United States Department of Agriculture

Forest Service

CP District-wide Salvage Project

Draft Environmental Impact Statement

Conejos Peak Ranger District, Rio Grande National Forest

July 2017 Conejos and Rio Grande Counties, Colorado

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CP District-wide Salvage Project
***Draft* Environmental Impact Statement**
Conejos and Rio Grande Counties, Colorado

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Abstract

This Draft Environmental Impact Statement evaluates the potential effects of salvage harvest of stands killed by spruce beetles under three alternatives: *No Action*, *Vegetation Management - Proposed Action*, and *Vegetation Management – Limited Action*. The Proposed Action would authorize the salvage harvest of spruce forests on up to 17,000 acres of Forest Service lands, post-harvest planting of conifer seedlings, and implementation of fuel reduction treatments adjacent to developed private lands and infrastructure. The analysis discloses the direct, indirect, and cumulative effects of implementing commercial and non-commercial management activities to meet the purpose and need and move toward desired conditions in the CP District-wide Salvage Project area.

This document follows the format established in the Council on Environmental Quality regulations (40 Code of Federal Regulations parts 1500-1508). It includes a discussion of the purpose and need for the proposal, alternatives to the proposal, the impacts of the proposed action and alternatives, and a listing of agencies consulted. It is tiered to the 1996 *Rio Grande National Forest Revised Land and Resource Management Plan*, as amended (Forest Plan), the final environmental impact statement, and record of decision issued for the Forest Plan. As the Rio Grande National Forest is currently undertaking a Forest Plan Revision, this project will be adapted, as needed, to accommodate new information or change associated with the new, finalized plan by utilizing the pre-implementation checklist process.

It is important that reviewers provide their comments at such times and in such a way that they are useful to the Agency's preparation of the EIS. Therefore, comments should be provided prior to the close of the comment period and should clearly articulate the reviewer's concerns and contentions. The submission of timely and specific comments can affect a reviewer's ability to participate in subsequent administrative review or judicial review. The comment period on the draft environmental impact statement will extend for 45 calendar days from the publication of the legal notice in the *Federal Register*. Publication is expected October 13, 2017.

Comments received in response to this solicitation, including names and addresses of those who comment, will be part of the public record for this proposed action. Comments submitted anonymously will be accepted and considered; however, anonymous comments will not provide the respondent with standing to participate in subsequent administrative or judicial reviews.

Submit email comments to: comments-rocky-mountain-rio-grande-conejos-peak@fs.fed.us

Submit hard copy comments to:

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Summary

In response to extensive mortality in spruce forests caused by the spruce beetle epidemic, the Conejos Peak (CP) Ranger District proposes to conduct salvage harvest activities on up to 17,000 acres of dead and dying spruce trees in order to move these stands closer to desired conditions in the long-term and capture economic value in the short-term. This proposal also includes performing hazardous fuel treatment activities on up to 1,000 acres of affected lands adjacent to private property and administrative sites, and, to evaluate regeneration needs to meet long-term desired conditions considering stocking requirements, wildlife habitat, and the desired rate of ecological recovery.

The CP District-wide Salvage Project area encompasses approximately 332,000 of National Forest System lands and is located across the Conejos Peak District in Conejos and Rio Grande Counties. Legal description for the project area is: T 32 N, R 3-7 E; T 33 N, R 3-7 E; T 34 N, R 3-7 E; T 35 N, R 2-5 E; T 36 N, R 2-5 E; T 37 N, R 3-5 E, New Mexico Prime Meridian.

The purpose and need for this project was developed by comparing objectives and desired conditions described in the Forest's land management plan relating to forest product use, forest and grassland health and function, and habitat needs for a variety of key wildlife and plant species. The purpose and need also considers the current conditions and expected future conditions of resources resulting from potential changes in climate and the impending mortality in the spruce forest across the Conejos Peak Ranger District. Due to the epidemic proportions of the spruce beetle infestation on the Rio Grande National Forest, project analyses were increased in scale to effectively consider larger landscapes.

Scoping and internal review have identified one key issue relating to timber salvage in this landscape: 1) Wildlife impacts specifically relating to Canada lynx and lynx habitat. This issue led the agency to develop the following three alternatives:

1. Alternative 1: *No Action*
2. Alternative 2: *Vegetation Management - Proposed Action*
3. Alternative 3: *Vegetation Management - Limited Action*

Both Action alternatives were designed to be viable, consistent with the direction of the land management plan, and capable of moving resources toward desired conditions, at least to some degree. The action alternatives propose varying acres of commercial harvest treatment activities that would be implemented adaptively to move toward desired conditions.

When evaluating effects between the alternatives, it was found that the No Action alternative would likely have the fewest short-term effects for most resources. The relatively slow rate of forest stand recovery in some areas could be detrimental to some resources. Fuel loadings would continue to increase as snags fall, increasing the potential for longer duration fires and negative soil-heating impacts and increased threat to Forest users, private resources and infrastructure. Under No Action, no National Forest System Roads would be maintained except under regular work orders and as funding allowed. No temporary road construction would be needed under this alternative. No Action would not benefit the local forest products industry.

The action alternatives would have some short-term (approximately 15 years) disturbance effects during harvest activities to soils, watersheds, wildlife and some Forest users. In the long-term (beyond 15 years), there is low risk for adverse effects to resources. Accelerated stand regeneration

would be positive in the long-term for all resources. Reducing potential long-term fuel loadings adjacent to private lands would reduce the risk for high-intensity fires in the project area and therefore reduce firefighter safety concerns. The action alternatives would do more to protect existing infrastructure. Positive benefits to local industry would be expected.

All proposed management activities for each action alternative would follow Forest Plan standards and guidelines and best management practices, project design criteria, and the silviculture guidelines. They would also incorporate the use of a project pre-implementation checklist process and monitoring elements to minimize adverse effects and protect resources.

Based upon the effects of the alternatives, the responsible official will decide whether or not salvage logging will proceed as proposed, as modified, or not at all; on all or part of the project area; and what monitoring, mitigation or activities will occur if salvage logging is implemented.

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Chapter 1. Purpose of and Need for Action

1.1 Introduction

The Forest Service has prepared this draft environmental impact statement (DEIS) in compliance with the National Environmental Policy Act and other relevant federal and state laws and regulations. This environmental impact statement discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives.

The document is organized into four chapters:

- **Chapter 1. Purpose and Need for Action:** This chapter provides background and context for the proposal considering the direction given in the 1996 *Rio Grande National Forest Revised Land and Resource Management Plan* (Forest Plan), as amended, along with other agency guiding strategies and direction.
- **Chapter 2. Alternatives including the Proposed Action:** This chapter provides a more detailed description of the agency's proposed action as well as alternatives for achieving the stated purpose. These alternatives were developed based on the purpose and need as well as the key issue raised both internally and by the public.
- **Chapter 3. Affected Environment and Environmental Consequences:** This chapter describes the environmental effects, organized by resource area, of implementing the proposed action and other alternatives.
- **Chapter 4. Consultation and Coordination:** This chapter provides a list of preparers and agencies consulted during the development of this environmental impact statement.
- **Appendices:** The appendices provide additional information related to the analysis and proposed implementation process.

