned hawk, occur in smaller numbers but may be found in forested landscapes. Kestrels can be found at the lower elevations.

3.8.1.7 *Pine Marten*

Pine martens are found in dense, old forest with a complex structure of understory and downed wood. They prefer spruce/fir forest, but are also found in multi-story lodgepole pine. Especially critical is the presence of many large limbs and fallen trees in the understory, known as coarse woody debris. These forests provide prey, protection, and den sites for the marten. Martens are expected to occur within the project areas at higher elevations where spruce/fir forest dominates and is adjacent to, or is commonly intermixed with, aspen. They may also occur within Douglas-fir/mixed conifer habitats, which are less common in the project areas.

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*

Direct and indirect effects to terrestrial wildlife were analyzed within the project area (Figures 2-1, 2-2, and 2-3).

3.8.2.1.1 Alternative A – No Action

Under the No Action Alternative, no direct effects are expected. Indirect effects of no active timber management would lead to natural forest succession and decomposition and heavier loadings of forest

material on the ground. Continuous fuel loading leaves 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, and could negatively affect wildlife habitat.

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

Habitat quality for different animal species 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. Natural processes, such as fire, forest insect and disease outbreaks (such as the spruce beetle epidemic associated with this project), 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 harvest, 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).

Species that are habitat generalists may be the least affected by Alternative B, while those that are habitat specialists may be the most affected. As noted above, the spruce beetle outbreak is a natural disturbance event currently influencing the landscape in the project areas. Project activities would add to the effects of the spruce beetle outbreak. Effects from the Alternative B would include temporary disturbance that could lead to displacement for some species, possible direct mortality of some individuals, reductions in habitat quality in potential treatment areas for some species (particularly species using snags and requiring overstory forest canopy), and habitat improvements for others (particularly species that use edge habitat and openings). The project design standards described in Section 2.1.3.13 would eliminate or minimize effects to raptors, big game, pine marten, and other terrestrial wildlife, and would encourage snag and coarse-woody debris retention, important habitat components for many species of terrestrial wildlife.

3.8.2.2 *Cumulative Effects*

Cumulative effects to terrestrial wildlife were analyzed within the project areas (Figures 2-1, 2-2, and 2-3).

3.8.2.2.1 Alternative A – No Action

Cumulative effects would be similar to the indirect effects discussed in Section 3.8.2.1.1. Because of the uncertainties of natural disturbances, however, it is possible that these cumulative indirect effects would not be fully realized.

3.8.2.2.2 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, has the potential to reduce habitat for some species of terrestrial wildlife by reducing forest cover. However, the proposed treatments are expected to remove variable percentages of forest habitat available to these species, depending on conditions at the time of treatment, and would retain adequate habitat to the extent that terrestrial wildlife populations would not experience measurable losses. These effects would be short-lived, as these species adjust to successional setbacks that are similar to those that would occur with

natural disturbances. Most terrestrial species have large home ranges and would be able to locate suitable habitat in adjacent areas.

3.8.2.3 *Plan Conformance Review*

The RMP requires that wildlife habitat be enhanced by improving or maintaining plant species and vegetative structure in upland and riparian areas, and by improving or maintaining wildlife habitat within forestlands. The proposed action is expected to improve wildlife habitats in the long term, and more quickly than the No Action Alternative. Wildlife objectives have been incorporated into the 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 terrestrial wildlife, because project design features (Section 2.1.3.13) would be implemented. Populations and habitats for terrestrial wildlife species would be maintained or enhanced by sustaining healthy, native plant and animal communities.

3.9 Migratory Birds

This section discusses migratory birds and their current habitat conditions, as well as potential changes to those conditions from the proposed alternatives.

3.9.1 Affected Environment

The MBTA implements various treaties and conventions between the United States and Canada, Japan, Mexico, and the former Union of Soviet Republics 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.

The Colorado Partners in Flight (CPF) and Landbird Conservation Priority Birds List (CPF 2000) were reviewed for this project. As it is highly unlikely that this project would harm adult birds, the discussion is focused on species that may find nesting habitat within the potential treatment areas.

Bird species of concern (listed by the USFWS for the Southern Rockies/Colorado Plateau) (USFWS 2008) that may find nesting opportunities within the potential treatment areas include Williamson's sapsucker (*Sphyrapicus thyroideus*), band-tailed pigeon (*Patagioenas fasciata*), boreal owl *(Aegolius funereus*), flammulated owl *(Psiloscops flammeolus*), broad-tailed hummingbird (*Selasphorus platycercus*), Grace's warbler (*Setophaga graciae*), Hammond's flycatcher (*Empidonax hammondii*), olive-sided flycatcher (*Contopus cooperi*), purple martin (*Progne subis*), red-naped sapsucker (*Sphyrapicus nuchalis*), and violet-green swallow (*Tachycineta thalassina*). Information noted below on these species was derived from The Birds of North America (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.

3.9.2.1 *Direct and Indirect Effects*

Direct and indirect effects to migratory birds were analyzed within the project areas (Figures 2-1, 2-2, and 2-3).

3.9.2.1.1 Alternative A – No Action

Under the No Action Alternative, no direct effects on migratory birds are expected to occur. Indirect effects of no active timber management would lead to natural forest succession and decomposition, leaving heavier loadings of forest material on the ground. Continuous fuel loading leaves these areas susceptible to wildfire with the potential to burn at intense temperatures closer to the ground. This could cause detrimental effects to soil fertility and structure, which could negatively affect wildlife habitat suitability.

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

A decrease in snag habitat, nesting habitat in green trees, and the potential for direct mortality (mainly of nestlings) could affect these migratory bird species with implementation of salvage harvest, hazard-tree removal, and creation of temporary roads. However, project design standards listed in Section 2.1.3.13 would be implemented; these standards require surveys to identify and protect active nests and cavities when project activities are planned during the spring nesting period (May 15 to July 15). Snag retention, required in Section 2.1.3.13, would preserve some nesting habitat for some species.

3.9.2.2 *Cumulative Effects*

Cumulative effects to migratory birds were analyzed within the Southern Rocky Mountains and Colorado Plateau physiographic regions (CPF 2000).

3.9.2.2.1 Alternative A – No Action

Cumulative effects would be similar to indirect effects discussed in Section 3.9.2.1.1, or, because of the uncertainties of natural disturbance, may not be fully realized.

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 area, has the potential to reduce nesting habitat by reducing forest cover. Cumulative activities are expected to remove variable percentages of forest habitat available to migratory bird species (depending on conditions at the time of treatment), but would retain adequate habitat such that migratory bird populations would not experience measurable losses, especially in the context of the physiographic regions. These effects are expected to be short-lived as these species adjust to successional setbacks that are similar to natural disturbances. Migratory birds are very mobile and would be able to locate suitable habitat in adjacent areas.

3.9.2.3 *Plan Conformance Review*

The RMP requires that wildlife habitat be enhanced by improving or maintaining plant species and vegetative structure in upland and riparian areas, and by improving or maintaining wildlife habitat within forestlands. The proposed action is expected to improve wildlife habitats in the long term, and more quickly than the No Action Alternative. Wildlife objectives have been incorporated into the action alternative through the use of project design standards.

Both alternatives for the project would conform to Public Land Health Standard 3, as it applies to terrestrial wildlife, because project design features (Section 2.1.3.13) would be implemented. Populations and habitats for terrestrial wildlife species would be maintained or enhanced by sustaining healthy, native plant and animal communities.

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 areas contain 11 sixth-level watersheds, all of which contain one or more potential treatment areas. All are tributaries of the Gunnison River. Five 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 Alternative B, and they are not carried forward for detailed analysis. The Indian Creek, Willow Creek, Little Blue Creek, Big Blue Creek-Blue Creek, Headwaters Little Cimarron River, and Pine Creek Watersheds were selected for detailed analysis.

3.10.1.1 *Indian Creek*

The main stem in this watershed is Indian Creek. Indian Creek is perennial and flows into the Lake Fork of the Gunnison River before entering Blue Mesa Reservoir. The Indian Creek project area is in the southern half of the watershed at the higher elevations. Several tributaries to Indian Creek evaluated by BLM are in proper functioning condition, though one tributary is rated as “functioning at risk”. Brook trout (*Salvelinus fontinalis*), brown trout (*Salmo trutta*), and rainbow trout (*Oncorhynchus mykiss*) (collectively, trout) and mountain sucker (*Catostomus platyrhynchus*), as well as an assemblage of typical aquatic insects including caddis, stone, and mayflies, are likely to occur in Indian Creek and downstream in the Lake Fork of the Gunnison River.

3.10.1.2 *Willow Creek*

The main stem in this watershed is Willow Creek. Willow Creek is perennial and flows into Outlet Lake Fork before entering Blue Mesa Reservoir. The Blue Mesa project area is in the southern-most portion of the watershed at the highest elevations. The Willow Creek watershed was rated as “functioning at risk”, with an aquatic biota rating of poor. Trout and mountain sucker, as well as typical aquatic insects, are likely occur in Willow Creek and downstream in the Outlet Lake Fork.

3.10.1.3 *Pine Creek*

The main stem in this watershed is Pine Creek. Pine Creek is perennial and flows into Morrow Point Reservoir. The Blue Mesa project area is in the southern-most portion of the watershed at the highest elevations. No watershed ratings have been compiled. Trout and mountain sucker, as well as typical aquatic insects, are likely to occur in Pine Creek and downstream into Morrow Point Reservoir.

3.10.1.4 *Little Blue Creek*

The main stem in this watershed is Little Blue Creek. Little Blue Creek is perennial and flows into Big Blue Creek, which flows to Morrow Point Reservoir. The Blue Mesa project area is in the southern half of the watershed at the highest elevations. Blue Creek below the Little Blue Creek watershed is listed on the State of Colorado’s Monitoring and Evaluation list for high levels of copper. The USFS rated this watershed as “functioning properly”. Trout and mountain sucker, as well as typical aquatic insects, are likely to occur in Little Blue Creek and downstream into Morrow Point Reservoir.

3.10.1.5 *Big Blue Creek-Blue Creek*

The main stem in this watershed is Big Blue Creek. Big Blue Creek is perennial and flows into Morrow Point Reservoir. The Blue Mesa project area is in the southern third of the watershed at the highest elevations. Big Blue Creek is listed on the State of Colorado's Monitoring and Evaluation List because of high levels of copper. One segment of Big Blue Creek was evaluated by the BLM and was determined to be "functioning at risk with an upward trend." The USFS rated this watershed as "functioning properly". Trout and mountain sucker, as well as typical aquatic insects, are likely to occur in Big Blue Creek and downstream into Morrow Point Reservoir.

3.10.1.6 *Headwaters Little Cimarron River*

The main stem in this watershed is Little Cimarron Creek. Little Cimarron Creek is perennial and flows into the Gunnison River, downstream of Morrow Point Reservoir. The High Mesa project area is in the northern third of the watershed at the lowest elevations. Van Boxel Creek and Moore Pasture Creek drain the potential treatment areas and are both perennial. The USFS rated this watershed as "functioning properly." Trout and mountain sucker, as well as typical aquatic insects including caddis, stone, and mayflies, occur in Little Cimarron Creek and downstream into the Gunnison River.

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*

Direct and indirect effects to aquatic wildlife resources were analyzed within the six sixth-level watersheds (Indian Creek, Willow Creek, Little Blue Creek, Big Blue Creek-Blue Creek, Headwaters Little Cimarron River, and Pine 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. No vegetation treatments would be implemented under this alternative. 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 (and earlier) peak flows and sediment yields, potentially affecting downstream species. Peak flows would also likely 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.

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 in the Willow Creek, Big Blue Creek-Blue Creek, Headwaters Little Cimarron River, or

the Pine Creek Watersheds (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. Predicted increases in peak flows for Indian Creek and Little Blue Creek may exceed five percent, though these may not be measurable either. 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 2.1.3.11 and Appendix B). 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 and BMPs (Appendix B), 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.

3.10.2.2 *Cumulative Effects*

Cumulative effects to water resources were analyzed within the six, sixth-level watersheds (Indian Creek, Willow Creek, Little Blue Creek, Big Blue Creek-Blue Creek, Headwaters Little Cimarron River, and Pine Creek) that were analyzed in detail.

3.10.2.2.1 Alternative A – No Action

There has been some past forest management within the watersheds encompassing the analysis area. Human activities occurred long enough in the past to have allowed recovery of hydrologic function. Past road construction is the action that has had the biggest cumulative effect. However, streams in the analysis area appear to be in relatively good condition, with some exceptions. Sedimentation, 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 treatments may be implemented in the future within the watersheds analyzed for the proposed project (Section 3.2). No information is currently available on the location or extent of these projects; therefore, the only known new effects would be the direct and indirect effects of the project analyzed in this EA. 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 past vegetation treatments would not be measureable. The

proposed project, when added to the past, current, and reasonably foreseeable activities, would cause no detectable cumulative effects. The actions proposed would likely improve watershed conditions in the long term, which would benefit downstream aquatic species and their habitat.

3.10.2.3 *Plan Conformance Review*

Overall fishery resource (aquatic habitat) management objectives in the GFO RMP are to manage fishery streams and associated riparian areas managed to improve or maintain the existing ecological status (hydrological, soil and vegetation). Surface disturbing activities will be designed with measures to prevent or mitigate damage to or loss of fishery stream channels and associated riparian habitat. The Proposed Action Alternative would implement BMPs for watershed protection (Appendix B), which include measures to minimize effects to stream channels and riparian habitat; therefore, the proposed project would conform to the RMP.

Both action alternatives for the project would conform to Public Land Health Standard 3 with respect to aquatic wildlife, because project design features (Section 2.1.3.11 and Appendix B) 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 GFO verified the USFWS list of threatened, endangered, candidate, and proposed (TECP) wildlife species that may occur within the project area (USFWS 2015). Upon closer inspection of potentially affected species, it was determined that Canada lynx *(Lynx canadensis)* may occur in the project areas. Other species, including the Gunnison sage-grouse (*Centrocercus minimus*), Mexican spotted owl *(Strix occidentalis lucida)*, yellow-billed cuckoo (*Coccyzus americanus*), bonytail chub (*Gila elegans*), Colorado pikeminnow (*Ptychocheilus lucius*), humpback chub (*Gila cypha*), razorback sucker (*Xyrauchen texanus*), and greenback cutthroat trout (*Oncorhynchus clarki stomias*) were eliminated from analysis because their habitat was not in or near the project areas, or they were not reasonably expected to be affected by the project. The project areas contain suitable greenback cutthroat trout habitat, but they are all occupied by non-native salmonid species, precluding their presence.

Of the BLM sensitive species identified by the state director (BLM 2009), American peregrine falcon, northern goshawk, and Townsend's big-eared bat *(Corynorhinus townsendii pallescens)* were identified as potentially occurring within the project areas. Table 3-11 lists the special status species that were analyzed in detail, and provides brief descriptions of their habitat and potential to be affected by the project.

Table 3-11 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)*.	Possible. Suitable habitat is present in the project areas.
American Peregrine Falcon	BLM Sensitive	Cliffs, open habitats, below 10,000 feet in elevation.	Possible. Cliff habitat is absent in the potential treatment areas, but present in the project areas; foraging habitat is present. Potential nest sites would be identified during wildlife surveys.
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 in elevation.	Possible. Suitable habitat is present in project areas. 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.	Unlikely. Suitable foraging habitat occurs within the project areas. Potential roost sites would be identified during wildlife surveys.

3.11.1.1 *Canada Lynx*

Lynx inhabit dense subalpine spruce-fir forests with rock outcrops and large boulders. Lynx habitat in the Southern Rocky Mountains is in the subalpine and upper montane forest zones, generally between 8,000 and 12,000 feet in elevation. Lynx have also been found in riparian and valley-wetland shrub habitats of the upper-montane and subalpine zones (Interagency Lynx Biology Team [ILBT] 2013). Snowshoe hares are the primary prey for lynx across their range and are most common in the Southern Rocky Mountains in older, multistoried spruce/fir stands with dense horizontal cover, as well as dense, younger lodgepole pine stands (ILBT 2013). Red squirrels are an important secondary prey for lynx and are most common in mature spruce/fir forests (ILBT 2013). Additional, detailed information on habitat requirements, life history, biology and ecology, and general risk factors for the Canada lynx can be found in the LCAS (ILBT 2013).

Through radio-telemetry, CPW researchers have confirmed lynx presence, dispersal, and reproduction on lands managed by the GFO (Shenk 2005). CPW monitoring of radio-collared lynx from April 2000 to April 2009 (Shenk 2009), and an assessment of “population-level” habitat use from 1999 through 2010 (Theobald and Shenk 2011), indicated that portions of the High Mesa and Blue Mesa project areas are located within low- to moderate-use intensity areas. The Indian Creek project area was not mapped as part of these use areas; however, occasional lynx locations were mapped in this area during some years of the study (Theobald and Shenk 2011). Based on these studies, lynx are assumed to be present in suitable habitats in the project areas.

Several Lynx Analysis Units (LAUs) have been delineated in and near the project areas (Figure 3-2). An LAU is an analysis unit within which direct, indirect, and cumulative effects of proposed projects to lynx are evaluated. The High Mesa project area is located in the Little Cimarron LAU. The Blue Mesa project area is located in the Blue/Pine Creek LAU and the Lake Fork Gunnison LAU. The Indian Creek project area is located in the Cebolla Creek LAU and Lake Fork Gunnison LAU. The project areas are not within an established habitat linkage or designated critical habitat.

Suitability of lynx habitat in the project areas has not been field-verified. Anecdotal information suggests that most stands mapped as suitable lynx habitat are, in fact, suitable. Spruce beetles have killed a substantial portion of the spruce overstory in some stands and, over the next few years, are expected to continue to kill larger spruce throughout the project areas. The remainder of the analysis for lynx assumes all mapped habitat is currently suitable. This represents a more conservative approach and may overestimate the actual amount of currently suitable lynx habitat, especially considering the rapidly advancing spruce beetle outbreak. Suitable lynx habitat in the LAUs occurs in both the project areas and potential treatment areas. Table 3-12 provides a summary of the environmental baseline for lynx habitats in project area LAUs.

Table 3-12 Environmental Baseline for Lynx Habitat

LAU	Lynx Habitat			Non-Habitat	Total LAU Acres
	Suitable	Unsuitable	Total		
	Acres (% of Total Lynx Habitat)		Acres (% of LAU)		
Little Cimarron	16,514 (96%)	630 (4%)	17,144 (34%)	33,551 (66%)	50,695
Blue/Pine Creek	30,861 (97%)	962 (3%)	31,823 (48%)	34,362 (52%)	66,185
Lake Fork Gunnison	48,153 (98%)	1,031 (2%)	49,185 (41%)	71,033 (59%)	120,218
Cebolla Creek	63,310 (97%)	1,747 (3%)	65,057 (42%)	90,004 (58%)	155,061

3.11.1.2 *Peregrine Falcon*

Peregrine falcon habitat includes nesting and hunting sites, as well as migration and wintering areas. Typical nesting sites are cliffs more than 200-feet high that overlook water and permit extensive views of the surrounding area. Prey abundance and diversity provided by these situations are major factors in aerie (nest) selection. Peregrines may travel up to 17 miles from nesting cliffs to hunting areas. Preferred hunting habitats include cropland, meadows, river bottoms, marshes, and lakes that provide an abundance of avian prey. Birds are occasionally reported in Colorado during the winter, but most peregrines migrate to Central and South America.

Peregrine falcons in the area are found in the roughest, most rugged, inaccessible areas BLM manages. Large canyon complexes with extensive rock are typically used during the breeding season. There are no known peregrine falcon aeries near the project areas.

Recovery goals for nesting peregrines were exceeded several years ago. CPW documents more than 100 nesting pairs of peregrines in Colorado each year. The peregrine was down-listed from a federal-threatened species to a state-listed species of special concern as recovery progressed. The BLM considers the peregrine falcon to be a sensitive species.

Cliff habitats that are required by peregrine falcons for nesting are absent in the potential treatment units, but are found nearby in the project areas (for example, on the edges of High Mesa). Peregrines may forage in the project areas. They are not expected to forage in the potential treatment units because of the continuous forest canopy.

3.11.1.3 *Northern Goshawk*

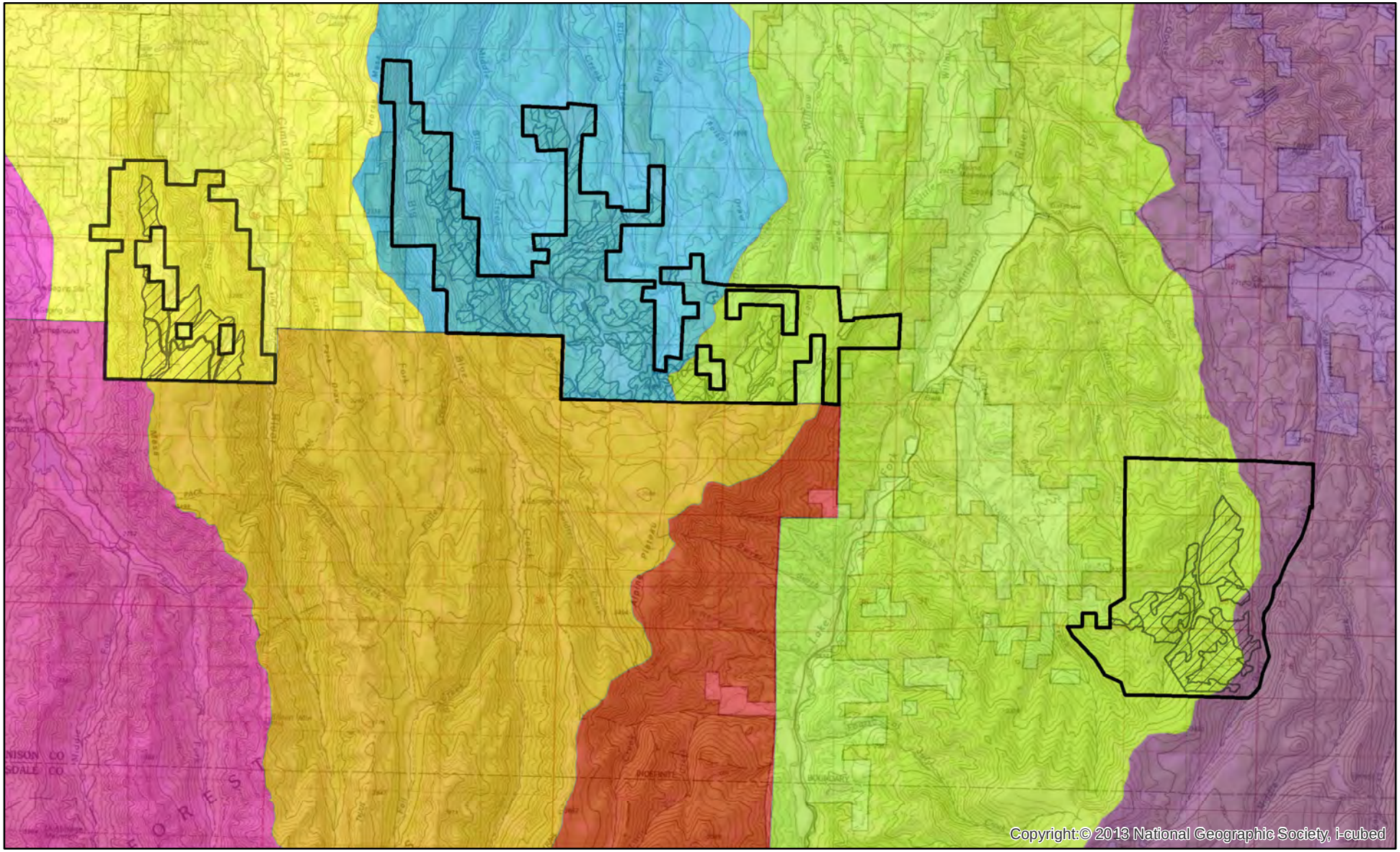
Northern goshawks primarily nest in older coniferous and mixed coniferous/deciduous forests with a high (greater than 60 percent) canopy closure. Their diet consists of small mammals such as ground squirrels and cottontail rabbits, and birds such as flickers and jays. Northern goshawks hunt from tree perches; therefore, an open understory contributes to successful prey capture. The main forest types occupied in the project areas are ponderosa pine, mixed-conifer, and spruce-fir. Average nest-tree size is variable, with mean-tree diameters ranging from 8- to 20-inches in Colorado. Goshawks appear to prefer denser tree stands on flatter slopes for nesting sites, and require large areas of continuous forest with only small (less than one acre) clearings for foraging and nesting. Nests can also be in stands of aspen and are commonly found near streams. Northern goshawks occupy home-range sizes of approximately 6,000 acres. Home ranges are comprised of nest areas (30 acres), post fledging-family areas (420 acres), and foraging areas (5,400 acres). Nests are usually located in a north-facing drainages or canyons. Nest areas are occupied by breeding pairs from early March until late September. Nests are typically large stick platform structures built in a fork near the trunk of the tree or on a large branch, and are usually 30 to 40 feet from the ground in the lower two-thirds of the tree crown. Goshawks often build more than one nest, with additional nests in adjacent trees or trees up to one mile from the active nest. The birds may alternate between one or more of these nests each year. Goshawks occupy the same territory year after year, and sometimes reuse the same nest.

In 1991, the USFWS was petitioned to list the southwestern United States population of northern goshawks as threatened. The USFWS determined that insufficient data existed to warrant listing. The Southwestern Region of the USFS listed northern goshawk as a sensitive species in 1992 and the BLM subsequently listed the species as sensitive as well. Declines may be caused by logging and to a lesser extent fire suppression, livestock grazing, drought, and pesticides. Goshawks are limited by prey and habitat availability. Goshawks are rare on BLM lands but habitat exists for the species in the project areas.

3.11.1.4 *Townsend's Big-Eared Bat*

Townsend's big-eared bat occurs throughout Colorado. Distribution is determined by availability of roosts, such as caves, mines, tunnels, crevices, and masonry structures with suitable temperatures. They can be found in structures in woodlands and forests up to elevations of 9,500 feet or more.

They are generally solitary or gather in small groups, although during the summer females may form larger maternity colonies. They often hang near the entrances to roosts, in the "twilight zone." The animals do not make major migrations and appear to be relatively sedentary. Hibernacula (sheltering places) have low and stable temperatures, sometimes with moderate airflow, during late October to April. While hibernating, the bats hang singly or in small clusters in the open, not in crevices. The bat is quite sensitive to changes in temperature and humidity within the hibernaculum and may arouse to move to a more favorable location. Populations may be principally limited by high winter mortality caused by the absence of roosts with stable temperatures. Most mortality occurs during the first year of life. Predators have not been documented, but snakes, owls and hawks probably take these bats (Colorado Natural Heritage Program [CNHP] 2015a). Occurrence of this species in the project areas would be rare, but not impossible. No caves, mines, or buildings suitable for roosting are known to exist in the project areas.



SW Gunnison Bark Beetle Salvage EA
Figure 3-2 Lynx Analysis Units
Bureau of Land Management
Gunnison Field Office

Date: 5/28/2015

N
W E
S

Legend

- Project Areas
- Potential Treatment Areas
- Alpine
- Blue/Pine Creek
- Cebolla Creek
- Lake City
- Lake Fork Gunnison
- Little Cimarron
- Turret Ridge

0 1.5 3 6 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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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*

Direct and indirect effects to peregrine falcon, northern goshawk, and Townsend's big-eared bat were analyzed within the project areas (Figures 2-1, 2-2, and 2-3). Direct and indirect effects to Canada lynx were analyzed within the Little Cimarron, Blue/Pine Creek, Lake Fork Gunnison, and Cebolla Creek LAUs.

3.11.2.1.1 Alternative A – No Action

Under the No Action Alternative, no direct effects are expected for any of the special status species analyzed. Indirect effects of no active timber management would be those of natural forest succession and decomposition, which would leave heavier loadings of forest material on the ground. Continuous fuel loading leaves 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 that could negatively affect habitat suitability. The possibility of this chain of events occurring is speculative; therefore, no measureable indirect effects to special status species are expected. A more detailed analysis is provided for Canada lynx.

The main factor influencing lynx habitat is the spruce beetle epidemic. Under the No Action Alternative there would be no direct effects to lynx, as no human-influenced vegetation management activity would occur. Suitable habitat would likely be converted to lower quality (and perhaps unsuitable) habitat as spruce die. However, depending on the density of the infestation, the amount of tree regeneration, and existing horizontal cover, the combination of live and dead vegetation may be sufficient to maintain suitable lynx habitat of varying quality. Over time, a patchy distribution of coarse woody debris (both standing dead and down trees) and newly regenerating trees and shrubs would develop across the landscape. Some areas would improve in quality as jackstraw piles form, root wads are exposed, and more coarse woody debris becomes available for denning. Other areas would become more open, releasing the understory vegetation. Areas with a dead overstory and no developed understory would become unsuitable, and lynx may only move through these areas to access other, more favorable areas. The extent of habitat that could be converted to an unsuitable condition is not known at this time, as many of the infested stands still have a green-tree component.

The spruce beetle epidemic is likely to affect lynx indirectly by affecting the population dynamics of the lynx's primary and main alternate prey species: the snowshoe hare and red squirrel. A substantial loss of mature cone-producing trees (the main food source for squirrels) is expected because of the high level of mortality of overstory spruce (more than 95 percent in some stands); therefore, it is reasonable to assume the red squirrel population would decline. Little research has addressed how red squirrels respond to insect infestations (Koprowski et al. 2005). However, red squirrel populations declined significantly in areas with more than 40 percent mortality of spruce caused by beetle infestations in Alaska (Matsouka et al. 2001) and Colorado. Effects of a spruce beetle epidemic on snowshoe hares would depend on the amount of developed understory vegetation present and rates of tree regeneration. With widespread mortality of spruce, it is possible that both the primary (snowshoe hare) and secondary (red squirrel) prey for lynx would become substantially less abundant for many years. These effects are likely to have a substantial influence on the environmental baseline for lynx within the analysis area.

Under this alternative, there would be no human-influenced (in terms of habitat manipulation) effects on lynx movement. No additional roadwork would occur beyond standard road maintenance activities and implementation of the 2010 Travel Management Plan. Overall, this alternative may offer the best opportunity for lynx, in that it would be most likely to create a continued mosaic pattern of lynx habitat across the landscape, with a mix of habitat types as influenced by natural processes.

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 are caused by the proposed action and occur contemporaneously. Potential direct effects include temporary disturbance caused by salvage harvest and possible, but unlikely, mortality of individual lynx. Lynx kittens are vulnerable when very young. They could be present nearby or in den sites while salvage operations are taking place, and could potentially be injured or killed by logging equipment and activities. However, because of wet soil conditions, much of the salvage activity is expected to take place during the summer, fall, and winter months (outside of the lynx denning period [April to late June]). Harvest of dead trees could cause mortality to lynx—particularly young kittens—from felling trees, but this is extremely unlikely because of the noise and human activity that would cause lynx to be displaced from the area at the onset of harvest. Mortality could also occur from collisions with logging trucks or other project vehicles. However, neither the level of traffic nor the speed of traffic would reach a level where the probability of a vehicle-lynx collision measurably increases.

Noise and human activity from salvage operations may reduce lynx use of the potential treatment areas and habitat adjacent to haul routes. Few studies have examined how lynx react to human presence. Some level of recreation may be compatible, but lynx may avoid areas of concentrated use in developed ski areas (ILBT 2013). Active timber harvest operations tend to have a high level of noise and human activity, not unlike concentrated use in ski areas; therefore, it is reasonable to assume lynx would be displaced from the potential treatment areas during operation. Habitats outside of the active treatment areas and haul routes would be available for use by displaced lynx. Displacement of lynx is expected to be short-term, with resumed use of the area once operations are completed. Salvage harvest and associated activities could occur throughout each year for a period up to 10 or more years, but would be staggered spatially and temporary and would not affect the entire analysis area at once. Nevertheless, the possibility remains that individual lynx could be displaced in any given year over the life of the project. Displacement may cause increased energy expenditure by lynx for avoidance of activities and movement to undisturbed habitats.

Indirect effects are caused by the proposed action and may be contemporaneous or occur later in time, but are reasonably certain to occur. Potential indirect effects include changes to habitat for lynx, snowshoe hares, and red squirrels, as well as a temporary increase in snow compaction.

The proposed action includes salvage harvest and related activities on up to 7,545 acres of suitable lynx habitat and 909 acres of unsuitable lynx habitat (Table 3-12). For this analysis, it was assumed that harvest activities would convert all currently suitable lynx habitats in the potential treatment areas to the Stand Initiation Structural Stage (SISS), as defined by the Lynx Conservation Assessment and Strategy (LCAS) (ILBT 2013). Changes in habitat in each of the four LAUs analyzed are shown in Tables 3-13, 3-14, 3-15, and 3-16. However, it is important to keep in mind that the main factor affecting lynx habitat and their prey base is the spruce beetle itself; the activities associated with the proposed project are additive to this natural event. Salvage harvest would further contribute to the effects of spruce beetle by removing dead, dying, and high-risk spruce, reducing canopy cover, coarse woody debris, and other habitat components.

Table 3-13 Lynx Habitat Change in the Little Cimarron LAU

Habitat Type	Baseline (acres)	Treated (acres)	Net Change (acres)	Post-Treatment Habitat (acres)	Total Post-Treatment Lynx Habitat in LAU (percent)
Suitable	16,514	1,107	-1,107	15,407	90
Unsuitable / SISS	630	309	+1,107	1,737	10
Lynx Habitat Total	17,144	1,416	0	17,144	100
Non-Habitat	33,551	1	0	33,551	Not applicable
LAU Total	50,695	1,417	0	50,695	Not applicable

Table 3-14 Lynx Habitat Change in the Blue/Pine Creek LAU

Habitat Type	Baseline (acres)	Treated (acres)	Net Change (acres)	Post-Treatment Habitat (acres)	Total Post-Treatment Lynx Habitat in LAU (percent)
Suitable	30,861	3,429	-3,429	27,432	86
Unsuitable / SISS	962	600	+3,429	4,391	14
Lynx Habitat Total	31,823	4,029	0	31,823	100
Non-Habitat	34,362	0	0	34,362	Not applicable
LAU Total	66,185	4,029	0	66,185	Not applicable

Table 3-15 Lynx Habitat Change in the Lake Fork Gunnison LAU

Habitat Type	Baseline (acres)	Treated (acres)	Net Change (acres)	Post-Treatment Habitat (acres)	Total Post-Treatment Lynx Habitat in LAU (percent)
Suitable	48,153	2,809	-2,809	45,344	92
Unsuitable / SISS	1,031	0	+2,809	3,840	8
Lynx Habitat Total	49,185	2,809	0	49,185	100
Non-Habitat	71,033	0	0	71,033	Not applicable
LAU Total	120,218	2,809	0	120,218	Not applicable

Table 3-16 Lynx Habitat Change in the Cebolla Creek LAU

Habitat Type	Baseline (acres)	Treated (acres)	Net Change (acres)	Post-Treatment Habitat (acres)	Total Post-Treatment Lynx Habitat in LAU (percent)
Suitable	63,310	200	-200	63,110	97
Unsuitable / SISS	1,747	0	+200	1,947	3
Lynx Habitat Total	65,057	200	0	65,057	100
Non-Habitat	90,004	0	0	90,004	Not applicable
LAU Total	155,061	200	0	155,061	Not applicable

Salvage operations would affect the quality and quantity of lynx habitat in the analysis area through the removal of dead trees that would have eventually provided lynx denning areas once the trees fell to the ground. Project design standards (listed in Section 2.1.3.7 and 2.1.3.13) would be implemented to maintain snags, logs, and coarse woody debris; however, the potential for large accumulations of coarse woody to develop would be reduced in the long-term because of the removal of most of the mature spruce. Outside of the potential treatment areas, dead spruce would remain and are expected to provide future habitat structure for denning. Once the project is completed, between 86 and 97 percent of the lynx habitat in each LAU would remain suitable (Tables 3-13, 3-14, 3-15, and 3-16) and is expected to provide sufficient denning opportunities.

The proposed action would reduce the extent and density of understory vegetation and horizontal cover in the potential treatment areas. Between 0 and 11 percent of each LAU would be converted to the SISS by the proposed action (Tables 3-13, 3-14, 3-15, and 3-16). Combined with the environmental baseline, between 3 and 14 percent of the lynx habitat in each LAU would be in an unsuitable condition. Project design standards (listed in Section 2.1.3.7 and 2.1.3.13) would be implemented to maintain advanced regeneration, understory vegetation, and dense horizontal cover; however, salvage operations would incidentally remove some of these habitat components. Temporary roads, skid trails, and landings would be needed to remove the harvested overstory. These project features would damage or remove some advanced regeneration and understory vegetation, as well as breaking up horizontal cover. The loss of horizontal cover is the primary reason the treated stands would be converted to the SISS and become temporarily unsuitable for lynx. Despite the increase in habitat in the SISS, each LAU would remain substantially below the 30 percent threshold recommended by the ILBT (2013).

In the long-term (two to three decades), treated stands are expected to regenerate to spruce, producing dense horizontal cover, and once again becoming suitable for lynx. The development of mature spruce that could provide down logs and coarse woody debris would require a century or more. Outside of the potential treatment areas, understory vegetation and horizontal cover would not be affected by the proposed action and may increase once the overstory is dead because suppressed trees would be released and more light, nutrients, and water would be available for growth. The vegetation that would remain is expected to be sufficient to provide cover for lynx moving through, or foraging in, the project areas.

The incidental loss of understory vegetation would reduce the quality and quantity of habitat for snowshoe hares, reducing their use of the potential treatment areas and displacing them to adjacent untreated areas that provide better habitat. Snowshoe hare habitat in the potential treatment areas, which represent between 0 and 11 percent of each LAU (Tables 3-13, 3-14, 3-15, and 3-16), would no longer be suitable for winter foraging. The reduction in hare habitat is expected to reduce the density of hares that are available as prey for lynx. Foraging opportunities for lynx would be reduced in proportion to the reduction in habitat for snowshoe hares. The reduction in foraging opportunities may increase the foraging range for lynx, leading to greater energy expenditure and increasing their exposure to predation or other mortality factors. As noted above, understory vegetation and horizontal cover are expected to recover and provide suitable habitat for snowshoe hares within 20 to 30 years following completion of project.