Additional documentation, including more detailed analyses of project area resources, may be found in the project planning record located at the Conejos Peak Ranger District or Forest Supervisor's Office, Rio Grande National Forest.

1.2 Project Location/Project Area

The proposed CP District-Wide Salvage (CPDWS) Project is located on the Rio Grande National Forest, Conejos Peak Ranger District in Conejos and Rio Grande Counties, Colorado. The project analysis area ranges in elevation from 8,300 feet to 13,000 feet and encompasses approximately 332,000 total acres of National Forest System lands. Legal description for the project area is: T 32 N, R 3-7 E; T 33 N, R 3-7 E; T 34 N, R 3-7 E; T 35 N, R 2-5 E; T 36 N, R 2-5 E; T 37 N, R 3-5 E, New Mexico Prime Meridian.

Vegetation within the project area ranges from low-elevation mountain grass and shrubland to mixed-conifer and spruce-fir forest to rocky, alpine tundra at the highest elevations. The majority of forested acres are described as Engelmann spruce-subalpine fir, though aspen is present as a seral species throughout much of the spruce-dominated project area

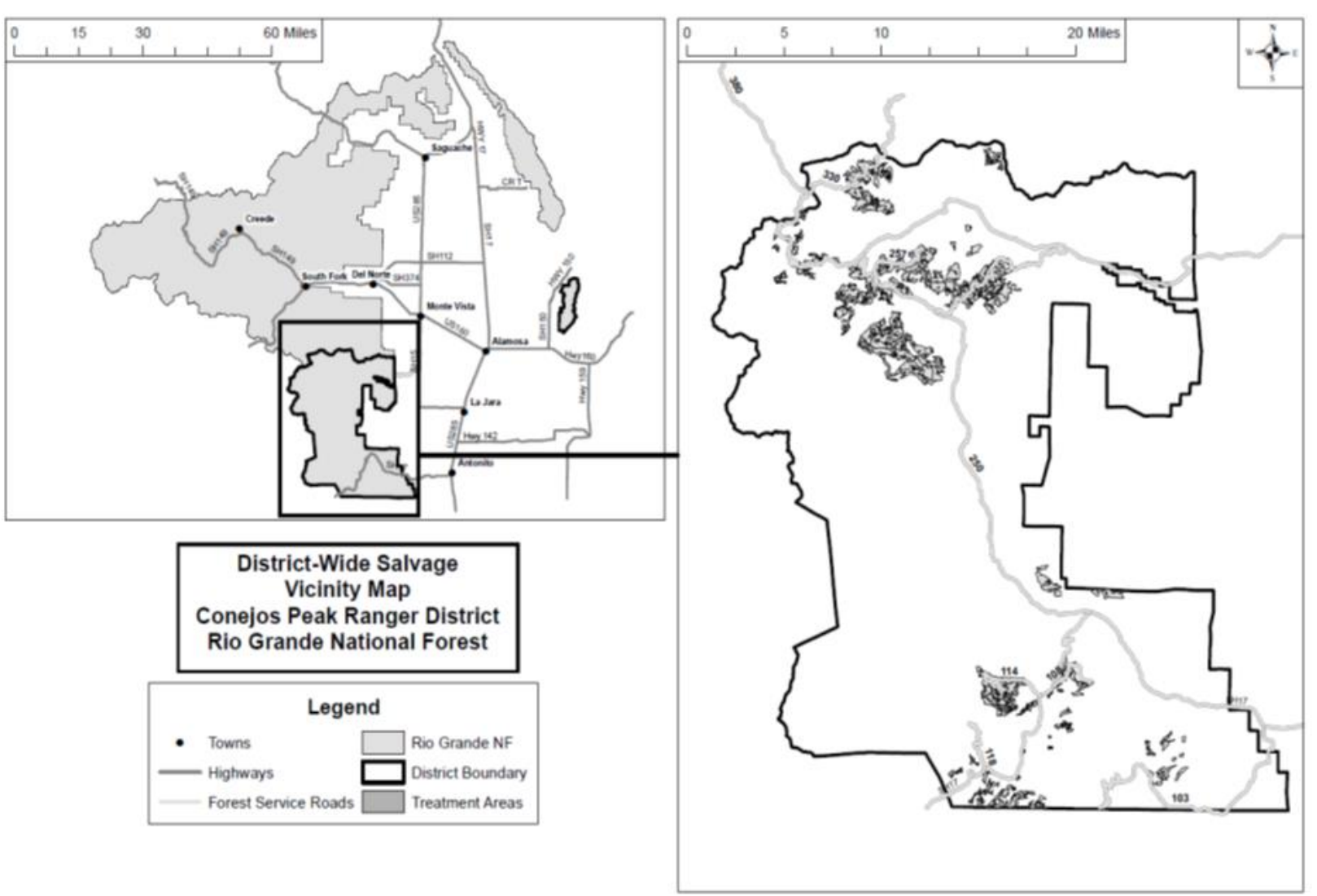

Figure 1. CP District-wide Salvage Project vicinity map

1.3 Background

Since the early 2000's, extensive spruce beetle mortality has occurred across the Conejos Peak Ranger District. Beetle population build-up was first noted in the southwestern part of the district in 2002 and began to spread to adjacent areas from there. Around 2007, it became evident that beetle populations were reaching epidemic proportions and were no longer behaving as endemic populations. Project analyses were subsequently increased in scale to effectively consider larger landscapes. Similar beetle activity and project responses have been occurring across the entire spruce-fir zone of the Rio Grande National Forest over the last 12 years.

When evaluating the spruce forest across the district, foresters anticipate that all remaining suitable beetle habitat will be infested within the next 2-3 years. Current affected acres are determined through aerial flight reconnaissance and then ground-truthed with field reconnaissance. Because the spruce beetle-kill signature does not appear in flight data until one year after infestation, it is estimated that a minimum of 85% of the spruce stands within the district (or approximately 126,000 acres) have already been impacted by beetles, far greater than the 67,000 acres observed in flight data. This assessment indicates a need to analyze all spruce beetle habitat across the district as a whole, both infested and anticipated, in consideration of future beetle mortality responses.

The first step in analysis was to determine the full extent of spruce beetle habitat and then define which of these areas have departed or are departing from the desired conditions described in the Revised Land and Resource Management Plan (Forest Plan). Across the district, approximately 149,000 acres of vegetation are mapped as having Engelmann spruce (the preferred food source) as a dominant life form. Most of these forested areas have not departed from desired conditions, due to Management Area Prescriptions (MAPs) such as Wilderness and Backcountry. Such areas would not be treated because they do not present a need for action. In other words, leaving dead spruce trees to deteriorate naturally in these areas meets the desired conditions of those MAP's. Other areas were also excluded from treatment consideration by the Colorado Roadless Rule. As a result of Forest Plan MAPs and additional Roadless Areas, approximately 109,000 acres of beetle habitat were removed from treatment consideration. Steep slopes and inaccessible areas were also removed from consideration, as well as areas already analyzed for treatment under previous projects. As a result, areas remaining for treatment consideration come to approximately 17,000 acres for salvage potential (11% of the total spruce forest on the district), and 1,000 acres of hazardous fuel treatment potential (less than 1% of the total spruce forest).