The proposed action is not expected to have any measurable effect on red squirrels in the analysis area. As described in the Environmental Baseline, the ongoing spruce beetle infestation is expected to cause the red squirrel population to decline. The proposed action would not exacerbate this decline because the spruce that are removed would be dead or dying and would no longer be providing a food source for red squirrels.

The proposed action is not located within lynx linkage areas and the potential treatment areas are relatively small. Lynx dispersal and habitat connectivity would not be affected because the potential

treatment areas are relatively small in the context of the LAUs and because the project design criteria (listed in Section 2.1.3.7 and 2.1.3.13) would maintain sufficient cover, even in the potential treatment areas, to allow for continued movement of lynx.

The proposed action would likely include winter logging, which would temporarily increase snow compaction above baseline conditions for a period of 10 or more years. Roads and skid trails used for winter logging would be plowed or compacted. Snow would also be compacted within potential treatment areas in association with creation of skid trails and harvest of dead trees. No new permanent snow compaction would be created by the proposed action. Temporary snow compaction would not occur equally throughout the analysis area but rather would be distributed spatially and temporally depending on the locations of timber sales that are active in the winter throughout the life of the project. Within a given a sale area, increased snow compaction would only occur in the period (typically one year) within which logging occurs.

3.11.2.1.2.2 Peregrine Falcon

Nesting habitat for peregrine falcon is absent, but the species may forage in open areas within the project areas. All treatments would occur within timbered areas; therefore, no direct effects are expected. Vehicle traffic coming to and from the potential treatment areas through foraging areas may temporarily discourage foraging, though the effects on foraging behavior would be insignificant.

3.11.2.1.2.3 Northern Goshawk

A decrease in nesting habitat in green trees and the potential for direct mortality (mainly of nestlings) are possible effects for northern goshawk with implementation of salvage harvest, hazard-tree removal, and creation of temporary roads. However, project design criteria (Sections 2.1.3.7 and 2.1.3.13) would be implemented, requiring pre-project nest surveys following accepted survey protocols, which would protect active nests and territories. Results of the surveys would be used to establish locations for buffers and timing limitations. Salvage actions could reduce nesting habitat and foraging opportunities. These effects would be short-lived, as prey availability is expected to increase in treated areas. In addition, nesting suitability of treated stands has likely already been lost because of spruce beetle mortality in the overstory.

3.11.2.1.2.4 Townsend's Big-Eared Bat

Roosting sites for Townsend's big-eared bat have not been found in the project areas; therefore, direct effects are not anticipated. Nighttime foraging behavior would not be affected by daytime project activities. Alternative B would not alter the level of habitat suitability in the project areas for Townsend's big-eared bats. Implementation of project design standards in Sections 2.1.3.7 and 2.1.3.13 would also ensure that potential roost habitats are not disturbed.

3.11.2.2 *Cumulative Effects*

Cumulative effects to peregrine falcon, northern goshawk, and Townsend's big-eared bat were analyzed within the project areas (Figures 2-1, 2-2, and 2-3). Cumulative effects to lynx were analyzed in the Little Cimarron, Blue/Pine Creek, Lake Fork Gunnison, and Cebolla Creek LAUs.

3.11.2.2.1 Alternative A – No Action

Alternative A would have no cumulative effects on special status wildlife species 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 shown in Tables 3-13 through 3-16, Alternative B would increase the amount of unsuitable lynx habitat in all four LAUs. All known completed and planned vegetation treatments are accounted for in Tables 3-13 through 3-16. As shown in Tables 3-13 through 3-16, the amount of unsuitable lynx habitat would be substantially less than 30 percent recommended by the LCAS. A substantial proportion of the suitable habitat in the LAU would remain available to lynx. In the long term (20 to 30 years), the proposed project may increase the quality of habitat for lynx and snowshoe hare, once sufficient horizontal cover and winter foraging opportunities for snowshoe hare are re-established in the treated areas. Alternative B would not cause adverse cumulative effects to Canada lynx in any of the four LAUs affected. Non-federal actions are not anticipated to affect the condition of lynx habitat in the LAUs; nor are they likely to influence Canada lynx.

3.11.2.2.2.2 Peregrine Falcon

The proposed action is not expected to decrease the overall available habitat for this species; therefore, there would be no cumulative effects to this species.

3.11.2.2.2.3 Northern Goshawk

Alternative B would contribute to a decrease in the overall availability of forested habitat for this species; however, much of this loss has already occurred because of the continuing spruce beetle infestation. The application of buffers around nests would maintain suitable habitat where it is currently in use by goshawks.

3.11.2.2.2.4 Townsend's Big-eared Bat

The proposed action is not expected to decrease the overall available habitat for this species; therefore, there would be no cumulative effects to this species.

3.11.2.3 *Plan Conformance Review*

The RMP requires that special status species habitat be maintained and protected to ensure suitable habitat conditions and viable populations. Measures to protect these species and associated habitat are required in all plans for surface-disturbing activities. Section 7 Consultations will be conducted with the USFWS regarding potential effects to federally listed species. The proposed project is expected to improve wildlife habitats in the long term, and more quickly than the No Action Alternative. Special status species objectives have been incorporated into the Proposed Action Alternative through the use of project design standards (Section 2.1.3), including requirements in the RMP; therefore, the proposed project would conform to the RMP.

Both alternatives would conform to Public Land Health Standard 4, with respect to special status wildlife, because project design features (Section 2.1.3) would be implemented. Populations and habitats for special status wildlife species would be maintained or enhanced by sustaining healthy, native plant and animal communities.

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 2015). In addition, Field Offices may include other plant species of concern that are not federally listed or BLM special status species.

The GFO maintains a list of BLM sensitive and species of concern plants. There are 27 special status plant species (8 sensitive and 19 species of concern) for the GFO. No plants listed, or proposed for listing, as endangered or threatened under the Endangered Species Act are included on the GFO's list. Table 3-17 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 27 species.

Table 3-17 Special Status Plant Species

Scientific Name, Common Name, Status	Description/Habitat	Potential to be Affected by Project Activities
Aliciella (Gilia) penstemonoides Black Canyon Gilia GFO Species of Concern	Plants up to 10 cm in height. Flowers blue, blooming June to August. Habitat is cracks on vertical walls, narrow ledges, and cliffs. Elevation 6,800 to 9,000 feet (CNHP 2015b).	None. No suitable habitat would be affected by project activities. Plant generally limited to the Black Canyon of the Gunnison.
Astragalus anisus Gunnison Milkvetch BLM Sensitive	Dwarf plant 5 to 10 cm in height. Pink to purple flowers, blooms May to June. Habitat is dry gravelly flats and hillsides, in sandy clay soils overlying granitic bedrock, usually among or under low sagebrush. Elevation 7,500 to 8,500 feet (CNHP 2015c).	None. Plants grow at elevations below the project areas and in habitat not likely to be affected by project activities.
Astragalus iodopetalus Violet Milkvetch GFO Species of Concern	Plant up to 20 cm in height with violet flowers, blooming May to June. Habitat is dry stony hillsides and benches or among sagebrush. Elevation 6,512 to 7,264 feet. Known from north side of Big Mesa in sagebrush areas (CNHP 2015d).	None. Plants grow at elevations below the project areas and in habitat not likely to be affected by project activities.
Astragalus microcymbus Skiff Milkvetch BLM Sensitive	Purple stems up to 60 cm in height. White flowers tinged with purple. Blooms May to early July. Habitat is open sagebrush or juniper-sagebrush on moderately steep to steep slopes, often in rocky areas with variable soils. Elevation 7,600 to 8,400 feet (CNHP 2015e).	None. Plants grow at elevations below the project areas and in habitat not likely to be affected by project activities.

Table 3-17 Special Status Plant Species

Scientific Name, Common Name, Status	Description/Habitat	Potential to be Affected by Project Activities
Arabis (Boechera) crandallii Crandall's Rockcress BLM Sensitive	Plants up to 40 cm in height with white-pinkish flowers, blooming May to June. Habitat is limestone chip-rock and stony areas, often among sagebrush, ridges, and steep hill slopes. Elevation 8,176 to 10,607 feet (CNHP 2015f).	None. Plants grow in habitat not likely to be affected by project activities.
Botrychium minganense Mingan Moonwort GFO Species of Concern	A small fern-like plant approximately two inches in height. Habitat is disturbed areas, either natural such as avalanche zones and rockslide areas, or manmade such as roadside ditches and logging roads more than 10 years after disturbance. Most abundant above 9,000 feet. (Southwest Colorado Wildflowers 2015).	Possible, but only in limited areas with suitable habitat. This species would be included in project specific surveys in areas designated for salvage activities.
Botrychium pinnatum Northwestern Moonwort GFO Species of Concern	A small fern-like plant approximately two inches in height. Habitat includes closed canopy forests, but most common in moist grassy sites in open forests and meadows. Most abundant above 9,000 feet. (Farrar and Popovich 2010).	Possible, but only in limited areas with suitable habitat. This species would be included in project specific surveys in areas designated for salvage activities.
Carex stenoptila Small-Winged Sedge GFO Species of Concern	Wetland sedge up to 70 cm in height. Found along streamsides. Fruits late summer. Elevation 7,800 to 9,500 feet.	None. Project activities would avoid riparian areas, wetlands, and stream habitat.
Cirsium perplexans Rocky Mountain Thistle GFO Species of Concern	Tap rooted plant up to 100 cm in height with reddish-purple flowers, blooming May to August. Habitat almost exclusively on barren clay soils or "adobe hills" that are derived from shales of the Mancos or Wasatch formations. Associated plant communities have been described as pinyon-juniper woodlands, and sagebrush, saltbrush, and mixed shrub lands. Elevation 4,892 to 8,373 feet (CNHP 2015g).	None. Plants typically grow at elevations below the project areas and in habitat not likely to be affected by project activities.
Cryptantha (Oreocarya) osterhoutii Osterhout's Cryptantha BLM Sensitive	Plants 10 cm in height with white flowers, blooming April to June. Habitat dry, barren sites, in reddish-purple decomposed sandstone. Elevation 4,500 to 6,100 feet. Known from just south of Blue Mesa (CNHP 2015h).	None. Plants typically grow at elevations below the project areas and in habitat not likely to be affected by project activities.
Cryptogramma stelleri Fragile Rockbrake BLM Sensitive	Delicate fern flourishing in early spring. Found scattered on moss and duff, in the shade of moist coniferous forests, in crevices in calcareous rocks in shaded localities with dripping water. Grows in horizontal crevices of moist, shaded limestone cliffs. Elevation 7,825 to 13,458 feet (CNHP 2015i).	None. Project activities would avoid effects to riparian and stream habitat.
Draba graminea Grass-like Draba GFO Species of Concern	Plants 1 to 5 cm in height. Yellow flowers, blooming usually in late snowmelt areas, July to August. Habitat is rocky alpine scree. Elevation 9,600 to 13,684 feet. Populations known from American Flats (CNHP 2015j).	None. Limited to the western San Juan Mountains. Project activities would be limited to forested areas below tree line.

Table 3-17 Special Status Plant Species

Scientific Name, Common Name, Status	Description/Habitat	Potential to be Affected by Project Activities
Draba porsildii Porsild's Whitlow-Grass GFO Species of Concern	Small plant up to 6 cm in height with white flowers, blooming June to July. Habitat is scree and grassy meadows along ridges, slopes, and summits in the alpine zone. Elevation 9,600 to 13,100 feet. Known from Grizzly Gulch (Wyoming Natural Diversity Database 2015).	None. Project activities not likely to affect suitable habitat.
Eriogonum coloradense Colorado Wild Buckwheat BLM Sensitive	Densely matted plant 6 to 10 cm in height. White to pinkish flowers, blooming July to August. Occurs over a wide range of habitat and soil types, but most often found on rocky slopes at higher elevations. Elevation 8,714 to 14,258 Ft. Known from Cochetopa Park (CNHP 2015k).	None. CNHP records indicate occurrences at higher elevations in northern Gunnison County (CNHP 2015k).
Eriophorum altaicum var. *neogaeum* Altai Cottongrass GFO Species of Concern	Plants 5 to 35 cm in height. Flowers fuzzy white, blooming July to August. Habitat is high wetland fens. Elevation 9,500 to 14,000 feet (CNHP 2015l).	None. Plant typically occurs at higher elevations in fen or wet meadow type habitat. Project activities would not affect any wetland or fen habitat.
Eriophorum chamissonis Chamisso's Cottongrass GFO Species of Concern	Plants up to 70 cm in height with cotton-like tops, flowering in June. Habitat is marshes and wet meadows (Decker et al. 2006).	None. Plant typically occurs in fen or wet meadow habitat. Project activities would not affect wetland or fen habitat.
Eriophorum gracile Slender Cottongrass GFO Species of Concern	Forming large uniform stands, flowering July to September. Habitat is fens, wet meadows, and pond edges. Elevation 8100 to 12,000 feet (CNHP 2015m).	None. Plant typically occurs in fen or wet meadow habitat. Project activities would not affect wetland or fen habitat.
Lilium philadelphicum Wood Lily GFO Species of Concern	Plant up to 60 cm in height with orange flowers, blooming June to August. Habitat is moist woods, thickets, and wet meadows. Elevation 6,800 to 9,800 feet (CNHP 2015n).	None. Plant typically occurs in wet meadow habitat. Project activities would not affect wetland or fen habitat.
Lomatium concinnum Colorado Desert-Parsley BLM Sensitive	Plants generally less than 20 cm in height. Yellow flowers, blooming in May. Habitat is adobe hills and plains on rocky soils derived from Mancos Formation shale. Associated with shrub communities dominated by sagebrush, shadscale, and greasewood. Elevation 5,500 to 7,000 feet (CNHP 2015o).	None. Occurs at elevations below the project areas and no suitable habitat would be affected by project activities.
Lomatogonium rotatum Marsh Felwort GFO Species of Concern	Plants 15 cm in height with light blue flowers blooming July to August. Habitat is wet meadows, fens, and marshes (Montana Natural Heritage Program 2015). Known from Texas Gulch.	None. Project activities would not affect wetland or fen habitat.
Machaeranthera coloradoensis Colorado Tansy-Aster GFO Species of Concern	Plants 4 to 10 cm in height. Flower heads pink to purple, blooming July to August. Habitat is gravelly areas in mountain parks, slopes, and rock outcrops up to dry tundra. Elevation 8,500 to 12,500 feet. Known from Cochetopa Park (CNHP 2015p).	Possible. The species would be included in project specific surveys in areas designated for salvage activities.

Table 3-17 Special Status Plant Species

Scientific Name, Common Name, Status	Description/Habitat	Potential to be Affected by Project Activities
Phacelia demissa Intermountain Phacelia GFO Species of Concern	Small plant up to 4 cm in height with purple flowers, blooming July to August. Habitat appears to be drier, sandy, perhaps saline sites.	None. Occurs at elevations below the project areas and no suitable habitat would be affected by project activities.
Physaria rollinsii Rollins' Twinpod GFO Species of Concern	Plants low and spreading. Leaves silver pubescent with bright yellow flowers, blooming May to June. Habitat is granitic talus, open knolls, limestone chiprock, steep slopes, clay banks, near granite boulders and sagebrush. Elevation 6,624 to 9,088 feet (CNHP 2015q).	None. Occurs at elevations below the project areas and no suitable habitat would be affected by project activities.
Thelypodiopsis juniperorum Juniper Tumblemustard GFO Species of Concern	Plant up to 100 cm in height with purple flowers, blooming May to June. Habitat is dry pinyon-juniper woodlands. Elevation 6,200 to 8,200 feet (Anderson 2004). Known from juniper uplands in the Cimarron area.	None. Occurs at elevations below the project areas and no suitable habitat would be affected by project activities.
Townsendia glabella Gray's Townsend Daisy GFO Species of Concern	A small cushion plant up to 5 cm in height with white ray flowers and yellow disk flowers, blooming May to August. Habitat is steeply sloping shale slopes, at lower altitudes. Found only on the Smokey Hill Member of Mancos Shale, Oyster Beds (CNHP 2015r). Elevation 6,348 to 9,675 feet.	None. No suitable habitat would be affected by project activities.
Townsendia rothrockii Rothrock's Townsend Daisy GFO Species of Concern	A small cushion plant up to 3 cm in height with large white ray flowers and yellow disk flowers, blooming June to August. Habitat includes alpine fell fields, krummholtz, subalpine meadows, oak brush, grasslands, shrub/herbaceous areas, talus slopes, forest openings, high plateau ridge tops, mountain passes. Elevation 7,923 to 13,218 feet. Known from Engineer Pass (CNHP 2015s).	None. No suitable habitat would be affected by project activities.
Trichophorum pumilum Rolland's (Little) Bulrush BLM Sensitive	Wetland plant up to 10 cm in height, flowering June to July. Habitat is moss hummocks in very rich fens. Elevation 9,300 to 11,000 feet (CNHP 2015s).	None. Plant occurs in fen or wet meadow type habitat. Project activities would not affect wetland or fen habitat.

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*

Direct and indirect effects to special status plants were analyzed within the project areas (Figures 2-1, 2-2, and 2-3).

3.12.2.1.1 Alternative A – No Action

Under the No Action Alternative, there would be no salvage activities within the proposed project areas. Any suitable habitat for special status plant species would remain undisturbed and individuals or populations would not be affected. In untreated 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

Under Alternative B, salvage activities would take place in designated areas in the potential treatment areas. There could possibly be some disturbance to suitable habitat for Colorado tansy-aster, Mingan moonwort, or northwestern moonwort through the building of temporary roads and salvage activities. Species-specific surveys would be conducted in potential treatment areas to identify occurrences of these three plants. If any such occurrences are located, additional mitigation measures, such as avoidance, would be developed to protect the occurrences, minimizing effects to this species. Other than the Colorado tansy-aster, Mingan moonwort, and northwestern moonwort, the plants listed in Table 3-17 are not expected to occur in the project areas and would not be affected by the proposed activities. 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*

Cumulative effects to special status plants were analyzed within the project areas (Figures 2-1, 2-2, and 2-3).

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

Possible cumulative effects to special status plant species would most likely occur from salvage operations or the introduction of noxious weed species. Salvage activities, including temporary road construction, could degrade habitat or destroy individual sensitive plants; however, the use of pre-disturbance surveys and protection measures would minimize this risk. Noxious weed infestations could out-compete native vegetation and special status plant populations, but project design standards would minimize the introduction or spread of noxious weeds. 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 threatened and endangered and sensitive species and plant communities will be inventoried and monitored as necessary to provide information for proper management. Habitat supporting existing populations of USFWS listed threatened, endangered species, and candidate species as well as BLM sensitive species, will be maintained and protected to ensure suitable habitat conditions

and viable populations. Surveys will be conducted in areas slated for salvage activities for special status plants with suitable habitat. Populations will be mapped and avoided during salvage operations, ensuring conformance with the RMP.

With respect to special status plant species, the proposed action would conform to Public Land Health Standard 4 because project design standards require pre-disturbance surveys and protection of any identified populations of special status plants. 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 OAHP (Metcalf 2015). The study area for this inventory was defined by the three project areas (Figures 2-1, 2-2, and 2-3). The primary information for the Class I inventory was provided by the BLM in geographic information system (GIS) format. Other records consulted include the OAHP GIS data and the on-line Compass database, General Land Office plats and patent records, and historic United States Geological Survey (USGS) topographic maps.

There have been 30 previous inventories completed entirely or partially within the Class I study area. Intensive inventory has been completed on approximately 4,250 acres (17.1 percent) of the Class I survey area. Within the Class I survey area, the area of potential effect (APE) for the proposed project was defined as the potential treatment areas (Figures 2-1, 2-2, and 2-3) because this is where any direct or indirect effects would occur to any cultural resources that are present. Of the 30 inventories, 17 overlap with the APE of the current project.

Twenty-five cultural resources were found during these inventories, including 18 sites and 7 isolated finds. The sites include nine prehistoric sites, six historic sites, two multi-component sites, and one unknown site. Most of the prehistoric sites are open lithic scatters, although one site is an open camp and another is an architectural site. The historic resources include three residential sites such as camps or cabins, one fence, and aspen art with an associated trash scatter.

The two multi-component sites represent the variety of prehistoric and historic activities exhibited by the other previous sites recorded in the area. One site consists of a small prehistoric lithic scatter and a larger, historic ranch complex. The second site consists of a prehistoric open camp and a historic sheepherder's camp. Neither site is within the APE of the current project.

Two of the sites were observed by the GFO and their locations plotted on a map; however, they were not recorded. For the purposes of the Class I study, they were considered as "site leads" and were included in the counts of known resources in the study area. One site has minimal information: it is a small historic site, not in the APE, that is recommended as not eligible for inclusion on the National Register of Historic Places (NRHP). The second site is larger but less information was provided. This site is in the APE.

The isolated finds include both historic and prehistoric types. None of the seven sites has been recommended or evaluated as eligible for inclusion on the NRHP.

A site-probability analysis was conducted to estimate the potential for occurrence of cultural resources in the study area and potential treatment areas (Metcalf 2015). Table 3-18 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. These are 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 (less than 9,700 feet) in open settings, with slopes less than 30 percent. 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 with moderate to steep slopes.

Table 3-18 Estimated Potential for Cultural Resources

Estimated Resource Potential	Potential Treatment Areas (acres)	Project Area (acres)
Low	6,322	15,732
Medium	2,071	8,868
High	7	250
Total	8,400	24,850

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*

Direct and indirect effects to cultural resources were analyzed within the APE, which is equivalent to the potential treatment areas shown in Figures 2-1, 2-2, and 2-3.

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 2.1.3.1) 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. Indirect 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.

3.13.2.2 *Cumulative Effects*

Cumulative effects to cultural resources were analyzed within the project areas (Figures 2-1, 2-2, and 2-3).

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 2.1.3.1) 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.

3.13.2.3 *Plan Conformance Review*

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

3.14 Visual Resources

This section discusses current conditions for visual resources in the analysis area as well as potential changes to those conditions from the proposed alternatives.

3.14.1 Affected Environment

The BLM uses the Visual Resource Management (VRM) system to analyze and manage visual resources on public lands, and to predict potential effects from proposed land uses. The VRM system includes an inventory of visual resources, described according to four basic visual elements: form, line, color, and texture. Using the VRM system, the BLM is able to determine appropriate visual-design measures for proposed land uses. For each project proposal, and each alternative within that proposal, the degree of visual contrast that would be created between the proposed project areas and the surrounding landscape is analyzed. Measures designed to reduce visual contrast, or meet VRM class objectives, are incorporated into the design and construction methods of authorized land uses. The management objectives for each VRM class are described here.

VRM Class II. The objective of this class is to retain the existing character of the landscape. The level of change to the landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any changes should repeat the basic elements of form, line, color, and texture found in the dominant natural features of the landscape.

VRM Class III. The objective of this class is to partially retain the existing character of the landscape. The level of change to the landscape may 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 natural features of the landscape.

VRM Class IV. The objective of this class is to provide for management activities that require major modifications of the existing character of the landscape. The level of change to the landscape can be high. Management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the visual effects of activities through careful location, minimal disturbance, and repeating the basic elements found in the dominant natural features of the landscape.

VRM CLASS II R, III R, AND IV R. This interim classification is applied to areas where existing management activity has caused visual intrusions without incorporating characteristic landscape elements in its design. The aim is to rehabilitate some of these elements to achieve visual contrast consistent with the objectives of the original class and improve the scenic quality to the level where applicable class objectives (II, III, or IV) could be applied. Upon rehabilitation, the lands would be managed as per the noted VRM Class (II, III, or IV).

In the High Mesa project area, VRM classes are primarily Class II and IV, with a smaller amount of Class III (Table 3-19). The potential treatment areas in High Mesa are located almost exclusively in VRM Class III and IV areas that cover the top of High Mesa. The Class II areas are located on the steep side slopes of the mesa where there are no potential treatment areas.

The Blue Mesa project area is a mosaic of VRM classes II, III, and IV, with the area split roughly equally between the three classes (Table 3-19). About 25 percent of the project area has been placed in the II R, III R, or IV R classes because of the extent of past vegetation management and roads that create visual contrasts on the landscape. Many of the past vegetation-management projects were completed 30 to

40 years ago, not long before the VRM classes were mapped for the RMP. Since that time, vegetation has regrown in many of these areas and reduced the degree of contrast on the landscape.

In the Indian Creek project area, VRM classes are split between Class II and Class IV, with about 15 percent of the area in Class II R or Class IV R (Table 3-19) and are related to the extent of past vegetation management and roads that create visual contrasts on the landscape. The past vegetation management projects were completed more than 40 years ago. Since that time, vegetation has regrown and reduced the degree of contrast on the landscape.

Table 3-19 VRM Classes

VRM Class	Project Area (acres)			Total (acres)
	High Mesa	Blue Mesa	Indian Creek	
II	3,429	2,353	3,559	9,341
II R	0	760	970	1,730
III	310	3,242	0	3,552
III R	0	1,200	0	1,200
IV	1,839	2,896	3,203	7,938
IV R	0	880	260	1,140

3.14.2 Analysis of Effects

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

3.14.2.1 *Direct and Indirect Effects*

Direct and indirect effects to visual resources were analyzed within the project areas shown in Figures 2-1, 2-2, and 2-3.

3.14.2.1.1 Alternative A – No Action

This alternative would have no direct or indirect effects on visual resources in the project areas. Spruce mortality would be visible, first as trees with red needles, and later as numerous snags, which would change the appearance of the landscape and is likely to attract the attention of the casual observer. The spruce mortality would most likely form a mosaic with other tree species and no strong contrasts would appear on the landscape.

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

Alternative B includes several project design standards (Section 2.1.3.10) that would be implemented to reduce effects to visual resources by blending topographic forms and vegetation patterns between potential treatment areas and untreated areas. Tree species other than spruce, along with spruce regeneration, would be retained in potential treatment areas (Section 2.1.3.9), minimizing contrast between treated and untreated areas. Evidence of management activities would attract the attention of the casual viewer in the foreground in the years immediately following treatment, but would not dominate the landscape. Over time, as vegetation regrows, evidence of activities would fade and the attention of casual viewer would no longer be attracted, even in the foreground. At middle ground and background distances,

management activities may be visible, but would not attract the attention of the viewer or dominate the landscape in the short or long term.

The proposed treatments in the High Mesa project area would meet the objectives of the VRM Class III and Class IV designations in the potential treatment areas because activities would attract the attention of the casual viewer, but would not dominate the landscape in the short term. In the long term, evidence of management activities would no longer attract the attention of the casual viewer.

The proposed treatments in the Blue Mesa project area would meet the objectives of VRM Class III and Class IV, but not Class II, in the potential treatment areas because activities would attract the attention of the casual viewer, but would not dominate the landscape in the short term. In the long term, evidence of management activities would no longer attract the attention of the casual viewer and the objectives of all three VRM classes would be met.

The proposed treatments in the Indian Creek project area would meet the objectives of VRM Class IV, but not Class II, in the potential treatment areas because activities would attract the attention of the casual viewer, but would not dominate the landscape in the short term. In the long term, evidence of management activities would no longer attract the attention of the casual viewer and the objectives of both VRM classes would be met.

3.14.2.2 *Cumulative Effects*

Cumulative effects to visual resources were analyzed within the project areas shown in Figures 2-1, 2-2, and 2-3.

3.14.2.2.1 Alternative A – No Action

This alternative would have no cumulative effects on visual resources because there would be no direct or indirect effects. Over time, vegetation in past treatment areas would continue to grow and existing contrasts would be further reduced. The ongoing spruce mortality would change the form and texture of the visual landscape, although the result is difficult to predict.

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

Alternative B would contribute to the cumulative visual effects of past vegetation management, road building, and the ongoing spruce beetle outbreak. The proposed treatment areas would attract the attention of the casual viewer in the foreground, and be visible in the middle ground and background, but would not dominate the landscape. To some extent, the ongoing spruce beetle outbreak is creating similar effects. Whether or not this alternative is implemented, the visual landscape of the project areas would be altered by the mortality of almost all of the spruce. Alternative B would accelerate the changes in form, line, color, and texture by implementing vegetation management across the project areas. Once the treatments are completed, revegetation would proceed, reducing long-term cumulative effects. In the absence of treatments, spruce snags would persist on the landscape, eventually creating heavy accumulations of down logs and debris, which would be visible to the casual viewer and may slow revegetation in the long term.

3.14.2.3 *Plan Conformance Review*

The RMP states that public lands will be managed according to VRM classes and objectives contained in each Management Unit prescription. Rehabilitation will be considered for VRM Class II R, III R, and IV R areas that contain existing human-made visual intrusions. The VRM classes described above for

each project area match the VRM classes in their respective Management Unit prescriptions. Each alternative would meet the objectives for all VRM Class III and Class IV areas within the project areas because any project activities would not dominate the view of the casual observer. Alternative A would not meet the objectives of VRM Class II because the extensive spruce beetle mortality would attract the attention of the casual observer. Alternative B would not meet the objectives of VRM Class II where potential treatment areas have this designation in the short term because evidence of project activities, such as skid trails and landings, would attract the attention of the casual observer. Neither Alternative A nor Alternative B would preclude attainment of Class II objectives in the long term; however, Alternative B may achieve Class II objectives sooner because it would remove or otherwise dispose of the majority of the dead spruce, leading to reduced visibility of snags and woody debris, as well as faster revegetation.

3.15 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.

3.15.1 Affected Environment

With respect to the project areas 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. BLM roads and trails, county roads, and user-created trails provide public access to most of the proposed treatments areas (Figures 2-1, 2-2, and 2-3). County roads pass through several potential treatment areas, increasing the potential for public interaction. Most notable of these is County Road 58, which provides access to the Powderhorn Lakes trailhead and parking area. These roads and trails allow access for dispersed recreational use by the public for hunting, firewood gathering, hiking, mountain biking, snow machines, and ATVs. Members of the public engaged in these activities may be affected if their use coincides with implementation of the proposed action.

3.15.2 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.

3.15.2.1 *Direct and Indirect Effects*

Direct and indirect effects to public health and safety were analyzed within the project areas (Figures 2-1, 2-2, and 2-3).

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. Public use of the project areas would continue uninterrupted. As the 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 of the 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 beetle-killed trees (Adamson 2015). Falling trees may affect the safety of users on roads, trails, or within the forest interior. The No Action Alternative would not decrease the potential for these effects to public health and safety.

To ensure public safety along roads and trails, future actions may be necessary to address individual tree hazards in high-use areas.

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. During that time, the public would be exposed to harvesting operations, including tree felling, 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 area, 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 subject 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 inherent risk posed to the public.

3.15.2.2 *Cumulative Effects*

Cumulative effects to public health and safety were analyzed within the project areas (Figure 2-1, 2-2, and 2-3), and the nearby surrounding matrix of BLM, USFS, state, and private lands.

3.15.2.2.1 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 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 beetles. 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.

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

From a public health and safety standpoint, implementing the proposed action would not create additional risks to the public. Areas that are unsafe for public use would be closed during treatment operations. Furthermore, any potential safety risks would be temporary. In the long-term, the proposed action would create areas largely free of standing dead trees, providing opportunities for users who consider this a safer alternative to using surrounding untreated stands.

3.15.2.3 *Plan Conformance Review*

The proposed project is subject to and has been reviewed for conformance with the Gunnison RMP. Public health and safety is not a specific managed value; however, decisions to provide safe recreational opportunities are applicable (Gunnison RMP, page 2-13). The project would conform to these decisions.

3.16 Economics

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

3.16.1 Affected Environment

The project area lies between the cities of Gunnison (Gunnison County) and Montrose (Montrose County). Basic employment and household income information for the area is shown in Table 3-20. From 2010 to 2013, Gunnison County population increased 1.2 percent to 15,507 while Montrose County population decreased 1.4 percent to 40,713 (US Census Bureau 2013).

Table 3-20 Employment and Income

	Gunnison County	City of Gunnison	Montrose County	City of Montrose
Worker Population (over 16)	12,916	5,157	32,444	15,205
Civilian Labor Force	9,609	3,887	19,954	8,969
Unemployed	802	410	2,193	1,178
Mean Household Income	$65,678	$43,310	$56,020	$50,724

Source: US Census Bureau 2013

Industries supporting the workforce are similar for both Gunnison and Montrose Counties. Educational services; health care and social assistance; arts, entertainment, and recreation; accommodation and foodservices; retail trade; and construction provide the majority of employment (US Census Bureau 2013). Resource extraction, such as the timber industry, is not a substantial provider of employment in either county.

The area supports a tourism industry centered on outdoor recreation. Year-round activities are available. Notable tourist destinations include the Black Canyon of the Gunnison National Park, Curecanti National Recreation Area, Crested Butte Mountain Resort, and Hartman Rocks Recreation Area.

3.16.2 Analysis of Effects

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

3.16.2.1 *Direct and Indirect Effects*

Direct and indirect effects to economics were analyzed within the counties most likely to be affected: Gunnison and Montrose Counties.

3.16.2.1.1 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. Taking no action is not expected to influence these factors because the timber industry is not a substantial segment of the economy. However, there is the potential for lost economic benefits 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 3.19). Though there is no substantial infrastructure or residential area at immediate risk should a fire occur in the project areas, 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 a desired outcome.

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. 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, and, thus it is not possible to estimate the project's effects on the local economy. However, 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.

3.16.2.2 *Cumulative Effects*

Cumulative effects to economics were analyzed within Gunnison and Montrose Counties.

3.16.2.2.1 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 those sectors of the local economy.

3.16.2.2.2 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, 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.

3.16.2.3 *Plan Conformance Review*

The proposed project is subject to and has been reviewed for conformance with the Gunnison RMP. Economics is not a specific managed value; however, the RMP does provide direction to allow for

commercial timber harvests. The potential economic effects from the proposed project would not conflict with decision objectives for other managed values.

3.17 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.

3.17.1 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, 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 et al. (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.

3.17.1.1 *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 areas 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, 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, Medium for basal area, 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. The spruce bark-beetle outbreak in the GFO has had great effect in the southern areas since approximately 2012. Since then, a continuous wave of beetles has moved north through the Powderhorn Wilderness and into the Indian Creek Watershed. Starting in approximately 2013, aerial detection has located outbreaks within the High Mesa and Alpine Plateau areas. Detection flights in 2014 do not show an increase in affected area, but ground reconnaissance has shown an increasing area of spruce beetle infestation, which is spreading south

to north within stands with a high susceptibility rating. 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.

3.17.1.2 *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 higher stem density. 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 some stands in the project areas that are 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. Fettig (2014) presents potential shortcomings of sanitation treatments of mountain pine beetle outbreaks; 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 is supporting 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. 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.

3.17.2 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.

3.17.2.1 *Direct and Indirect Effects*

Direct and indirect effects by and to future forest management were analyzed for the project areas (Figures 2-1, 2-2, and 2-3).

3.17.2.1.1 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 relating to spruce 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.

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

Alternative B would remove dead, infested, and high-risk spruce trees using sanitation/salvage treatments. This would have a similar effect to Alternative A, in that the outcome would be a near-complete removal of overstory spruce. The main difference between Alternative A and Alternative B would be how long it would take the spruce overstory to be removed. Based on stand characteristics and observations of spruce beetle effects in the surrounding landscape, there is no expectation that spruce would persist and maintain dominance once stands are infested beyond normal endemic levels. Therefore, treatments to extract infested spruce are warranted and accepted.

At the current stage of infestation, sanitation/salvage treatments would be designed to maximize the economic value of the stands' potential. Smaller diameter spruce would be retained if not infested and where practical. Though spruce less than 10 inches in diameter 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 smaller size classes 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.

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 will perpetuate spruce following the removal of the dominant spruce overstory. Nonetheless, treated stands would not be dominated by spruce for many decades or even centuries. 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.

3.17.2.2 *Cumulative Effects*

Cumulative effects to forest management were analyzed for the project area and surrounding BLM, USFS, state, and private lands (Figure 1-1).

3.17.2.2.1 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 majority of infested stands would not be treated or salvaged within the analysis area. Under the No Action Alternative, spruce beetle infestations would continue unchecked. Alternative A would add to the cumulative effects of past and ongoing activities in the area. The majority of spruce stands would not be treated and would continue to be affected by bark beetles. Future forest management decisions would be driven by stand conditions as they develop under the influence of bark beetles.

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

Timber harvest probably began in the late 1800s and early 1900s as wood products became needed in surrounding communities. 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, USFS, state, and private lands in the analysis area, though no specific records of these harvests are known to exist. Most past treatments were thinning with removal in the 1970s and 1980s, and some patch cutting in the 1980s. Some of these past activities overlap with potential treatment areas for the proposed project. Nearby, the Grand Mesa, Uncompahgre, and Gunnison National Forest is analyzing potential commercial and non-commercial treatments to address spruce beetle infestations and sudden aspen decline on about 250,000 to 350,000 acres, including some USFS lands immediately south of the High Mesa and Blue Mesa project areas. The proposed project would contribute to these past and planned projects; however, as with Alternative A, the majority of the landscape would continue to be minimally managed from a spruce treatment perspective. Future forest management would be dictated by the level of spruce population that survives the current beetle outbreak. Stands affected by active management (as with Alternative B) 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.