Areas expressly analyzed for treatments for this project are in MAPs such as those with an emphasis on wood production, where there is intent to evaluate insect and disease outbreaks against the potential for loss of commercial forest resources and with an emphasis on protecting the commercial resources. In other words, in appropriate MAP's leaving all of the standing dead trees to their natural deterioration does not meet MAP and Forest Plan objectives, while vegetation treatment would meet the management intent for these areas. Within other MAPs, vegetation composition and structure are managed to meet specific objectives for the area (e.g. recreation) and vegetation management treatments are implemented to accomplish those objectives or contribute to user safety. In additional MAPs within the project area, the plant communities may be managed in a range of successional stages to achieve biological diversity and vegetation management treatments are allowed with resource constraints.

These desired conditions for the MAPs tie to overarching Forestwide Desired Conditions and Objectives. One overarching Desired Condition is to supply wood products while providing for the biological diversity of forested areas. An associated Objective provides an emphasis on long-term sustainable production of resources for economies, communities, and people. Another overarching Desired Condition is that fuel profiles be consistent with land uses and estimates of historic fire regimes. An associated objective provides for using appropriate vegetative-management methods to modify

unacceptable fuel profiles, contributing to the protection of human life, property, and resources needed to support long-term industries.

The purpose of this project is to provide an adaptive decision framework for responding to spruce beetle mortality with salvage and hazardous fuel treatment projects in a timely and cost-effective manner in appropriate management emphasis areas, while providing for site-specific protection of biological diversity and other resource management objectives.

1.4 Purpose and Need for Action

In areas where forest conditions have departed from desired conditions, action is needed to respond to the widespread tree mortality caused by the ongoing spruce beetle epidemic. The disparity between existing and desired conditions creates a need to utilize available dead and dying trees in a timely manner to meet multiple-use mandates and provide for the protection of firefighters, users, communities, and private resources.

This project considers the landscape as a whole and responds to the desired conditions and objectives as described in the Forest Plan, *Rio Grande National Forest Land and Resource Management Plan* (USDA Forest Service 1996, as amended). Forest-wide objectives include reducing insect and disease infestations and using a range of silvicultural prescriptions to achieve ecosystem management objectives (Forest Plan p. II-3). The Forest Plan FEIS also addresses the demonstrated and ongoing demand for wood and miscellaneous forest products such as firewood and poles (FEIS p. 3-159). Additional Forest Plan desired conditions and objectives for this analysis are listed in Table 1 below. Objectives are "concise projections of measurable, time-specific intended outcomes. The objectives for a plan are the means of measuring progress toward achieving or maintaining desired conditions (36 CFR 219.7(a) (2) (ii))."

The purpose of this action is to utilize salvage logging in spruce stands impacted by tree mortality to protect against loss of forest products while perpetuating landscape resiliency and diversity, reducing hazardous fuels near private land and infrastructure, and to meet or move existing resource conditions toward desired conditions. This action will be consistent with Forest Plan direction, including standards and guidelines. Where agency land management plan direction was silent, outdated, or not applicable, the best available science and local knowledge was used. In order to meet the purpose of this action, the following needs have been identified.

In spruce stands heavily impacted by spruce beetle mortality, there is a need to:

- salvage dead or dying trees while these trees have economic value;
- plant conifer seedlings as needed to meet future forest objectives; and
- promote economic sustainability for local communities, including the forest product industry.

To meet hazardous fuel treatment management objectives, there is a need to:

- mechanically treat vegetation within 400 feet of private boundaries or 200 feet of administrative sites to increase defensible space;
- remove hazard trees within 400 feet of private boundaries or 200 feet of administrative sites;
- prune residual trees to lift crown base heights; and
- pile and burn or remove activity-generated fuels within timber sale or pre-commercial thinning areas.

The indicators for the Purpose and Need are as follows:

- acres of salvable timber expected to lose merchantability post mortality;
- volume of commercial forest products recovered from insect mortality;

- acres of hazardous fuel treatment; and
- proportion of spruce forest landscape diversified in stand structure and/or composition as a result of project activities.

The purpose and need for this project was developed by comparing objectives and desired conditions described in the Forest Plan relating to multiple-use objectives, forest health and function, biodiversity and sustainability along with considering the current and expected future conditions resulting from the persistent forest mortality due to insects and disease and potential climate changes.

1.5 Forest Plan and Other Direction

All land management decisions are governed by laws and policy which direct or provide bounds for project proposals and decisions. Some laws and policy provide constraints; others provide intent and direction for management actions to occur. Direction for this analysis was guided by the following documents:

USDA Forest Service Strategic Plan: 2015-2020

The Forest Service develops and publishes five year plans to guide management efforts and establish accountability for making progress toward the goals and objectives stated in these plans. The strategic goal, *Sustain our Nation's Forests and Grasslands*, with the following objectives apply to this project area:

Objective A – Foster resilient, adaptive ecosystems to mitigate climate change; and

Objective B – Mitigate wildfire risk.

The Forest Service Strategic Plan, with additional information, can be found online at:
http://www.fs.fed.us/strategicplan

Western Bark Beetle Strategy

The Western Bark Beetle Strategy (USDA Forest Service, 2011i) was developed in response to ongoing, widespread bark beetle epidemics across the western United States. The strategy addresses the three prongs of the bark beetle problem: human safety, forest recovery, and forest resiliency. Due to budget constraints and the scale of the epidemic, the Forest Service recognized it could not treat all affected acres, and the strategy prioritized treatments areas with human safety as the first priority, followed by recovery and resiliency. This document can be viewed at
http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5338089.pdf

Rio Grande National Forest Land Resource Management Plan

This proposal responds too many of the desired conditions (goals) and objectives described in the Forest Plan and would move the project area toward desired conditions described in the Forest Plan. Table 1 lists the Forest Plan desired conditions and objectives related to this project analysis and proposed management activities.

The Forest Plan can be viewed online at:
http://www.fs.usda.gov/main/riogrande/landmanagement/planning

Table 1. Forest Plan Desired Conditions and Objectives that pertain to the CP District-wide Salvage Project

Forestwide Desired Conditions	Forestwide Objectives
Vegetative structure on the Forest is capable of sustaining timber harvesting that supplies wood products for humankind while providing for biological diversity of those forested areas.	**2.2**. Manage the Forest to maintain or improve the health and vigor of all native plant associations.
The amount, arrangement, and continuity of live and/or dead material, which would contribute to fire spread (fuel profiles), are consistent with land uses and estimates of historic fire regimes.	**2.10** Use appropriate vegetative-management methods to modify unacceptable fuel profiles and reduce potentially unacceptable future high-intensity wildfires.
Special forest products, such as firewood, continue to be available from the Forest… **The Forest recognizes the needs of people from the San Luis Valley and surrounding areas, and strives to meet their needs for forest and wood products, while protecting those resources for future generations.**	**3.2.** Emphasize long-term sustainable production of resources for economies, communities, and people. **3.3.** Use a range of silvicultural prescriptions to achieve ecosystem management objectives. These objectives may include supplying forage for wildlife, reducing insect and disease infestations, maintaining or improving aspen stands, or enhancing scenery. **3.4.** Use existing roads, instead of constructing new ones.
Improve the financial efficiency of all programs and projects.	**6.2.** Manage, as much as practicable, the Forest's market oriented programs (timber, range, minerals, and special uses), so that they are financially profitable.
Emphasize cooperation with individuals, organizations, and other agencies while coordinating planning and project implementation.	**7.1.** Cooperate with all people, including those whose livelihood is dependent on National Forest resources, in the development of plans and projects. **7.2.** Cooperate with federal, state, local, and tribal governments, as well as private organizations and individuals, to: promote rural-development efforts…reduce loss of wildlands and structures to wildfires.
Promote rural development.	**8.1** Be a leader in working with rural people and communities including American Indian tribes, to develop opportunities and enterprise that contribute to their economic and social vitality. **8.2** Recognize the nature and extent of local economic dependencies on National Forest activities. Give special attention to resources that help diversify rural economies.
General Infrastructure.	Facilities are safe, accessible […].as needed to achieve resource management objectives.