3.17.2.3 *Plan Conformance Review*

Standard Management Direction per the GFO RMP specifically emphasizes the harvest of over-mature and pest-killed trees; however, the RMP did not consider the need to respond to a bark beetle outbreak of the present magnitude. The RMP allows for the annual harvest of approximately 1,200 MBF of commercial timber and 490 cords of fuelwood. Since the RMP was approved in 1993, the GFO has implemented harvests averaging far below these annual thresholds. It is possible that an annual harvest associated with bark beetle salvage could exceed the RMP thresholds. Once bark beetle salvage is completed, maintaining annual harvests above these thresholds is not the intent of this project. If an annual harvest were proposed to exceed these thresholds, it would be evaluated for feasibility in terms of funding and staff availability. If such an annual harvest were considered, it would be approved only if all design criteria and mitigation measures could be implemented, both for that year's projects as well as continued monitoring and rehabilitation of previous projects.

3.18 Rangeland Management

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

3.18.1 Affected Environment

All or portions of 21 grazing allotments lie within the project areas (Table 3-21). Of these, portions of 13 allotments lie within potential treatment areas (Table 3-21). Most of the allotments would be minimally affected, as less than 10 percent of each allotment area is within potential treatment areas.

Alpine Plateau (69 percent of the allotment area within potential treatment areas), High Mesa (38 percent), Cox Peak (26 percent), Little Blue Creek (20 percent), Willow Creek (17 percent), and Blue Canyon (12 percent) may be more substantially affected.

Table 3-21 Range Allotments

Allotment	Total Acres	In Project Area		In Potential Treatment Areas	
		Acres	Percent	Acres	Percent
Indian Creek Project Area					
Indian Creek[1]	25,553	7,001	27	2,170	8
Powderhorn	20,220	3	<1	--	--
West Powderhorn	4,315	43	1	--	--
Yeager Gulch	9,289	464	5	76	1
Blue Mesa Project Area					
Alpine Plateau	2,656	2,654	100	1,796	68
Big Blue	2,984	86	3	--	--
Big Park	3,089	567	18	74	2
Blue Canyon	4,841	1,466	30	591	12
Cox Park	1,367	859	63	352	26
East Middle Fork	673	58	9	21	3
Fort Hicks	210	13	6	2	1
Indian Creek[1]	25,553	197	1	--	--
Little Blue Creek	2,732	1,264	46	557	20
Metzler Basin	597	114	19	--	--
Willow Creek	4,514	2,715	60	754	17
Workman Creek[2]	761	43	6	15	2
High Mesa Project Area					
Cimarron[2]	1,232	471	38	--	--
High Mesa	3,692	3,191	86	1,403	38
Johnson Park	1,525	507	33	0.1	<1
Little Cimarron	1,263	422	33	--	--
West Slope	397	278	70	--	--
Total	117,463	22,415		7,811	

[1] The Indian Creek allotment lies in both the Indian Creek and Blue Mesa project areas, but only contains potential treatment areas in the Indian Creek project area.
[2] No current grazing permit

3.18.2 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.

3.18.2.1 *Direct and Indirect Effects*

Direct and indirect effects to rangeland management were analyzed within the project areas (Figures 2-1, 2-2, and 2-3).

3.18.2.1.1 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.

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

Timber harvesting would affect grazing use and 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 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, 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. Several measures may be implemented to minimize negative effects during and after treatments; however, it may not be possible to avoid all effects to grazing operations. Potential treatment areas could be designed to take advantage of natural barriers or additional herding and salting operations could be implemented to limit livestock-logging interactions.

Modification or exclusion of livestock grazing may be necessary to promote natural regeneration, allow for establishment of aspen suckers, or protect plantings in order to meet stocking goals. This could be accomplished by salting and herding coupled with natural barriers. Temporary fencing may be needed to ensure complete exclusion. If these measures are deemed inadequate, it may be necessary to temporarily suspend the affected grazing permit. These measures would increase the cost of grazing operations, and in the case of permit suspension, require the permittee to locate alternative pasture and move livestock, which would be an additional expense. Specific allotments that may be affected cannot be identified at present, but would be determined after treatment through monitoring.

3.18.2.2 *Cumulative Effects*

Cumulative effects to rangeland management were analyzed within the project areas (Figures 2-1, 2-2, and 2-3), and the nearby surrounding matrix of BLM, USFS, state, and private lands.

3.18.2.2.1 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.

3.18.2.2.2 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 treatment areas; however, in the context of the larger analysis area, with many unaffected or minimally affected allotments, this change would be minimal.

3.18.2.3 *Plan Conformance Review*

The GFO RMP provides direction to manage approximately 470,460 acres for livestock grazing, with a capability of 45,539 Animal Unit Months (AUMs). The proposed project would likely not remove lands from grazing, nor would it reduce available AUMs. Therefore, the project would conform to RMP direction.

3.19 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.

3.19.1 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).

In a beetle outbreak situation, 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.

3.19.1.1 *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 show that an increase in fire potential does occur; 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.

3.19.1.2 *Fire History*

Based on field reconnaissance and historical observation, there is evidence of previous fire activity within the project areas. This evidence includes charred stumps, logs, and wood, and is found scattered throughout the project areas. It is difficult to reconstruct a complete fire history; however, data are available for all fires that were reported in the Wildland Fire Management Inventory (WFMI) from 1980 to the present. Within one mile of the project areas, there have been 23 recorded fires (Table 3-22), of which the majority were naturally caused (13 of 23). Several of these fires occurred within or near the potential treatment areas. With the mixed-land ownership pattern and presence of rural residences, suppression is expected to continue to be the primary fire response.

3.19.1.3 *Fuel Models and Fire Behavior*

As described by Scott and Burgan (2005), three fuel models predominate the potential treatment areas: TU1, TL3, and TL5. These fuel models are estimated using vegetation type and structure, and typical fuel loads.

Fuel model TL5 (High Load Conifer Litter) is the most prevalent fuel model within the potential treatment areas. The primary carrier of fire in TL5 is typically high-load conifer litter, light slash, or mortality fuel. Spread rate and flame length are low. Observations within the potential treatment areas have noted higher fuel loads than described by TL5. Therefore, expected fire behavior would be more intense, particularly as the canopy deteriorates.

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 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 areas 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.

Table 3-22 Fire History

Year	Location	Fire Name	Size Class[1]	Cause Category
1980	Blue Mesa	Hilarious	No Data	Human
1980	Blue Mesa	CO Fire	D	Natural
1980	High Mesa	Cimarron	A	Natural
1980	High Mesa	John Truck	No Data	Human
1983	Blue Mesa	Willow Creek	A	Natural
1987	Indian Creek	FA 1	No Data	No Data
1992	Indian Creek	West Fork	B	Natural
1995	Blue Mesa	Swanson	A	Natural
1996	High Mesa	Bear Creek	C	Natural
1998	Blue Mesa	Blue	C	Human
1999	High Mesa	Moore	A	Human
1999	Indian Creek	Indian	B	Natural
2000	Blue Mesa	West Fork	A	Natural
2002	High Mesa	Low Mesa	A	Natural
2002	Indian Creek	Indian Creek	E	No Data
2002	Indian Creek	Indian Creek	D	No Data
2003	Blue Mesa	Gux 1	C	Human
2003	Blue Mesa	Alpine Plateau FS28	B	Natural
2003	Blue Mesa	Alpine Plateau	B	Natural
2003	High Mesa	Johnson Park	A	Human
2003	Indian Creek	West Powderhorn	B	Natural
2008	Indian Creek	Indian Creek	A	Natural
2013	Indian Creek	Powderhorn	B	Human

[1] A=0 to 0.25 acres; B= 0.26 to 9.9 acres; C= 10.0 to 99.9 acres; D= 100 to 299.9 acres; E= 300 to 999 acres

3.19.2 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.

3.19.2.1 *Direct and Indirect Effects*

Direct and indirect effects to fire and fuels were analyzed within the project area (Figures 2-1, 2-2, and 2-3).

3.19.2.1.1 Alternative A – No Action

Under the No Action Alternative, no 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. Fire with a high rate of spread or active crown fire could occur, creating conditions that prevent safe firefighting. Fires may become larger than they would if stands were treated. 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. Fire suppression would continue with decisions based on values at risk, fire behavior, and accessibility.

3.19.2.1.2 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, mechanically compacted, 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.

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 should 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 light 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 be 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 less than 12-inches DBH, the non-spruce forest component (overstory and understory), and remaining slash. Herbaceous and shrub regeneration would also contribute to the fuel profile. Canopy-fire potential would be reduced following removal of the spruce overstory, though not completely eliminated. With the removal of the dominant spruce overstory, crown fire would be predicted to be smaller in extent and less likely to spread.

As under Alternative A, fire suppression would continue. It is expected that treatments would promote favorable suppression conditions by decreasing severity of fire behavior, leading to safer, more cost-effective suppression activities.

3.19.2.2 *Cumulative Effects*

Cumulative effects to fire and fuels were analyzed within the project areas (Figures 2-1, 2-2, and 2-3), and surrounding BLM, USFS, state, and private lands.

3.19.2.2.1 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. 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.

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

Alternative B would influence cumulative effects through forest management activities and subsequent 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 by retained and regenerating vegetation, and are expected to lead to an overall reduction in severe fire behavior. The proposed project would increase the number of 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.

3.19.2.3 *Plan Conformance Review*

The project was reviewed for consistency with management decisions in the GFO RMP. Two suppression approaches apply to the planning area: conditional suppression and full suppression (RMP page 2-15; Appendix G). The proposed treatment areas are nearly entirely in areas identified for full suppression. The project conforms to this management direction, as it would facilitate continued active suppression.

3.20 Wilderness, Wilderness Study Areas, and Lands with Wilderness Characteristics

This section discusses Wilderness, Wilderness Study Areas, and lands with wilderness characteristics (LWCs), including current conditions and potential changes associated with the proposed alternatives.

3.20.1 Affected Environment

There are no Wildernesses, WSAs, or LWCs in or near the High Mesa or Blue Mesa project areas. The remainder of this section applies only to the Indian Creek project area.

The Powderhorn Wilderness is located adjacent to the east and south edges of the Indian Creek project area (Figure 2-3). The wilderness consists of large expanses of alpine tundra, spruce forests, and several alpine lakes. The Powderhorn Wilderness covers 47,980 acres of BLM lands and an additional 14,270 acres of USFS lands. This wilderness was designated in 1993, shortly after the Gunnison RMP--in which it is referred to as the Powderhorn Primitive Area--was completed.

The Powderhorn WSA consists of 6,944 acres of BLM land in several separate pieces adjacent to the north edge of the Powderhorn Wilderness. It was identified in 1980 as a relatively undeveloped area that may be suitable for wilderness designation. Until Congress makes a determination on the area's suitability, the BLM is tasked with management of the WSA to a standard that will not impair its eligibility for wilderness designation. About 1,248 acres in the southwest corner and along the east edge of the Indian Creek project area are part of the Powderhorn WSA. No potential treatment areas are located in the Powderhorn WSA.

Section 201 of the Federal Land Policy and Management Act of 1976 (FLPMA) requires the BLM to maintain an inventory of all public lands and their resources and other values, including wilderness characteristics. In 2013, the GFO 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, to identify lands with potential wilderness characteristics outside existing Wilderness and 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.

Thirty-four areas were identified for inventory through the review, which included approximately 104,180 acres of public land. BLM then conducted the field inventory of the identified areas, photographing and documenting the existing conditions on the ground. In conjunction with the field inventory, additional information from BLM resource specialists and review of aerial photographs was included to help identify the presence or absence of wilderness characteristics. Twenty-seven of the 34 areas, totaling 81,102 acres, were found to possess wilderness characteristics.

The Indian Creek project area contains portions of two of the inventory areas: Indian Creek (COS-060-023) and West Fork Powderhorn (COS-060-024). The Indian Creek project area contains 6,451 acres of LWCs, of which approximately 2,100 acres are within potential treatment areas. BLM Road 3033, which runs north/south through the middle of the Indian Creek project area (Figure 2-3), is the dividing line between these two LWCs; the area west of BLM Road 3033 is in the Indian Creek LWC and the area east of BLM Road 3033 is in the West Fork Powderhorn LWC.

The Indian Creek LWC contains 12,888 acres, all of which were found to possess naturalness, outstanding opportunities for solitude and primitive and unconfined recreation, and supplemental values (including scenic vistas, fens, and wildlife habitat). It is bounded on the west and north by State Highway 149, on the south by the Powderhorn WSA, and on the east by BLM Road 3033. Livestock grazing is the main human use, although evidence of past vegetation treatments, closed roads, and dispersed recreational activity are also present.

The West Fork Powderhorn LWC contains 7,093 acres, all of which were found to possess naturalness, outstanding opportunities for solitude and primitive and unconfined recreation, and supplemental values (including fens and wildlife habitat). It is bounded on the north by State Highway 149 and private lands, on the west by BLM Roads 3033 and 3149, on the south by the Powderhorn Wilderness and WSA, and on the east by BLM Road 3034, the Powderhorn Wilderness, and the Powderhorn WSA. Human uses for this LWC include access to the Powderhorn Wilderness and WSA, livestock grazing, vegetation treatments, and dispersed recreational activities. Closed roads are also present in this LWC.

3.20.2 Analysis of Effects

This section describes the anticipated direct, indirect, and cumulative effects to Wilderness, WSAs, and LWCs 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*

Direct and indirect effects to Wilderness, WSAs, and LWCs were analyzed within the Indian Creek project area (Figure 2-3).

3.20.2.1.1 Alternative A – No Action

Under the No Action Alternative, beetle-killed spruce would not be salvaged; therefore, there would be no direct or indirect effects to the Powderhorn Wilderness, Powderhorn WSA, or Indian Creek and West Fork Powderhorn LWCs.

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

This alternative would not have any direct effects on the Powderhorn Wilderness or Powderhorn WSA because these areas would be avoided by all project activities. Buffers have been created around these areas to ensure that the potential treatment areas do not encroach on the Wilderness or WSA.

Short-term indirect effects to the Powderhorn Wilderness and Powderhorn WSA may include noise and visibility of project activities; however, the rugged topography and existing vegetation in the Wilderness and WSA would limit these effects to the portions of these areas immediately adjacent to the potential treatment areas. No long-term indirect effects are expected to the Wilderness or WSA. Once the treatments are completed, noise would return to background levels. Views of the potential treatment areas from small areas of the Wilderness and WSA (those not screened by topography and vegetation) would be altered, but would not be substantially different in form, line, color, or texture from the existing landscape. Both the Wilderness and WSA would retain their current naturalness, outstanding opportunities for solitude and primitive and unconfined recreation, and supplemental values.

Alternative B includes salvage harvest on about 2,100 acres in the Indian Creek and West Fork Powderhorn LWCs (about 11 percent of their combined areas). The remaining 89 percent of these LWCs would not be affected by this alternative and would retain their current state of naturalness and opportunities for solitude and primitive and unconfined recreation, as well as supplemental values.

In those portions of the LWCs containing potential treatment areas, 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 potential 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.

3.20.2.2 *Cumulative Effects*

Cumulative effects to Wilderness and WSAs were analyzed within the Indian Creek project area (Figure 2-3), as well as those portions of the Powderhorn Wilderness and Powderhorn WSA that lie outside the Indian Creek project area. Cumulative effects to LWCs were analyzed across all lands managed by the GFO.

3.20.2.2.1 Alternative A – No Action

Under the No Action Alternative, there would be no cumulative effects to the Powderhorn Wilderness, Powderhorn WSA, or Indian Creek and West Fork Powderhorn LWCs because there would be no direct or indirect effects. The spruce beetle outbreak would continue, altering forest vegetation in the analysis area. Spruce beetle outbreaks are a natural occurrence and would not affect the naturalness or outstanding opportunities for solitude and primitive and unconfined recreation of the Powderhorn Wilderness,

Powderhorn WSA, or Indian Creek and West Fork Powderhorn LWCs. Supplemental values, particularly wildlife habitat, would change because of the loss of spruce in infested stands. Over time, the visibility of closed roads and past timber-management areas in the LWCs would continue to diminish and the natural appearance of the area would increase. Outstanding opportunities for solitude and primitive and unconfined recreation would not be affected.

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

Under Alternative B, cumulative effects to the Powderhorn Wilderness and Powderhorn WSA would be limited to short-term increases in noise and visibility of project activities in small portions of these areas. No long-term cumulative effects are expected because there would be no long-term direct or indirect effects. Both the Wilderness and WSA would retain their current naturalness, outstanding opportunities for solitude and primitive and unconfined recreation, and supplemental values.

Alternative B would contribute to evidence of past activities, such as road building and vegetation management, in the Indian Creek and West Fork Powderhorn LWCs. These areas contain about 1,597 acres of past vegetation management, including 59 acres of clear cuts and 1,538 acres of thinning with removal (Table 3-2). Considering the 871 acres of overlap between past vegetation management and the potential treatment areas for Alternative B, about 1,229 acres of new vegetation management would be added in the LWCs. The naturalness of these areas would decrease for several decades until treated areas regain their current state. However, these effects would only be evident on a small portion of the LWCs, which represent less than two percent of the LWCs managed by the GFO. 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 these areas.

3.20.2.3 *Plan Conformance Review*

Each of the proposed alternatives is subject to and has been reviewed for conformance to the Gunnison RMP. Public lands in the Powderhorn Primitive Area (now the Powderhorn Wilderness) will be managed for primitive and semi-primitive, non-motorized ROS settings and according to the prescription for Management Unit 2, in order to maintain and enhance scenic, recreation, and natural values. Both alternatives would conform to these requirements.

Wilderness Study Areas will be managed according to the BLM's Interim Management Policy and Guidelines for Lands under Wilderness Review until Congress decides on designations regarding each area. These guidelines require the BLM to manage the WSA to a standard that will not impair its eligibility for wilderness designation. Both alternatives would conform to these requirements.

Under the Gunnison RMP, there are no specific protections for wilderness characteristics outside Wilderness and WSAs. Therefore, each of the alternatives would conform to the RMP in terms of requirements for LWCs.

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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		
Gay Austin	Natural Resource Specialist	Special Status Plants, Wetlands and Riparian Zones
Andrew Breibart	Hydrologist	Soils, Water Resources
Brian Brown	PI/Project Manager/Forester	Vegetation, Public Health and Safety, Economics, Forest Management
Rebecca Bruno	Cadastral Survey	Realty Authorizations / Lands, Cadastral Survey
Randy Chappell	Fire Management	Fuels / Fire Management
Tara De Valois	Rangeland Management Specialist	Rangeland Management, Invasive, Non-Native Species
Elizabeth Francisco	Archaeologist	Cultural Resources
Russell Japuntich	Wildlife Biologist	Terrestrial Wildlife, Migratory Birds, Special Status Animals, Aquatic Wildlife
David Lazorchak	Geology	Geology and Minerals
Jim Lovelace	Recreation	Recreation, Lands with Wilderness Characteristics
Marnie Medina	Realty Specialist/NEPA Coordinator	Realty Authorizations / Lands, NEPA Compliance
Kristi Murphy	Recreation	Recreation, Lands with Wilderness Characteristics
Jacob Schmalz	Range Management	Rangeland Management, Invasive, Non-Native Species
David Sinton	GIS Specialist	GIS Analysis
Brian Stevens	Fire Management Specialist	Fuels / Fire Management
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

Table 4-1 List of Preparers

Name	Title	Area of Responsibility
Katy Reagan	GIS Specialist	GIS analysis
Matt Schweich	Project Manager, IDT Leader	NEPA Compliance, Quality Control, Visual Resources, Wilderness, Wilderness Study Areas, 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 and the comment period on the Draft EA, those who provided comments during scoping or on the Draft EA (identified with an asterisk*), or who otherwise communicated with the BLM about this project.

Tribes	
Northern Ute Tribe	Ute Mountain Ute Tribe
Southern Ute Tribe	
Interest Groups	
American Lands Alliance	Natural Resources Defense Council
Audubon Society, Denver Field Office	Rocky Mountain Biological Lab
Blue Mesa 4-Wheelers	Rocky Mountain Recreation Initiative
Colorado Cattleman’s Association	Rocky Mountain Resource Management Services
Colorado Environmental Coalition	Rocky Mountain Wild
Colorado Mountain Club	Sierra Club - Rocky Mountain Chapter
Colorado Native Plant Society	The Nature Conservancy
Colorado Off-Highway Vehicle Coalition	The Wilderness Society
Colorado Outfitters Association	Trout Unlimited
Colorado Trail Foundation	Trout Unlimited
Colorado Trail Riders	Western Colorado Congress
Defenders Of Wildlife	Western Watersheds Project
Earth Justice Legal Defense Fund	WildEarth Guardians
Environmental Defense Fund	Intermountain Resources, LLC
Environment Colorado	Western Slope 4-Wheelers
Great Old Broads For Wilderness	Arrowhead Snowmobile Club
Grouse, Inc.	Coffeepot Outfitters
Gunnison County Stockgrowers Assoc, Inc.	San Pahgre Outfitters
Gunnison County Trails Commission	Conrad's High Country Outfitters
High Country Conservation Advocates*	Indian Creek Outfitters
Lake City Snowmobile Club	Gunnison Gravel And Earthmoving, LLC
Land And Water Fund	Schmalz Construction
National Wildlife Federation	Public Lands Partnership
Montrose Forest Products, LLC*	
Local, State, And Federal Government	
Representative Scott Tipton	Board Of County Commissioners, Montrose County*

Senator Michael Bennet	Board Of County Commissioners, Saguache County
Senator Cory Gardner	Board Of Grazing Advisors, Norwood
Army Corps Of Engineers	Board Of Grazing Advisors, Powderhorn
USDA - NRCS	Gunnison Basin Weed Commission
USDA Forest Service, Gunnison Ranger District	City Of Gunnison
USDA Forest Service, Ouray Ranger District	Gunnison County Wildlife Coordinator
USDI Bureau Of Reclamation, Project Office	Gunnison County
USDI Fish And Wildlife Service, Ecological Service	Gunnison County Public Works Department
USDI National Park Service, Curecanti National Recreation Area	Gunnison County Community Development Dept.
US EPA Region 8, EPR-N	Gunnison County Sheriff
Western Area Power Administration	Hinsdale County
Colorado Department Of Natural Resources	Hinsdale County Road And Bridge
Colorado Office of Archaeology and Historic Preservation*	Hinsdale County Sheriff
Colorado Parks And Wildlife	Lake City Chamber Of Commerce
Colorado State Forest Service	Town Of Lake City
CPW, Natural Areas Program	Montrose County Sheriff
Board Of County Commissioners, Gunnison County	Montrose County Weed Mitigation
Board Of County Commissioners, Hinsdale County	Montrose County Public Works
Educational	
CSU Cooperative Extension Service	WSC Dept. Of Natural And Environmental Sciences
CSU Mountain Meadows Research Center	WSC Center For Environmental Studies
Media and Public Information	
Crested Butte Library	Lake City Public Library
Crested Butte News	Lake City Silver World
Gunnison Country Times	Montrose Library District
Gunnison County Library	The Gunnison Country Shopper
High Country News	Montrose Daily Press
Grazing Permittees	
Don Stanfield	Kent Wollert
Jim Bean	Aaron Sohl & Davy Gorsuch
Dean Soderquist	Cindy Smock
Mike Scheer	Les Cook
Jaun Inda	Scott Williams
Gilbert Howell	Joe & Wilma Youmans
Helen Whinnery	
Adjacent Landowners	
Nicolas August Family Partnership LLLP	Thomas Barry etal
R & G Butte Rock Ranch LLC	Stephen Ramsey
Western Rivers Conservancy	McCollum Living Trust
Don & Detra Gordon	Robert & Harriet Winter
Vincent & Margaret Farnsworth	Winchell Family Trust
David Taylor	Clint & Amy Roth Trust
David & Yvonne Richmond	David & Marilyn Tumlinson

Darrel Bailey	GFI IACO Properties LLC
Wayne Maurer	Arrowhead Improvement Association Inc.*
Karen & Jack Perrin	James Squirrell
Gomez Esquivel	Bluemountain Arrowhead LLC
George Basel & Kathleen Manfred	Donald & Pamela Squirrell
Louise & Gary Maxfield	William Hobson & Lucia Lebon
Christa Collins	Leland Cox et al.
Michelle & Patrick McClure	Soga LLC
William Whitworth	Charles Maurer Trust et al.
Vandehey Trust	Donald & Ronald & Debra Masden
Ruth & James Talboy	Adele Virden
Barrow Cimarron LLC	Tim Revell
Leslie Gofforth et al.	Kathrine Hadedorn & Susie Daves
James & Karleen Sollenbarger	Lloyd & Margaret Hawes Trust et al.
David Cooper	Orlie & Betty Price
Raymond & Margaret Wardlaw	Stephen Baines etal
Michael Closser	Blue Partnership Ltd
High Mesa Inc.	Blue Creek Partnership
Nicolas August Family Partnership LLLP	Wayne Maurer
Lakeside On The Colorado Ltd	Tejon Investments LLC
Nicolas Paul Family Partnership LLLP	Ainsworth Ollie Surviving Grantors Trust
James & Sharon Barber	Hicks Family Property Trust
Dennis & Ruby Stevenson	Lavorn McGraw et al.
Cloris & Leonard Hopkins et al.	Lamar Norsworthy
Gerdin Colorado Properties, LLC	
Right-of-Way Holders	
Blue Mesa Road Association	Nicholas O. et al.
Shinn Park Ranch	Stuart Chappell
Gunnison County Electric	

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.

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5.2 Acronyms

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

Table 5-1 List of Acronyms

Acronym	Definition
ACEC	Areas of Critical Concern
APE	Area of Potential Effect
AUM	Animal Unit Month
BA	Biological Assessment
BLM	Bureau of Land Management
BMP	Best Management Practice
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CNHP	Colorado Natural Heritage Program
COR	Contracting Officer's Representative
CSFS	Colorado State Forest Service
CPF	Colorado Partners in Flight
CPW	Colorado Parks and Wildlife
CWA	Clean Water Act
DAU	Data Analysis Unit
DNA	Determination of NEPA Adequacy
DBH	Diameter at Breast Height
EA	Environmental Assessment
ESA	Endangered Species Act
FLPMA	Federal Land Use and Policy Management Act
GCDB	Geographic Coordinate Database
GFO	Gunnison Field Office
GIS	Geographic Information System
GMU	Game Management Unit
IDT	Interdisciplinary Team
ILBT	Interagency Lynx Biology Team
LAU	Lynx Analysis Unit
LCAS	Lynx Conservation Assessment and Strategy
LWC	Lands with Wilderness Characteristics
MBTA	Migratory Bird Treaty Act
NCRS	Natural Resource Conservation Service
NEPA	National Environmental Policy Act
NRHP	National Register of Historic Places
NWI	National Wetland Inventory

Table 5-1 List of Acronyms

Acronym	Definition
OAHP	Office of Archaeology and Historic Preservation
OHV	Off-Highway Vehicle
RMP	Resource Management Plan
ROW	Right of Way
SISS	Stand Initiation Structural Stage
SURRGO	Soil Survey Geographic Database
TECP	Threatened, Endangered, Candidate, and Proposed
TPCC	Timber Production Capability Classification
USC	United States Code
USDA	United States Department of the Interior
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WFMI	Wildland Fire Management Inventory
VRM	Visual Resource Management
WEPP	Water Erosion Prediction Project
WIZ	Water Influence Zone
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.

10-hour fuels

Dead fuels consisting of round wood 1/4 to l inch in diameter and, very roughly, the layer of litter extending from immediately below the surface to 3/4 inch below the surface.

100-hour fuels

Dead fuels consisting of round wood 1 to 3 inches in diameter and very roughly the layer of litter extending from approximately three-fourths of an inch to 4 inches below the surface.

1000-hour fuels

Dead fuels consisting of round wood 3 to 8 inches in diameter and, very roughly, the layer of the forest floor more than about 4 inches below the surface.

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.

Burn Boss

Person responsible for supervising a prescribed fire from ignition through mop-up.

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 OAHP, all cultural resources with a Colorado OAHP 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.

Fire use

Also known as wildland fire use or prescribed natural fire. Management of a natural fire ignition under pre-determined conditions to accomplish resource objectives. Actions taken may range from monitoring to partial suppression.

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 within 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.

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.

Hydric

Used to describe soils that form under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part.

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 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.

Jackstraw

An accumulation of dead and down tree boles in an unorganized, loose manner.

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.

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

Specifications, generally for resource protection, 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 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 storm, fires, or girdled or poisoned trees.

Snag

A standing dead tree usually greater than five feet in height and six inches in diameter at breast height.

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.

Suppressed

A tree whose crown is completely overtopped by the crowns of one or more neighboring trees. The growth and vigor of suppressed trees is often reduced by competition for light and other resources.

Stem density

The number of trees per unit area, typically trees per acre.

Surface fire

A fire spreading through 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 the purchaser or permittee's 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.

Water Influence Zone (WIZ)

Used to collectively describe buffers applied around streams, springs, fens, and wetlands during project implementation. The intent of a WIZ is to provide a protective buffer to minimize project effects to important water features.

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.

Appendix A Interdisciplinary Team Checklist

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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. Climate change is an important emerging concern. However, there is no established scientific methodology to measure the effects of small-scale projects on global climate. Any differences in the effects of climate change on the proposed project among alternatives (including no action) would be negligible. The proposed activities are extremely small in scope and magnitude relative to a global scale. Although it may be possible to quantify a project's direct effects on carbon sequestration and greenhouse gas emissions, there is no certainty about the actual intensity of a project's indirect effects on climate change. Cumulative effects of greenhouse gas emissions from numerous small projects over time may be of concern. But, as greenhouse gas emissions are integrated across the global atmosphere, it is not possible to determine the cumulative effects associated with particular projects, nor would such disclosure provide a practical or meaningful analysis for project decisions. Any differences between alternatives (including no action) would be negligible at a global scale.
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. There are currently no active mining claims in the project area, as verified in the LR2000 database.
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.

Table A-1 IDT Checklist

Determination*	Resource	Rationale for Determination
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 between the BLM and Northern Ute, Southern Ute, and Ute Mountain Ute Tribes occurred on October 15, 2014 and again on April 7, 2015 as part of face-to-face consultation meetings. Maps and a project description were distributed to the tribes at these meeting. To date, no concerns have been expressed and no comments have been received.
NI	Paleontology	An exposure of Mancos Shale occurs in the northwest corner of the High Mesa project area; however, this exposure is outside any of the potential treatment areas. Surface geology in the remainder of the analysis area is volcanic, with low potential for paleontological resources.
NP	National Historic Trails	There are no National Historic Trails in the analysis area.
Human Resources		
PI	Visual Resources	The project may affect visual resources.
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 known 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.

Table A-1 IDT Checklist

Determination*	Resource	Rationale for Determination
PI	Fuels / Fire Management	The project may affect fuels/fire management.
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	Each project area contains post-1910, brass cap survey markers. Corners, monuments, and other survey evidence would be preserved and not disturbed. As the project progresses, the condition of survey evidence would be determined by Cadastral Survey personnel or other qualified individuals. Portions of the Indian Creek Project area are adjacent to the Powderhorn Wilderness and WSA. Modification of potential treatment areas has alleviated encroachment concerns.
NI	Recreation	The analysis area is within the Extended Recreation Management Areas for the GFO. Recreational use is mostly dispersed camping and hunting. Some hunting outfitters use the analysis area. Any effects, such as disturbance of recreational users by noise caused by logging operations, would be short-term and limited to the time of project implementation. No long-term or cumulative effects are expected.
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.
PI	Wilderness and Wilderness Study Areas	Project activities would not be conducted in Wilderness or Wilderness Study Areas; however, the potential for indirect effects will be analyzed in detail in the EA.
PI	Lands with Wilderness Characteristics	The project may affect Lands with Wilderness Characteristics.

Table A-1 IDT Checklist

Determination*	Resource	Rationale for Determination
*NP = not present in the area affected by the proposed or alternative actions NI = present, but not affected to a degree that detailed analysis is required PI = present with potential for relevant effects that need to be analyzed in detail in the EA		

Appendix B Watershed Best Management Practices

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Watershed Best Management Practices
SW Gunnison Bark Beetle Salvage Project

The following Best Management Practices (BMPs) would be applied during implementation of the SW Gunnison Bark Beetle Salvage Project to protect soil and water resources.

The Water Influence Zone (WIZ) would be used to collectively describe buffers to be applied around streams, springs, fens, and wetlands during project implementation. Table B-1 displays the WIZ for each of these features. WIZ buffers may be adjusted to account for site conditions, such as a spring emanating from a rocky talus slope in a different watershed. A hydrologist, fisheries biologist, or riparian specialist would make any determinations for WIZ buffer adjustments.

Table B-1 WIZ Buffers

Water Influence Zone Feature	Buffer (feet)
Fens	500
Perennial Streams	100 to 325
Wetlands and Springs	100 to 500
Intermittent and Ephemeral Streams	50

Log Landing Location

Objective: Locate new landings or reuse old landings to avoid effects to watersheds and associated degradation of water quality.

Implementation: No new landings would be created in the WIZ or in fens, wetlands, or meadows. Existing landings inside the WIZ would not be used and such landings would be rehabilitated as necessary. Existing landings outside the WIZ would be used whenever possible. Development of new landings would be minimized by grouping harvest areas whenever possible.

Erosion Prevention and Control Measures During Timber Sale Operations

Objective: Ensure that the purchaser's operations would be conducted to minimize soil erosion.

Implementation: Equipment would not be operated when ground conditions are such that excessive damage would be caused to soils. Soil should be dry, frozen, or covered with sufficient snow or ice to avoid compaction, displacement, erosion, or sedimentation. The purchaser may need to adjust work to ground and weather conditions. Erosion control measures would be maintained.

Log Landing Erosion Control

Objective: Reduce erosion and subsequent sedimentation associated with log landings.

Implementation: Include proper drainage on landings. Avoid use of poorly located landings.

Erosion Control on Skid Trails

Objective: Protect water quality by minimizing erosion and sediment derived from skid trails.

Implementation: Ensure that no more than 15 percent of the activity area outside the WIZ has compacted skid trails. Potential treatment areas with more than 15 percent compacted skid trails would be rehabilitated to improve infiltration. Techniques may include, but are not limited to tilling, sub-soiling, ripping, using slash or other material to achieve 60-percent ground cover, or installation of water bars. Compaction rates in the WIZ would not exceed five percent without approval by a BLM hydrologist, fisheries biologist, or riparian specialist.

Protection of the WIZ

Objective: Maintain or improve long-term stream health and riparian ecosystem condition.

Implementation: Apply the following measures:

- Where crossings of the WIZ are needed to access treatment areas, designated locations would be approved by the BLM hydrologist, fisheries biologist, or riparian specialist.
- Keep heavy equipment out of streams and swales (Figure B-1) except to cross at designated points, build designated crossings, or restore streams and swales.
- Keep heavy equipment out of streams during fish spawning, incubation, and emergence periods.
- Fell trees in a way that protects vegetation in the WIZ from damage.
- Keep log landings and skid trails out of the WIZ, including swales.

A swale is shallow troughlike depression that carries water mainly during rainstorms or snow melts.

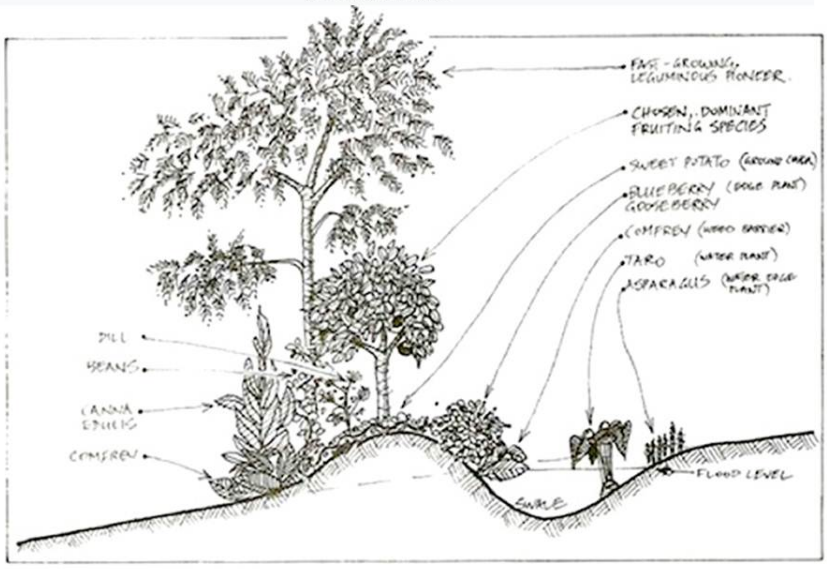

FIGURE 6.4 Trees planted off swale bank to take advantage of wet-season water.

Figure B-1. Sketch of a swale within the landscape.

Soil Moisture Limitations for Mechanical Equipment Operations

Objective: Prevent compaction, rutting, and gullying, with subsequent sediment production and turbidity.

Implementation: Ensure soil conditions are evaluated and soil moisture is low or soils are frozen before implementation of management activities.

Maintenance of Ground Cover

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

Explanation: Organic ground cover (plants, litter, and humus) is vital to maintain hydrologic function. Reduced ground cover decreases infiltration of water and increases surface runoff and peak flows. Continued or severe loss of ground cover often causes the formation of pedestals, rills, and gullies that greatly concentrate runoff, increase peak flows, and damage streams.

Implementation: Apply the following measures:

- Maintain the organic ground cover of each activity area so that pedestals, rills, and surface runoff from the activity area are not increased. The amount of organic ground cover needed varies by different ecological types and should be commensurate with the potential of the site.
- Maintain or improve long-term levels of organic matter and nutrients on all lands.
- If machine piling of slash is done, conduct piling to leave topsoil in place and to avoid displacing soil into piles or windrows.

Maintenance of Roads

Objective: Maintain roads in a manner that provides for water quality protection by minimizing rutting, failures, side casting, and blockage of drainage facilities, all of which can cause erosion, sedimentation, and deteriorating watershed conditions.