This project is also addressing Forest-wide objectives for other resources such as recreation, wildlife and scenery. These are discussed under the individual resource areas in Chapter 3, Affected Environment and Environmental Consequences.

Management Area Direction

The Forest Plan designated areas to be managed for a particular emphasis or theme known as management area prescriptions (MAPs). Each management area prescription includes a description of the theme and physical setting, along with a description of the desired future conditions. The project area includes sixteen management area prescriptions displayed in Table 2 below. Figure 1 shows the spatial distribution of the management area prescriptions within the project area.

Table 2. Management area prescriptions in the CP District-wide Salvage Project area.

Management Area Prescription	Management Area Prescription Theme Description	Percentage	Treatment Allowance
1.11 - Wilderness, Pristine	Manage to protect pristine conditions; natural processes are not measurably affected by human use.	5%	none
1.11/1.5 - Inclusion - National Wild River in Pristine Wilderness	Manage to protect pristine conditions and Wild River segments.	2%	none
1.12 – Wilderness, Primitive	Manage to protect ecological conditions.	19%	none
1.5 – Eligible Wild Rivers	Wild Rivers and adjacent areas are managed to protect and perpetuate eligible river segments.	<1%	fuels treatment only
3.1 – Special Interest Areas – Emphasis on Use or Interpretation	Manage to protect or enhance areas of unusual characteristics.	<1%	fuels treatment only
3.3 – Backcountry[1]	Manage to maintain plant and animal habitats that are shaped primarily through natural processes, and to provide backcountry experiences to the public where there is little evidence of human activities.	33%	fuels treatment only
3.4 – National River System – Scenic Rivers Designated and Eligible	Manage to protect and perpetuate eligible river segments.	1%	salvage & fuels treatment
4.21 – Scenic Byways or Railroads	Manage adjacent lands to preserve scenic and recreation values.	3%	salvage & fuels treatment
4.3 – Dispersed Recreation	Manage for recreation opportunities.	5%	salvage & fuels treatment
4.4 – National River System – Recreation Rivers Designated and Eligible	Manage to protect eligible Recreation River segments.	2%	salvage & fuels treatment
5.11 – General Forest and Rangelands – Forest Vegetation Emphasis	Allow for a variety of management options, such as livestock grazing, wildlife habitat, dispersed recreation, exploration or development of minerals and energy resources, and timber harvest. Management emphasis is on a balance of resource uses.	3%	salvage & fuels treatment
5.13 – Forest Products	Allow a full range of activities, with an emphasis on the production of commercial wood products. Numerous open roads offer commercial access and roaded recreation opportunities, while restricted roads offer non-motorized recreation opportunities.	8%	salvage & fuels reduction

Management Area Prescription	Management Area Prescription Theme Description	Percentage	Treatment Allowance
5.41 – Deer and Elk Winter Range	Managed to supply adequate amounts of quality forage, cover, and solitude for deer, elk, and other species while on winter range.	4%	salvage & fuels reduction
5.42 – Bighorn Sheep Area	Managed to maintain or improve bighorn sheep habitat.	8%	salvage & fuels reduction
6.6 – Grassland Resource Production	Managed to produce forage for livestock, wildlife, and/or recreational stock.	5%	salvage & fuels reduction
Total project area		***100%***	

[1]Many of the MAP 3.3 Backcountry areas are now managed under the Colorado Roadless Rule.

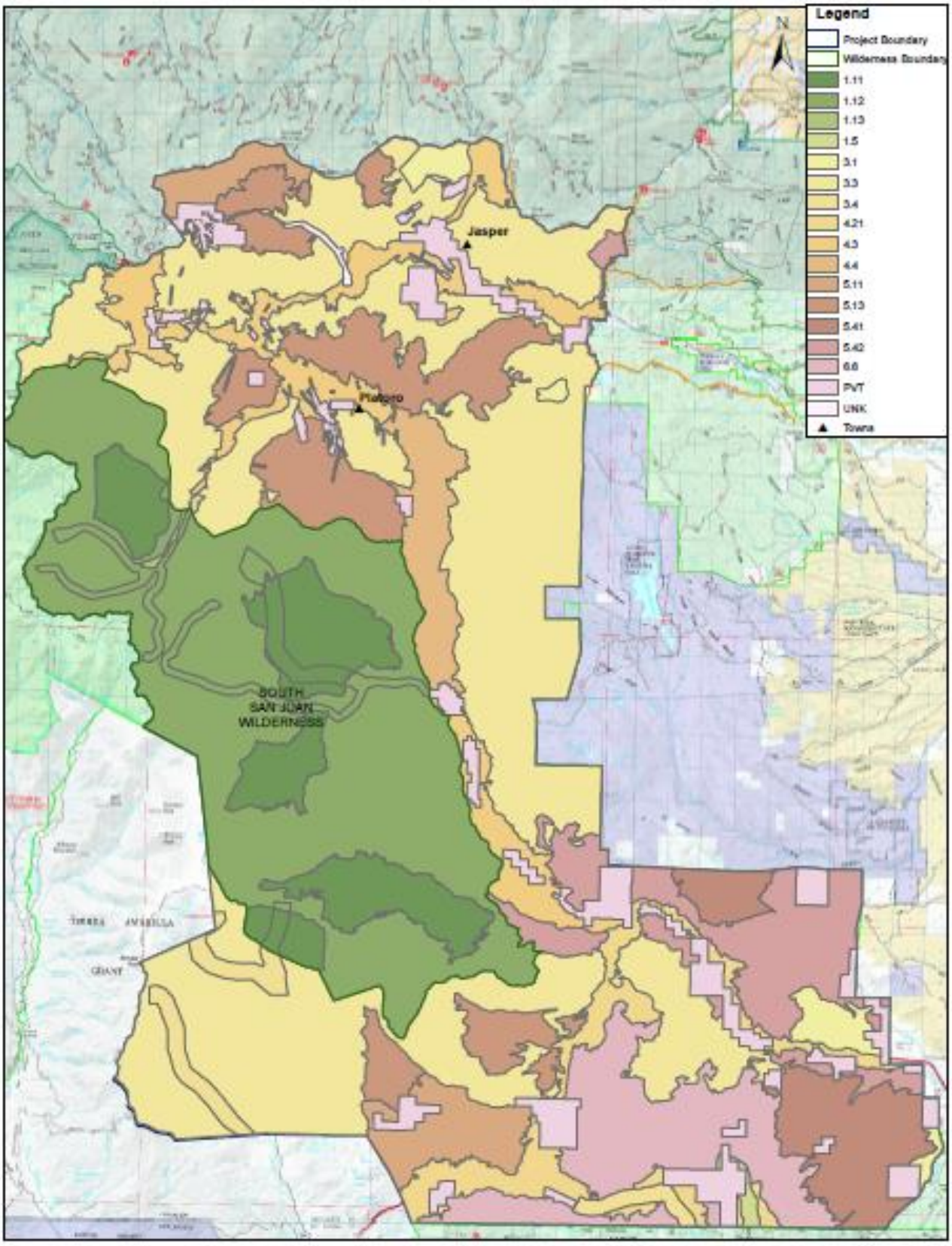

Figure 2. Management area prescriptions in the CP District-wide Salvage Project area