Implementation: Work with the BLM Authorized Officer to ensure roads are maintained for soil and water-quality protection. Apply the following measures:

- Key sediment traps into the ground. Clean them out when 50 percent full. Remove sediment to a stable, gentle, upland site and revegetate.
- Do not disturb ditches during maintenance unless needed to restore drainage capacity or repair damage. Do not undercut the cut slope.
- Space cross drains and water bars according to road grade and soil type.
- Empty cross drains onto stable slopes that disperse runoff into filter strips. On soils that may gully, armor outlets to disperse runoff. Tighten cross-drain spacing so gullies are not created.
- Armor rolling dips as needed to prevent rutting damage. Ensure that road maintenance provides stable surfaces and adequate drainage.

- Where berms must be used, construct and maintain them to protect the road surface, drainage features, and slope integrity while also providing user safety. Ensure there are outlets in the berms to allow runoff to leave the road.

Traffic Control during Wet Periods

Objective: Reduce surface disturbance, rutting of roads, and minimize sediment washing from disturbed road surfaces.

Implementation: Control hauling activities when wet conditions exist that could create adverse effects to the road and local resources.

Control of Road Drainage

Objective: Minimize the erosive effects of water concentrated by road drainage features, disperse runoff from disturbances within the road clearing limits, lessen the sediment yield from roaded areas, and minimize erosion of the road prism by runoff from road surfaces and uphill areas.

Implementation: Maintain the road and associated drainage features to prevent erosion and sedimentation of water bodies and WIZs.

Snow Removal and Storage

Objective: Prevent or reduce erosion, sedimentation, and chemical pollution that may be caused by snow removal and storage activities.

Explanation: Rural roads are sometimes used in areas that receive snow. Snow removal from roads may adversely affect aquatic and riparian resources in several ways. Plowing may physically displace native or engineered surfaces on roads, damage drainage structures, or alter drainage patterns. Plowing may also remove protective soil cover (for example, vegetation and mulch). These changes can cause concentrated flow, increased erosion, and a greater risk of sediment delivery to water bodies.

Snow piled in large heaps or in sensitive areas may contribute to increased runoff, hill slope erosion, mass slope instability, and in-channel erosion from snowmelt. Snow stored in riparian areas and floodplains may compact soils, break or stunt vegetation, or channel runoff in undesirable patterns, thereby weakening the buffering capacity of these areas. Additionally, both snow removal and storage may add nutrients or fine aggregates used for de-icing or traction control directly to surface water and indirectly to both surface water and groundwater during runoff.

Implementation: Apply the following measures:

1. Prepare a winter road-maintenance plan. Include an erosion and sediment control component to address the following, particularly when no other alternatives exist:

    a. Snow storage areas that could affect water bodies, riparian areas, wetlands, floodplains, and streams.

    b. Fill slopes subject to erosion.

    c. Snow storage locations whose runoff could overwhelm drainage features.

d. Winter logging operations.

e. Store snow in pre-approved areas where snowmelt would not cause erosion or deposit snow, road de-icers, or traction-enhancing materials directly into surface waters.

f. Plan as though snowmelt from snow storage is the equivalent of an intense localized rainfall.

g. Mark drainage structures to avoid damage during plowing.

2. Move snow in a manner that prevents disturbance of road surfaces and drainage structures, while protecting adjacent aquatic and riparian resources.

3. Control areas where snow-removal equipment can operate to prevent damage to riparian areas, floodplains, and stream channels.

4. Install snow berms where such placement precludes concentration of snowmelt runoff and serves to rapidly dissipate melt water. Provide frequent drainage through snow berms to avoid hydrologic connectivity with surface waters, concentration of snowmelt runoff on fill slopes and other erosive areas, to dissipate melt water, and to prevent sediment delivery to water bodies.

5. Conduct frequent inspections to ensure road drainage is not adversely affecting soil or water resources.

6. Where feasible, discontinue road use and snow removal when sediment delivery, or the threat thereof, is occurring.

Temporary Road Construction

Objective: Minimize potential risks to soil and water resources from the construction and use of temporary roads.

Implementation: No temporary roads would be constructed within WIZs. Any existing, closed routes outside of WIZs that are used would be obliterated upon completion of the project. Existing closed routes within WIZs would be considered for use as temporary roads on a case-by-case basis with review and approval by the BLM hydrologist, fisheries biologist, or riparian specialist.

Servicing and Refueling of Equipment

Objective: Prevent pollutants such as fuels, lubricants, bitumens, and other harmful materials from being discharged into or near rivers, streams, wetlands, springs, fens, impoundments, or natural or man-made channels.

Implementation: Operators are required to remove all service residues, waste oil, and other materials from BLM land. Refueling and storage of fuels and other harmful materials would occur outside of the WIZ on gentle upland sites. Mix, load, and clean on gentle upland sites. Dispose of chemicals and containers in State-certified disposal areas. Prepare a Spill Prevention Control and Countermeasure Plan as required by 40 CFR 112.

Monitoring

Objective: Ensure BMPs are appropriately applied and effective at achieving their objectives. Identify needs for new or modified BMPs to meet resource objectives.

Implementation: The Field Office Hydrologist, working with other staff as needed, would randomly select sites for monitoring each year. Monitoring would follow methods developed by the USFS (2002).

References

USDI and USDA. 2007. Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development. BLM/WO/ST-06/021+3071/REV 07. Denver, Colorado: Bureau of Land Management.

USDA Forest Service. 2006. Watershed Conservation Practices Handbook. Forest Service Handbook 2509.25.

USDA Forest Service. 2002. Investigating Water Quality in the Pacific Southwest Region. Best Management Practices Evaluation Program (BMPEP) User's Guide. Vallejo, California: USDA Forest Service, Pacific Southwest Region.

Appendix C Comment Content Analysis and Response to Comments

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Public Comment Content Analysis and Response to Comments

SW Gunnison Bark Beetle Salvage Draft Environmental Assessment

Introduction and Summary

The public comment period on the Draft Environment Assessment (EA) for the SW Gunnison Bark Beetle Salvage began with release of the Draft EA and notification of interested parties on June 12, 2015. A 30-day comment period was provided, ending on July 13, 2015. Four comment letters were received from individuals, agencies, or organizations during the public comment period. Table C-1 lists the respondents and the identification number that was assigned to each letter for tracking.

Table C-1 Individuals, Agencies, or Organizations Providing Comments

Commenter	Organization (if applicable)	Letter Number
Mark Tobias	Colorado Office of Archaeology and Historic Preservation	1
Mark Wigent	Arrowhead Improvement Association	2
Mike Granroth	Montrose Forest Products	3
Allison Melton	High Country Conservation Advocates	4

Comments and Responses

Each substantive comment received has been reviewed. Comments in favor of or against the proposed action or alternatives, or those that only agree or disagree with agency policy are not considered substantive. Substantive comments are defined as those that do one or more of the following:

- Question, with reasonable basis, the accuracy of information in the EA;
- Question, with reasonable basis, the adequacy of the analysis in the EA;
- Present reasonable alternatives other than those presented in the EA; or
- Cause changes or revisions in the proposal. In other words, they raise, debate, or question a point of fact or policy.

The interdisciplinary team (IDT) responded to all substantive comments. Similar comments have been compiled and summarized as general comments. These are presented under each of the issue headings below, with numbers indicating which letters and comments were used to develop that general comment. A response is then given. Following the general comments and responses, the original individual comments are listed in Table C-2. This allows the reader interested in a particular topic to review the substance of the issue and the team's response. Copies of the comment correspondence and a listing of the substantive comments have been placed in the administrative record.

The comment statements loosely follow the organization of the EA. Some comments may cover more than one issue; therefore, all issues should be completely reviewed before conclusions are reached on the level of comment for each resource issue.

General Comments

Comment: We did not receive notice of scoping. Please send it to us if available. (2-2).

> Response: *A postcard announcing the scoping comment period was mailed to "Arrowhead Improvement Association, Inc., P. O. Box 89, Montrose, Colorado, 81402" on December 22, 2014. The content of the postcard is available in the administrative record. The Draft EA reviewed by the commenter contains information about the project that is more current; therefore, a copy of the scoping postcard was not forwarded to the commenter.*

Proposed Action and Alternatives

Comment: We support the proposed action (2-1, 3-1).

> Response: *Thank for your comment.*

Comment: The proposed action should include the Ridge Stock Drive Trail, to address Douglas-fir beetle mortality. (2-3)

> Response: *The Ridge Stock Drive Trail was not added to the Proposed Action Alternative in the Final EA because the majority of lands managed by the BLM along this trail are not accessible, nor are they generally operable using ground-based equipment. The economics of salvage operations are not favorable in the very small areas of BLM lands that are both accessible and operable along the Ridge Stock Drive Trail.*

Comment: Treatment of areas in excess of 35 percent slope should not be included in a normal timber sale contract. (3-4).

> Response: *The BLM understands the commenter's concern with the costs of non-ground based yarding (cable or helicopter). The potential treatment areas were identified based partially on slope, with the goal of generally limiting treatments to areas with slopes of less than 35 percent. The project design standard limiting harvest on slopes greater than 35 percent to cable or helicopter methods has been retained in the Final EA to allow flexibility in the event that the economics of these methods change or that treatment of steep areas becomes desirable. The BLM would carefully consider the feasibility (including economics) of any timber harvest proposed on slopes greater than 35 percent.*

Comment: Unit boundaries should be well marked with flagging or paint, or using existing boundaries (for example, roads). (3-5)

> Response: *Unit boundaries would be marked in accordance with current BLM contractual requirements, which may include the use of flagging, paint, or existing physical boundaries, as applicable.*

Comment: The BLM should consider an alternative that prioritizes protection of public safety and critical infrastructure. This alternative should prioritize spruce beetle management along roads, trails, and other public sites, in conjunction with particularly fire-prone areas that are most vulnerable to erosion and watershed damage. (4-1)

> Response: *The BLM considered an alternative that prioritizes protection of public safety and critical infrastructure (Section 2.2.3 in the Draft EA). Reducing the risk to public health, safety, and infrastructure is one purpose of the proposed project. The alternative suggested by the commenter would meet this purpose. However, another purpose of the proposed project is to reduce the risk of severe wildfire and subsequent damage to watersheds. Achieving this objective requires an approach that considers the entire landscape, not just high-priority corridors along roads, trails, and at other sites used by the public. The suggested alternative would not meet this purpose. The Proposed Action Alternative (Section 2.1.2 in the Draft and Final EAs) would reduce the threat to public health and safety, including critical infrastructure in high priority areas, as well as reducing the threat to watersheds posed by future severe wildfires. The Final EA considers the suggested alternative, but not in detail, because it would not meet the entire purpose and need for the project.*

Comment: The Final EA should describe the specific stands that would be treated (with documentation supporting their selection) and their total acreage. (4-2)

> Response: *The best currently available information on the progress of the spruce beetle infestation and specific stands that could reasonably be treated was used to define the potential treatment areas. No more detailed information is available. The 8,700 acres proposed for treatment is the best estimate available of the extent on the potential treatments.*

Comment: The effectiveness and feasibility of implementing the project design standards should be assessed in the Final EA. (4-3)

> Response: *The BLM does not have any formal monitoring results showing the effectiveness of the proposed project design standards on other, completed projects. In this case, the IDT is relying on their best professional judgement and experience using similar standards on similar projects. During development of the project design standards, the IDT considered whether the standards would meet their stated purpose of sufficiently limiting the effects of project activities on the resources they were designed to address. The IDT also considered the feasibility of successfully implementing the project design standards. This use of the best available information and IDT knowledge constitutes a sufficient assessment of the project design standards and provides a reasonable basis for development of the Finding of No significant Impact (FONSI).*

Comment: More discussion of monitoring, including photo-documentation, is needed in the Final EA (see Table C-2 for detailed recommendations). (4-4, 4-5)

> Response: *Additional discussion of monitoring, including photo-documentation, has been added to the project design standards in the Final EA.*

Comment: Rest (from livestock grazing) of treated areas should be proactively discussed among BLM staff and implemented consistent with grazing permits. (4-6)

> Response: *The Draft EA (Section 2.1.3.5) contains several measures developed through discussions among BLM staff that would be implemented as needed (based on monitoring) to*

ensure successful tree regeneration following treatment. These measures include the consideration of rest from livestock grazing and have been retained in the Final EA.

Comment: Slash treatments should not include machine piling or burning of large piles. Piles should be no more than about six feet high. (4-15)

Response: *Machine piling and burning of large piles have been retained as components of the Proposed Action Alternative in the Final EA. In some cases, these methods are expected to provide the most efficient means of disposing of the slash created by project activities. The BLM would consider trade-offs among efficiency, effectiveness in reducing slash to acceptable levels, and effects to different resources when selecting slash disposal methods for each potential treatment area.*

Roads

Comment: The Alpine Plateau Road is a Forest Service Road, not a Gunnison County Road. (2-4)

Response: *Ownership and maintenance of the Alpine Plateau Road is complex. Different parts of road are subject to County, BLM, and U. S. Forest Service jurisdiction. Routine maintenance is currently conducted by Gunnison County.*

Comment: The EA does not discuss traffic on the Alpine Plateau Road, including number of logging trucks or timber volume removed. (2-5)

Response: *No estimate of project traffic levels on the Alpine Plateau Road is available. Several factors, including the size and location of timber sales, the allowed operating season, and the selected contractor (including their operating capacity), are unknown at this time, making any estimate of traffic levels speculative.*

Comment: A haul-safety plan should be developed, discussed in the Final EA, and placed in any timber sale contracts. (2-6)

Response: *A project design standard requiring development of a transportation plan, and its inclusion in any timber sale contracts, has been added to the Final EA. Safety of all road users during haul would be a primary consideration in the transportation plan.*

Comment: Reconstruction of the Alpine Plateau Road is recommended (see Table C-2 for detailed recommendations from the commenter). The Final EA should include an economic analysis of the costs and available funds for this work, which should be prioritized based on available funds. (2-7)

Response: *Reconstruction of the Alpine Plateau Road is not part of the Proposed Action Alternative, nor are funds for the suggested improvements available. The BLM would require the timber sale contractor to maintain the road to its current or better condition during and after its use for timber hauling.*

Comment: A dust abatement plan should be developed, discussed in the Final EA, and placed in any timber sale contracts. (2-8)

Response: *A project design standard requiring development of a transportation plan, and its inclusion in any timber sale contracts, has been added to the Final EA. Dust abatement would be a component of the transportation plan.*

Comment: Measures are needed to address safety concerns with winter haul and snow plowing, as well as restrictions during break-up and high-use periods, and potential conflict with snowmobile trails (2-9, 2-10).

> Response: *A project design standard requiring development of a transportation plan, and its inclusion in any timber sale contracts, has been added to the Final EA. Winter haul, snow plowing, use restrictions, and reduction of conflicts with snowmobile use would be components of the transportation plan.*

Comment: Timber sales should be set up along roads with no winter-use restrictions. (3-6)

> Response: *The BLM considers winter logging a viable option in any location where it would not adversely affect other resources. During preparation of timber sale contracts, winter logging would be considered in all appropriate locations.*

Comment: Additional information on temporary roads should be provided (see Table C-2 for detailed recommendations from the commenter). (4-16)

> Response: *No additional information is available on the locations of temporary roads that would be part of the proposed project. In general, existing roads would be used to access the potential treatment areas. Temporary roads would only be constructed where existing access is not adequate for safe or efficient salvage operations. The exact locations of temporary roads would be determined by the timber sale contractor, with approval by the BLM (Section 2.1.3.7 in the Draft EA, Section 2.1.3.8 in the Final EA).*
>
> *One use of temporary roads would be for short spurs to log landings that may be located adjacent to existing roads. In some locations, temporary roads may be constructed to reduce the need for long skids out to existing roads. In this case, use of a temporary road can eliminate several long skid trails, minimizing the extent of soil disturbance and simplifying the task of post-treatment reclamation and monitoring.*
>
> *Temporary roads would be constructed immediately before they are needed, and closed and rehabilitated (Section 2.1.3.7 in the Draft EA, Section 2.1.3.8 in the Final EA) as soon as feasible once their use is complete. The length of time between construction and rehabilitation of temporary roads would depend on several factors, including the extent of treatment areas each road is used to access, the allowed operating season, and the operating capacity of the contractor. The intent of temporary roads is for them to be constructed, used, and then rehabilitated within one operating season; however, this timeline may not always be feasible.*
>
> *The rehabilitation process would include use of physical barriers, including construction of water bars as needed and placement of slash and other debris on the road surface. These measures are expected to prevent public use of the temporary roads. Temporary roads would be monitored for noxious weeds and public use for a minimum of two years following completion of the rehabilitation process. If monitoring shows that public use is occurring, additional measures would be developed and implemented by the BLM to prevent public use.*

Soils and Water Resources

Comment: The project should adhere to Colorado's Best Management Practices. (3-2)

Response: *The project design standards included in the Draft EA (Section 2.1.3, and expanded in Appendix B) meet or exceed the requirements of Colorado's Best Management Practices. These project design standards have been retained in the Final EA.*

Comment: We believe the EA underestimates the likely effects on soils. (4-13)

Response: *The effects to soils (and watersheds) were analyzed using the Water Erosion Prediction Project (WEPP) model (Elliot and Hall 2010). The WEPP model is based on modern hydrologic and erosion science. 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, erosion is occurring so that best management practices can be selected to most effectively control soil loss and sediment yield (Section 3.4.2.1.2 in the Draft and Final EAs). The WEPP model represents the best available analysis tool and provides the best available estimate of the potential effects of the proposed project on soils.*

Cultural Resources

Comment: Office of Archaeology and Historic Preservation (OAHP) is the name given to the State Office of Historic Preservation (SHPO) in Colorado. (1-1)

Response: *This has been noted in the Final EA.*

Comment: Additional discussion and definition of Area of Potential Effect (APE) is needed. BLM should justify its boundary decision so that reader understands how potential direct and indirect effects have been considered. (1-2)

Response: *Additional discussion and definition of the APE have been added to the Final EA.*

Comment: Setting is normally considered an indirect effect. (1-3)

Response: *Setting has been changed to an indirect effect in the Final EA.*

Wildlife

Comment: The project forester should have the authority to waive the elk calving restriction if no elk are present in the timber sale area. (3-3)

Response: *The project design standard that contains the elk calving restriction is based on a requirement in the RMP for the GFO (page 2-12). The RMP does not have a provision for waiving this restriction – a RMP amendment, which is not a component of the Proposed Action Alternative, would be needed to change this restriction. The elk calving restriction has been retained in the Final EA as it is written in the Draft EA.*

Special Status Animals

Comment: The lynx analysis in the Final EA should discuss how long the project would last and which specific areas would be prioritized. The BLM should actively ensure adequate lynx habitat remains on site. Project design standards for lynx habitat should be implemented by contractors and closely monitored by the BLM. (4-7)

> Response: *Discussion of how long the project would last has been added to the Final EA. Specifically, salvage harvest operations and associated activities could occur throughout each year for a period up to 10 or more years, but harvest operations would be staggered spatially and temporally and would not affect the entire analysis area at once. The best currently available information on the progress of the spruce beetle infestation and specific stands that could reasonably be treated was used to define the potential treatment areas. No more detailed information is available on which specific areas would be prioritized.*
>
> *Several project design standards (Section 2.1.3 in the Draft and Final EAs) promote the retention of specific components of lynx habitat, such as snags, coarse woody debris, dense horizontal cover, and advanced regeneration of spruce. These project design standards would be integrated into silvicultural prescriptions and cut-tree specifications for all timber harvest contracts. The BLM would monitor implementation of all timber harvest contracts.*