Other Relevant Laws, Policy, and Direction

Where consistent with other land management plan goals and objectives, there is Congressional intent to allow active vegetation management including timber harvest on suitable lands (*Organic Administration Act of 1897, Multiple-Use Sustained-Yield Act of 1960; Forest and Rangeland Renewable Resources Planning Act of 1974; Federal Land Policy and Management Act of 1976; National Forest Management Act of 1976).* Intent is also expressed to allow the salvage of dead timber (*Forest and Rangeland Renewable Resources Planning Act of 1974)*, as appropriate. Such actions are also directed and authorized by federal regulation (*36 CFR 221.3; 36 CFR 223).*

In keeping with these intents, it is Forest Service policy to provide timber resources to the local and regional economy (*Forest Service Manual [FSM] 2402; Forest Plan, pp. II-3 through II-4)*, salvage dead trees (*FSM 2435)*, and treat stands experiencing insect or disease infestations or to prevent infestations (*Forest Plan IV-25 through IV-28)*.

1.6 Proposed Action Summary

The Forest Service developed the proposed action (Alternative 2) to meet the purpose and need and move current conditions toward desired conditions in beetle-infested spruce stands. This alternative could implement management activities on up to 18,000 acres on Forest Service lands to meet objectives described in the purpose and need.

Commercial salvage timber harvest would be conducted with ground-based equipment on slopes less than forty percent. All or parts of cut trees could be skidded to designated landings, but slash could be lopped and scattered or piled and burned or removed at landings. Depending on the level of advanced regeneration in the spruce-beetle-impacted stands, tree planting may be required to meet stocking objectives. Landings, skid trails, and old temporary road prisms from previous harvests would be re-used as much as possible to minimize additional disturbance. Some temporary road construction would be necessary. This proposal includes performing hazardous fuel treatment activities on up to 1,000 acres of affected lands adjacent to private property and administrative sites.

The proposed action would be implemented over a ten to fifteen year period. Tree planting would not be implemented until other operations were substantially complete in a treatment area.

1.7 Decision Framework

Given the purpose and need, the responsible official will review the proposed action, the other alternatives, and the environmental consequences disclosed in this document in order to make the following decisions:

Will project activities be implemented as proposed, as modified, or not at all?

If project activities proceed, will the project design criteria, mitigation measures, pre-implementation evaluation process, monitoring items, and adaptive management strategies included provide sufficient protection to minimize or eliminate adverse effects?

The CP District-wide Salvage Project is subject to the objection process pursuant to 36 CFR 218, subparts A and B. After receiving and considering the comments on this draft environmental impact statement, a final environmental impact statement will be prepared. The Forest Service will issue a draft record of decision in conjunction with the final environmental impact statement that will initiate the 36 CFR 218 objection process. The record of decision will explain the rationale for the decision and disclose how the decision responds to the issues and moves toward desired conditions.

1.8 Public Involvement

The notice of intent to prepare an environmental impact statement was published in the Federal Register on March 1, 2016. The notice of intent asked for public comment on the proposal by March 31, 2016. In addition, as part of the public involvement process, a scoping notice was published in the *Valley Courier,* the newspaper of record on March 9, 2016; a scoping package was also mailed to seventy-eight addresses. Eleven comment letters were received, we had twenty-five requests to stay on the mailing list for the project.

In addition, a public field trip was held for any interested parties or individuals on October 26, 2016 in the Cumbres Pass area of the Conejos Peak Ranger District. Seven members of the public attended this field trip. The project has also been listed on the Rio Grande National Forest schedule of proposed actions (SOPA) since April 2016.

Comments from the scoping process were used to identify issues and develop alternatives to the proposed action.

1.9 Issues

Issues are described as follows in Forest Service Handbook (FSH) 1909.10:

- Issues are cause and effect statements that serve to highlight effects or unintended consequences that may occur from the proposed action and alternatives.
- Issues are used to identify opportunities during the analysis to reduce adverse effects.
- Issues are used to compare trade-offs in an understandable and, if possible, quantitative manner.

The process used in this project is intended to ensure all issues are identified and other concerns are appropriately addressed in the analysis. Scoping comments were separated into two groups: issues and concerns. Issues were defined as those directly or indirectly caused by implementing the proposed action which cannot be completely mitigated through standard project design criteria.

Concerns were identified as follows:

1. Outside the scope of the proposed action;
2. Already decided by law, regulation, land management plan, or other higher level decision;
3. Irrelevant to the decision to be made;
4. General in nature or not supported by scientific or factual evidence; or
5. Addressed as part of the analysis by Forest Plan standards and guidelines, best management practices, project design criteria, mitigation measures, or monitoring.

The interdisciplinary team, along with consideration of public input, identified one issue and measurement indicators for the analysis. The issue statement and indicator selected was used to develop an additional action alternative, focus the analysis, and compare potential effects of each alternative. The issue analysis process is documented and is part of the project record.

Issue 1: Effects on Canada Lynx Habitat

Tree mortality from the spruce beetle epidemic has altered habitat conditions for spruce forest associated wildlife species, including the Canada lynx. Project activities may compound beetle impacts by reducing late-successional and future forest habitat components. Canada lynx would be used as a focal species for this key issue.

The indicators for issue 1 are as follows:

- Percent of suitable lynx habitat affected by treatment per Lynx Analysis Unit (LAU)
- Acres of unsuitable lynx habitat improved by planting per LAU
- Acres of within-treatment-area movement corridors available

1.10 Opportunities

As part of the scoping and analysis process, project activities were developed to provide opportunities to meet a variety of integrated resource improvement objectives. Proposed activities may be implemented that could improve stand growth or reduce insect or diseases, reduce fuels or change the fuel profile to meet specific objectives, and, improve habitat for some species of wildlife. Some projects may be funded with Knutson-Vandenberg monies collected from timber sale receipts, if available, though additional funds will be requested from other sources, as appropriate. Some examples of integrated opportunities include:

- Improve watershed condition by completing road reconstruction and additional road maintenance on several roads to reduce erosion and sedimentation (see the *Hydrology* section).
- Close unauthorized routes to improve watershed condition (see the *Hydrology* and *Transportation* sections).
- Identify and plan to treat unknown populations of invasive plants and noxious weeds (see *Invasive Species and Noxious Weeds* section).

Chapter 2. Alternatives

This chapter describes and compares the alternatives considered in order to meet the purpose and need for the CP District-wide Salvage Project analysis. It includes a description of each alternative considered. This section also presents the alternatives in comparative form, defining the differences between each alternative and providing a basis for choice among options by the decision maker. The official may choose any of the three alternatives in part or whole, or may choose elements from different alternatives and combine them into a modified alternative to be chosen in the decision.

2.1 Alternatives Considered but Eliminated from Detailed Study

Federal agencies are required by the National Environmental Policy Act (NEPA) to rigorously explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14). Public comments received in response to the proposed action provided suggestions for alternative methods for achieving the purpose and need. Four other alternatives were considered, but dismissed from detailed consideration for reasons summarized below.

- **Focus vegetation treatment only in areas to protect infrastructure** – This alternative only addresses hazardous fuels reduction and would not meet the purpose and need of capturing economic value of dead and dying trees while there is still value.
- **Mechanical treatments only in wildland urban interface areas with no temporary roads** - This alternative would not meet the purpose and need of recovering economic value from dead and dying trees. Furthermore, it would only partially meet the need to reduce hazardous fuels near developed private lands and infrastructure.
- **Use pheromones to manage the beetle epidemic** – This alternative would not meet the purpose and need of salvaging economic value from timber or reducing hazardous fuels. In addition, the majority of the spruce trees have already been killed by the spruce beetle, therefore pheromones would be of no benefit.
- **Decommissioning closed National Forest System Roads** – This alternative does not address the vegetation management purpose and need of this project though it does respond to some overall objectives in travel management and watershed health. The Rio Grande National Forest is currently undergoing a forest plan revision process in which travel management will be generally discussed and direction for a Forest-wide, comprehensive review of all system roads will take place post-plan revision. Therefore, addressing extensive travel management in a project-level decision would be inappropriate at this time.

Other suggestions received were outside the scope of this project or duplicative of the alternatives considered in detail.

2.2 Alternatives Considered in Detail

The Forest Service developed three alternatives, including the No Action and Proposed Action, in response to issues raised both internally and by the public. Collectively, these alternatives represent a reasonable range of alternatives given the site-specific situation, purpose and need, and issues identified for this project. Table 6 in Section 2.3 of this chapter compares the three alternatives by their effects to resources. For the action alternatives (Alternatives 2 and 3), additional descriptions of actions that could be implemented under different stand conditions can be found in the *Silviculture Guidelines* in Appendix D.

Alternative 1 – No Action

The National Environmental Policy Act (NEPA) requires the study of the no action alternative and directs that this alternative be used as a basis for comparing the effects of the proposed action and other alternatives.

The no action alternative assumes no implementation of this proposed action or the other action alternatives would take place in the project area. This alternative represents no attempt to actively respond to the issues, the purpose and need for action, or concerns identified during public scoping. There would be no effort to modify existing conditions, unless authorized by other decisions. Other management or currently permitted uses such as livestock grazing, firewood cutting near open roads, and dispersed and developed recreation would continue. This alternative serves as an environmental baseline for the evaluation of the action alternatives.

Under the no action alternative, natural processes would continue across all proposed treatment areas, except where influenced by firewood gathering and other resource management decisions. No salvage of dead or dying trees would occur beyond those areas open to permitted firewood cutting. Effects on wildlife habitat would be variable depending on species considered. Seedlings would not be planted to reforest understocked stands or to manage stand species composition. Over time, large diameter down fuel and coarse woody debris would continue to increase as trees die and fall. Hazardous fuel treatments would not occur along private boundaries or near administrative sites. System roads would be maintained as funding permits.

Activities Common to all Action Alternatives

Each action alternative was designed to be viable, consistent with land management plan direction, meet the purpose and need and capable of moving resources toward desired conditions to some degree. The action alternatives propose varying acres of spruce salvage harvest and hazardous fuel treatment activities to adaptively move toward desired conditions that would occur within the defined areas as shown on the alternative maps (Figures 3 - 6).

All proposed management activities for each alternative would follow standards and guidelines/best management practices, project design criteria, incorporate the use of a project pre-implementation checklist process, silviculture guidelines, and monitoring elements.

Activities associated with spruce salvage harvest common to both action alternatives would include:

- Salvage logging and log hauling operations using ground-based equipment: all or parts of cut trees could be skidded to designated landings, but slash could be lopped and scattered or piled and burned at landings,
- National Forest System Road maintenance and reconstruction,
- Re-use of old non-system road templates, followed by decommissioning,
- New temporary road construction and use, followed by decommissioning,
- Identification of areas for public and commercial firewood gathering: firewood gathering would still be permitted along open roads across the district per existing rules.
- Planting of native conifer seedlings as needed to meet future forest objectives.

Activities associated with hazardous fuel treatments within spruce mortality zones common to both action alternatives would include:

- Establishment of shaded fuel breaks by thinning within 400 feet of private boundary or 200 feet of administrative sites. This activity would modify fuel profiles to reduce fire behavior and intensity

to provide better opportunities for firefighters to engage the fire near structures, both public and private. Treatments would generally involve chainsaw work but may also include mechanical operations and chipping.
- Hazard tree removal within 400 feet of private boundary or 200 feet of administrative sites,
- Pruning of residual trees within the fuel break to lift crown base height,
- Piling and burning or removal of activity-generated fuels within salvage harvest and fuel break thinning areas.

Activities would begin the summer of 2018 and continue for 10-15 years.

Alternative 2 - Proposed Action (*preferred alternative*)

Under this alternative, salvage of dead and dying spruce from suitable areas across the district would occur. Hazardous fuel treatments would also be utilized to modify forest fuels adjacent to private property and administrative sites that are within areas affected by spruce beetle mortality. Salvage harvest activities would occur on up to 17,000 acres on lands determined appropriate for timber salvage. Hazardous fuels treatment activities would occur on up to 1,000 acres of treatment area.

The proposed action also includes development of pre-implementation checklists for later-stage analysis (see Appendix C). The developed checklists would tier to this early-stage decision and allow focus on compliance in relation to 1) project decision, 2) Forest Plan, statute, and regulation, and 3) reporting and notification requirements.

Table 3. Summary of proposed activities under Alternative 2.

Activity	**Alternative Estimate** *(these are the largest number of treatment acres possible under this alternative)*
Area salvaged	17,000 acres
Non-system road templates re-opened, followed by decommissioning	35 miles
New temporary road construction, followed by decommissioning	32 miles
Planting of native conifer species	Approximately 860 acres
Fuel break thinning, hazard tree removal, pruning, and pile burning	1,000 acres

Proposed treatment areas and associated road needs are identified within the project geodatabase for site-specific analysis. Adjustments made during later-stage analysis would be kept within the scope of impacts analyzed in this environmental impact statement and Forest Plan through use of the implementation checklists.

Table 4. Approximate treatment acres by MAP for Alternative 2, the Preferred Alternative.