Comment: The Biological Assessment (BA) should be provided to the public with the Final EA, with a comment period before the final decision is made. (4-8)

> Response: *The BA will be available to the public as part of the administrative record for the project. The Final EA contains the same analysis for federally listed species as the BA. The FONSI, which is included in the Decision Record, references and summarizes the conclusions of the BA.*

Comment: Any openings created should not be larger than 40 acres. (4-9)

> Response: *A 40-acre limit would be arbitrary because the size of any openings created would not be based on the extent of the spruce beetle infestation or any other factor; therefore, this suggestion has not been incorporated into the Proposed Action Alternative. The goal for the Proposed Action Alternative is to salvage dead, dying, and high-risk spruce. Post-harvest, many of the treated stands would resemble land treated with a regeneration harvest method, such as a seed-tree cut or overstory removal, because the targeted stands are dominated by spruce and because mortality of mature spruce in infested stands is nearly 99 percent. Harvest in these areas would create openings because of the high level of spruce beetle mortality, even though the creation of openings is not an explicit goal of the Proposed Action Alternative. Even if the No Action Alternative were selected, some openings exceeding 40 acres in size would likely develop as trees die, rot, and fall over in the infested stands.*

Comment: Advanced regeneration of all tree species should be left standing. (4-10)

> Response: *As stated in Section 2.1.2 of the Draft and Final EAs, other trees species that are not dead or beetle-infested (for example, aspen and subalpine fir) would be retained, except where individual trees impede treatment operations or pose a hazard. Advanced regeneration of spruce that is not dead or infested with spruce beetles would also be retained to the extent feasible.*

Comment: Effects to marten should be analyzed. (4-11)

> Response: *The Draft EA did not analyze specific effects to marten because it is not a special status species for the BLM and because it was not mentioned as a specific concern during scoping. Analysis of marten has been added to the Final EA.*

Comment: Specific project design standards should be implemented where goshawk territories are identified (see Table 2 for detailed recommendations). (4-12)

> Response: *The project design standards specific to the goshawk (Section 2.1.3.12 in the Draft EA and Section 2.1.3.13 in the Final EA) would be implemented where goshawk territories are identified.*

Comment: The EA should provide an analysis comparing the effects of winter harvest on watersheds with the effects on lynx. (4-14)

> Response: T*he effects of winter harvest on watersheds and on lynx are not directly comparable. Additional analysis of the potential effects of winter harvest on lynx has been added to the Final EA. In the Decision Record, the Authorized Officer will have the opportunity to carefully consider the effects of winter harvest on both lynx and watersheds.*

Wilderness and Wilderness Study Areas

Comment: Treatments should not go right up to the boundaries or occur within the boundaries of Wilderness or Wilderness Study Areas (WSAs). Boundaries should be based on natural topography. (4-17)

> Response: *As stated in Section 2.1.3.11 of the Draft EA and Section 2.1.3.12 in the Final EA), no project activities would take place in Wilderness or WSAs. In addition, buffers have been established to prevent any project activities from inadvertently entering Wilderness or WSAs. No project activities would take place within 500 feet of Wilderness or within 200 feet of WSAs. Where feasible and practical, natural boundaries would be used during on-the-ground layout of potential treatment areas.*

Comment: There is no real threat to the Powderhorn Lakes Trailhead. Dead spruce along the trail should be left standing. Once they fall, they should only be cut out where they are directly on the trail. (4-18)

> Response: *Dead and dying spruce are present both around the Powderhorn Lakes Trailhead and along BLM Road 3033, which provides access to the trailhead. While the potential for damage to infrastructure from falling trees is limited, the risk of the road or trail being blocked remains. In addition, the risk to members of the public who may be in the area when trees fall would be substantial. Finally, additional mortality of spruce in this area is expected as the spruce beetle infestation proceeds, which would increase the risk to public health and safety, and infrastructure.*

Comment: All three project maps should show land designations such as Wilderness, WSAs, and Forest Service. (4-19)

> Response: *Wilderness, WSAs, and lands managed by the U. S. Forest Service have been added to the maps in the Final EA, as applicable.*

Table C-2 lists each individual substantive comment, reproduced from the comment letters. Some of the more extensive comments have been edited to reduce their volume without losing their content. All original comment letters have been placed in the administrative record.

Table C-2 Individual Comments

Comment #	Comment
1-1	OAHP is the name given to the SHPO in Colorado.
1-2	Additional discussion and definition of APE is needed. BLM should justify its boundary decision so that reader understands how potential direct and indirect effects have been considered.
1-3	Setting is normally considered an indirect effect.
2-1	The Arrowhead Improvement Association (AIA) is generally supportive of the salvage of beetle killed timber on the Alpine Plateau (shown as the Big Blue Area in the EA).
2-2	The EA shows that scoping occurred in December of 2014 and included sending scoping information to the AIA. We have no record of receiving any such information. Please send it to us if available.
2-3	We do note that the plan seems to ignore the Ridge Stock Drive Trail that is located directly to the east of the Arrowhead community and is currently experiencing a very heavy attack from Douglas fir bark beetles. We request that the EA be modified to include timely harvest of beetle infested trees in that area, as well.
2-4	Our primary concern is the Alpine Plateau road for timber haul and the lack of information in the EA related to this road. The EA incorrectly identifies this Forest Service Road as a Gunnison County Road. There are several written agreements between the Forest Service, Gunnison County, and the AIA related to the maintenance of this road. Copies of these agreements have been provided to Brian Brown under separate cover.
2-5	Adding logging trucks and related traffic from 4,791 acres of salvage timber will add a significant amount of traffic to this road [County Road 867]. (No information is provided in the EA on the number of logging trucks or the timber volumes to be removed).
2-6	In addition, there should be a haul safety plan developed. With advance planning this type of safety plan should be discussed in the EA and followed up in detail in each timber sale contract.
2-7	We feel it would be advantageous for the BLM to coordinate with the Forest Service to do the following suggested reconstruction work through and below Arrowhead on the Alpine Plateau Road: • Remove large boulders and bed rock that are showing through the surface rock. These large rocks result in vehicles driving on the wrong side of the road creating a safety hazard. • Add a minimum of 6” of surface rock with as much as 12” needed in areas that currently have virtually no surface material • Added surface rock needs to be compatible with the use of Mag Chloride for dust abatement • Remove rock out crops in several places to increase road width and site distance. A detailed cost analysis should be done in the EA to determine the funds available for road work. This analysis should also set priorities for the work to be done depending on the available funds. None of this type of analysis is apparent in the current version of the EA.
2-8	Describe in the EA and follow up in timber sale contracts and agreements with the Forest Service, a dust abatement plan which is essential for safety and air quality during the summer.
2-9	Plowing snow to maintain a safe travel width in coordination with the Arrowhead community is essential for winter haul. Winter haul also needs to include restrictions and agreements on timber hauling during freeze-thaw (break up) conditions, during known peak travel times and holidays.

Table C-2 Individual Comments

Comment #	Comment
2-10	There is currently a snowmobile trail located on BLM land under special use agreement with the Arrowhead Snowmobile club. The EA and subsequent timber sale contracts need to assure that this trail will be maintained in its present condition and available for use during the snowmobile season.
3-1	Montrose Forest Products is in support of the Proposed Action.
3-2	BMPs – Adherence to Colorado's Best Management Practices is important to preserve soil and water quality.
3-3	Wildlife – We understand the importance of preserving and protecting wildlife, but recommend language in the contract that allows the project forester authority to waive the elk calving restriction, provided there are no elk present in the timber sale area. The July 1 startup date often does not allow enough time to construct temporary roads, before the monsoon mud season.
3-4	Slopes in excess of 35% require cable or helicopter logging – The value of dead and dying spruce does not cover the prohibitive cost of cable and helicopter logging. The only equipment available in salvage operations is ground based. Treatment of such areas should not be included in a normal timber sale contract.
3-5	Undulation edges for aesthetics – Although this reduces the visual impact, it is difficult and time consuming for a logger to stay within the boundary. To avoid the problem, we recommend that the boundaries are well marked in paint or flagging. A good alternative is to use existing boundaries (roads, drainages, ridgelines, etc.).
3-6	Winter operations – Winter is a great season for logging. Snow and frozen soils eliminate compaction and sedimentation, as well as reduce impact to wildlife that normally use the spruce/fir zone. Timber sales should be set up along roads with no winter use restrictions.
4-1	The sheer magnitude of Colorado's spruce beetle outbreak renders it impossible to treat every affected acre of BLM forest land. Given these complicating factors, the BLM's approach to forest management in the Gunnison Field Office should prioritize public safety and infrastructure protection. In scoping comments submitted by HCCA we suggested that one alternative focus solely on the highest priority areas (human safety and critical infrastructure), and recommended that this be the focus of the proposal to ensure that severe hazards and risks are addressed in a timely manner to reduce and prevent physical harm. However, instead of a reasonable range of alternatives, the BLM has chosen to fall back on the Proposed Action Action/No Action dichotomy. We disagree with the reasoning outlined in the EA that dismisses offering additional alternatives for analysis. This does not give a realistic analysis of legitimate methods for responding to the spruce beetle outbreak. HCCA's request in scoping for a middle-ground alternative that focuses on public safety and infrastructure while minimizing environmental impacts is supported by the approach taken in 2012 Colorado Bark Beetle Strategic Plan. The EA concludes that "this alternative has been eliminated from further analysis because it fails to meet the entire purpose of and need for the proposed project." We disagree that it would not meet the purpose and need. Prioritizing spruce beetle management along roads, trails, and other public sites, in conjunction with particularly fire-prone areas that could lead to erosion and watershed damage (areas that would not in the backcountry), is not the same as what is envisioned in the Proposed Action. Between doing absolutely nothing (the No Action Alternative) and the heavy-handed proposal of the BLM (the Proposed Alternative) exists a procedurally and substantively legitimate option, one that could meet the purpose and need for the project. With limited resources, we strongly encourage the focus of any treatment be where we know infrastructure and other features that need a buffer, rather than remote landscapes.

Table C-2 Individual Comments

Comment #	Comment
4-2	We request that the agency determine stands within the three project areas that require attention based on the stated purpose and need. The EA states that "potential treatment areas would be concentrated in areas where 50 percent or more of the large trees are dead or under attack by the spruce beetle." 21 How many acres is this? Where specifically are these stands located in the Project Areas? We ask that this be clarified by providing the total amount of acres proposed to be treated as well as the documentation/studies that support this conclusion.
4-3	The EA lists numerous "Project Design Standards" that "would be used to protect important forest resources and infrastructure." As these are mitigation measures that are being relied upon in part by the BLM in its determination that the project warrants a FONSI, the EA must assess the effectiveness and feasibility of each of these measures. "Mitigation measures may be relied upon to make a finding of no significant impact only if they are imposed by statute or regulation, or submitted by an applicant or agency as part of the original proposal. As a general rule, the regulations contemplate that agencies should use a broad approach in defining significance and should not rely on the possibility of mitigation as an excuse to avoid the Environmental Impact Statement requirement." The EA lists design standards but does not assess their effectiveness. To support the efficacy of Design Standards, BMPs and the other mitigation measures, the BLM may not rely merely on prior experience without providing substantial data used to draw conclusions on the mitigation measures' effectiveness.
4-4	As one of the stated purposes is resiliency, it is essential that monitoring and analysis of treatments be executed properly. We strongly encourage the analysis to explain this in more detail in order to adhere to NEPA's hard look requirement. For monitoring and treatment to be effective, it must be well planned, and have assured funding to guarantee consistency.
4-5	We are pleased the BLM plans to use photo-documentation as part of monitoring. Use of such documentation should be formalized in the decision document to ensure it would be conducted as well as how it would be used, such as taking a photo from all cardinal directions, with the potential for additional photos should there be particular features of interest at each photo point. We recommend that multiple photo points are taken per-treatment area. For example, the decision document should require photos to be taken where significant disturbance would occur (such as skid trails), areas that are cut but have less disturbance than a skid trail, as well as in areas where advanced regeneration would be left undisturbed (this would serve as somewhat of a control group). Photos should be taken before, during, and after implementation. Photos taken during implementation should be taken multiple times so different phases of implementation would be captured (before skid trail, during use of skid trial, after skid trail is used). These photos would provide important documentation for comparing to post-implementation photos to document recovery of areas, including among other things, skid trails, and the presence and eradication of noxious weeds. We also would support the use of game cameras or other monitoring equipment that could be used to document any treatment area before, during, and after implementation. This type of documentation could be highly informative of what happens on the ground and would be useful for understanding impacts, whether positive or negative, of treatments in spruce-fir forest types.

Table C-2 Individual Comments

Comment #	Comment
4-6	Specific, identified measures should be taken to ensure that areas post-treatment receives proper rest from herbivore browsing to allow sufficient recovery. Although the BLM cannot control wild herbivore browsing, coordination with those at the BLM office in charge of grazing is important and something that can be controlled. We recommend that prior to a Final EA, that both staff looking to implement this project and grazing staff identify permits that overlap with potential treatment areas, determine what measures can be taken to allow these treatments areas to rest that would be compliant with the grazing permit, and how these measures would be implemented. Successful resting is up to strong internal BLM communication and coordination as well as external communication and coordination with the permittee. We believe a proactive approach like this could prevent an undesirable situation from occurring first, and then having to be addressed only after a certain amount of undesirable effects may have occurred.
4-7	We are especially concerned about the undetermined timeframe of this project in relation to lynx. The EA concludes that under the Proposed Action "any direct effects would subside after the project is complete, with the post-harvest areas available for use by lynx immediately following the activity, as long as adequate habitat remains on site." But there is no estimate of how long the project will last nor which specific areas will be prioritized. If the project lasts many years, we are concerned this may have long-term negative impacts on lynx and potentially exclude them from these areas. It is also not reassuring that the EA says that lynx will be okay "*as long as adequate habitat remains on site*." The BLM should actively make sure that adequate habitat does in fact remain on site. The EA states that "the number of trees, along with other vegetation, that would remain after the project would be sufficient to provide cover for lynx moving through or foraging in the project areas." Given the status of the species it is essential that the design standards for habitat cover identified in the EA be adhered to by contractors, and that this be closely monitored by the BLM.
4-8	We strongly recommend that the BA and any conclusions it may come to, be provided to the public. As this has yet to be provided during the Draft EA comment period, it would best serve the purposes of NEPA's public involvement requirements to provide this information with the Final EA and provide a comment period prior to releasing as a finalized decision.
4-9	We reiterate that if openings are created, they should not be any larger than 40 acres. This is important for wildlife as well as guarding against windthrow in project areas and providing necessary shade for the next generation of spruce.
4-10	We request that advanced regeneration of all tree species—even those that are not desirable strictly due to lack of merchantability—are left should standing. Connectivity areas need to be provided as well to prevent the landscape from having patches of regeneration that are isolated or "islands" surrounding an area that would be cut.
4-11	Treatments in spruce stands would pile and/or burn some of the existing down logs and thus damage or eliminate marten habitat. Habitat destruction due to clearcutting" is listed as a threat to marten. Down dead structure is critically important for marten, as this provides access to areas under snow. Most winter prey is taken under the snow surface. Fuel treatments could remove or rearrange fuels, which could degrade or destroy marten habitat, and habitat for prey. Snags and trees are also important.
4-12	Goshawk could be adversely affected by the proposed treatments. To help protect these species, we ask that three nest sites and three replacement nest sites of 30 acres each be retained where the species has been identified and to prohibit activities from March 1 to August 30. Additional protection measures that Reynolds et al., specifically noted also includes: 420-acre post-fledging family area ("PFA"), in which canopy cover in the older structural stages in spruce-fir is maintained at 70 percent and a 5,400-acre foraging area.

Table C-2 Individual Comments

Comment #	Comment
4-13	We believe the EA underestimates the likely effects on soils from the proposed project. Logging, skidding, and most other operations are accomplished with the use of heavy equipment. The use of these machines can cause rutting, compaction, and displacement of soils, especially when soils are wet, as they often are in spruce stands. Accordingly, this is an additional persuasive reason to keep heavy equipment from operating even on the outer part of the WUI to decrease instances of overland flow on top of compacted soil, which in turn could carry additional sediment into water bodies.
4-14	Operating during winter is one way to reduce impact to watersheds. However, such operations can require snow plowing and have deleterious impacts on Canada lynx. We would like to see analysis weighing over-snow activities impacts on watersheds versus impacts to Canada lynx. We believe this may demonstrate that backcountry treatments (which we strongly encourage not to take place) do not outweigh potential negative impacts on watersheds and/or species.
4-15	Slash should not be machine piled and burned in large piles. Machine piling requires numerous trips by heavy equipment, increasing the likelihood of compacting or displacing soil. Burning large piles is especially bad because it results in a hot fire of long duration. That can sterilize the soil and volatilizes most nutrients. Any piles to be burned should be no more than about six feet high. Please see Attachment B of HCCA's scoping comments for more information.
4-16	We ask that the BLM: • Provide likely locations for road construction; • Provide the duration for which temporary road would be on the landscape; • Provide measures and the monitoring/enforcement that would be used to prevent public use of these temporary roads; • Obliterate temporary roads immediately upon completion of a project; • Monitor obliterated roads for invasive weeds and illegal use for a minimum of two years after project completion.
4-17	Based on our review, it appears that only one of the proposed project areas, Indian Creek Project Location, is within close proximity to wilderness and WSAs. To respect and protect the pristine, untrammeled by man characteristics of lands with both of these designations, we recommend that treatments do not occur in the backcountry. Should, however, such treatments take place despite our recommendation, they should not go right up to boundary lines and most certainly cannot occur within the boundaries. The natural topography of the landscape should provide boundaries that are defensible for these lands to prevent potential mishaps and degradation of remote and wild experiences in lands with these characteristics that would occur if a treatment area went into such a landscape or is visible from within it.
4-18	A recent inventory by staff of the Powerhorn Lakes Trailhead demonstrated no real threat from potential hazard trees. Although there are some dead and dying spruce along the first part of the trail, which is not in wilderness, rather than cutting these trees down preemptively, they should be left standing. Spruce trees after dying due to spruce bark beetle can still stay standing for multiple decades. This helps retain soil, provides important habitat for wildlife, and shade so the next forest of spruce can begin to grow. Should such trees fall over the trail at some later point in time, we recommend they be left lying where they fell with a section cut out where it directly overlaps the trail.
4-19	Although particularly helpful for the Indian Creek Project, all three project area maps should include land designations, such as Wilderness, WSA, and Forest Service. This information is important for the public to have certainty that Wilderness and WSA's will be respected and protected and to ensure any contractor is aware of land designations and their relation to a potential project area.

References

Elliot, W. J., and D. E. Hall. 2010. Disturbed WEPP Model 2.0. Ver. 2014.04.14. USDA Forest Service, Rocky Mountain Research Station. Moscow, Idaho. Online at: http://forest.moscowfsl.wsu.edu/fswepp.