MAP	**MAP Description**	**Approximate Treatment Acres**	**MAP**	**MAP Description**	**Approximate Treatment Acres**
4.21	Scenic Byways/Railroads	451	5.41	Deer/Elk Winter Range	409
4.3	Dispersed Recreation	1,934	5.42	BHS Area	481
5.11	General Forest/Rangeland	86	6.6	Grassland Resource	1,354
5.13	Forest Products	11,984			

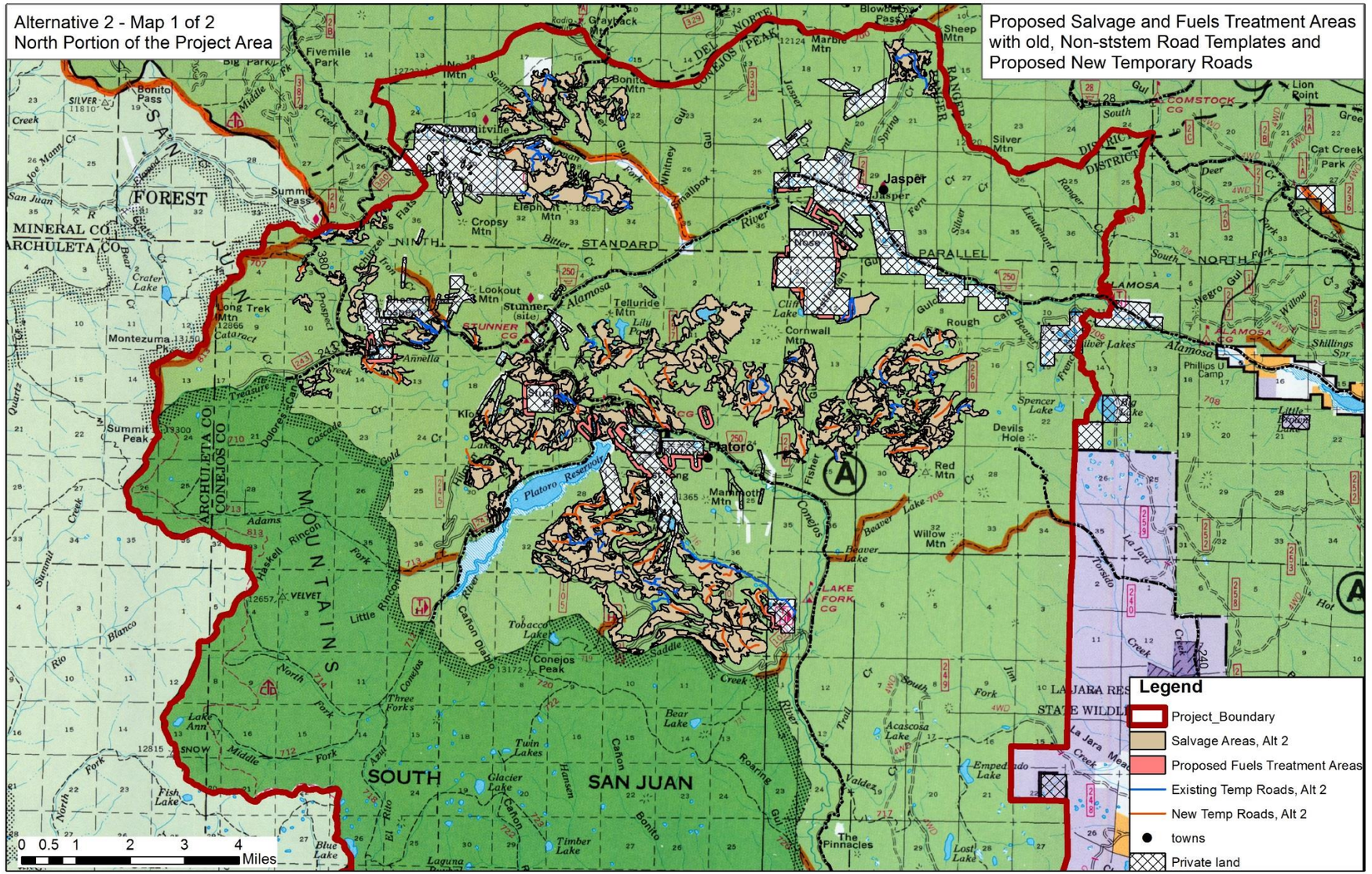

Figure 3. Proposed salvage and fuels treatment areas for the northern portion of the project area, Alternative 2 (Preferred Alternative).

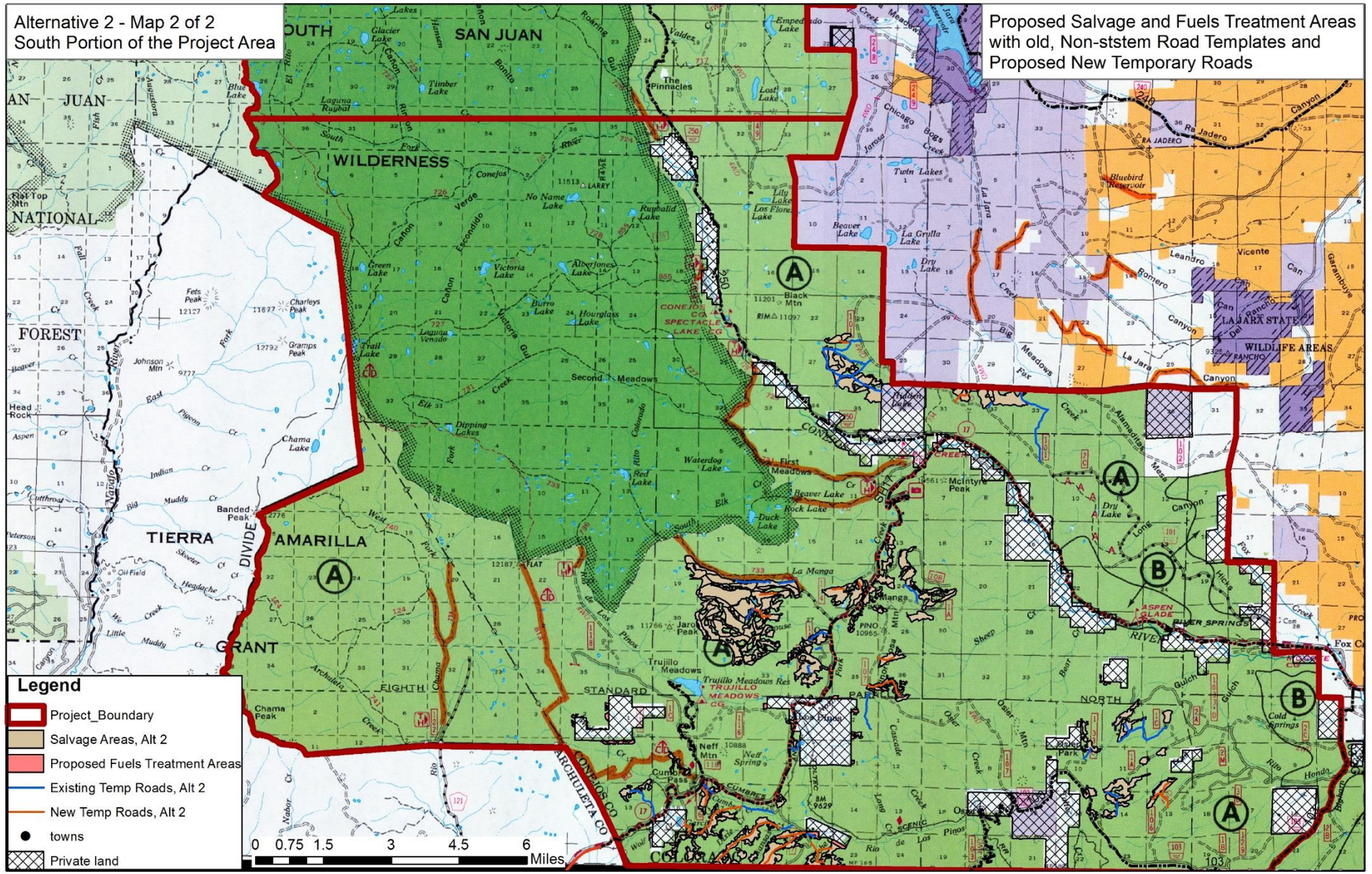

Figure 4. Proposed savage and fuels treatment areas for the southern portion of the project area, Alternative 2 (Preferred Alternative).

Alternative 3 – Vegetation Management - Limited Action

Under this alternative, salvage of dead and dying spruce from some suitable areas across the district would still occur, as well as hazardous fuel treatment activities. Salvage harvest activities, however, would be focused on areas outside of field-verified, high-quality lynx habitat through implementation of specific project design criteria and lynx habitat protection elements. Additional explanation and lynx priority area descriptions can be found in Appendix E. Salvage harvest activities would occur on up to 8,500 acres, on lands determined as appropriate for timber salvage. Hazardous fuel treatment activities would occur on up to 1,000 acres of treatment area on lands determined appropriate for fuels management.

Lynx Habitat Elements for Alternative 3

This alternative focuses treatment activities using the following lynx habitat elements:

Element 1: Protection of the Future Forest and Addressing Uncertainties Involving Existing Quality Lynx Habitat in a Changed Landscape Condition

- No harvest would occur in lynx habitat priority 4 areas or priority 3 areas where there is >35% DHC at the stand level (i.e. high-quality lynx habitat). Detailed priority area descriptions can be found in Appendix F.
- No harvest would occur in areas that overlap more than 20 acres of habitat identified by a local lynx denning habitat model (Topolewski 2017). This model selects forest type and abiotic habitat conditions used by denning lynx based on local research (Merrill and Shenk 2006). Model outputs can be found in the project file.

Element 2: Habitat Connectivity

- This element is addressed through project design criteria relating to movement corridors and leave islands (See design criteria in section 2.4).

Element 3: Lynx Primary Use Areas

- Salvage projects will be delayed in the Conejos Canyon and Alamosa Lynx Analysis Units (LAUs) to allow for current research to be integrated.
- This element is further addressed through project design criteria relating to documented lynx reproduction areas and in designing Alterative 3.

Like the proposed action, the limited action also includes development of implementation checklists for later-stage analysis (see Appendix C). The developed checklists would tier to this early-stage decision and allow focus on compliance in relation to 1) project decision, 2) Forest Plan, statute, and regulation, and 3) reporting and notification requirements.

Table 5. Summary of proposed activities under Alternative 3.

Activity	**Alternative Estimate** *(these are the largest number of treatment acres possible under this alternative)*
Area salvaged	8,500 acres
Non-system road templates re-opened, followed by decommissioning	34 miles
New temporary road construction, followed by decommissioning	23 miles

Planting of native conifer species	Approximately 860 acres
Fuel break thinning, hazard tree removal, pruning, and pile burning	1,000 acres

Proposed treatment areas and associated road needs are identified within the project geodatabase for site-specific analysis. Adjustments made during later-stage analysis would be kept within the scope of impacts analyzed in this environmental impact statement and Forest Plan through use of the implementation checklists.

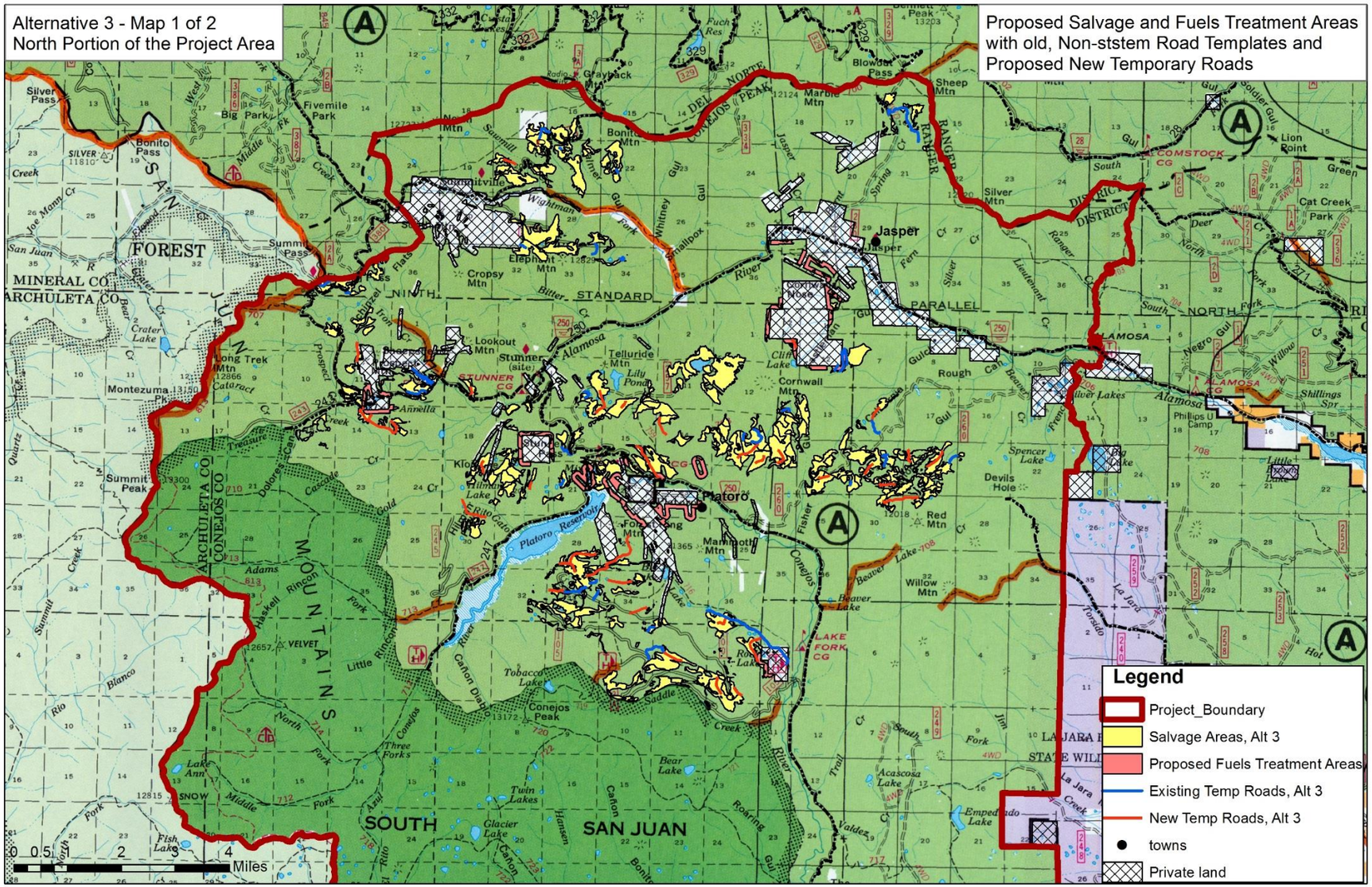

Figure 5. Proposed salvage and fuels treatment areas for the northern portion of the project area, Alternative 3.

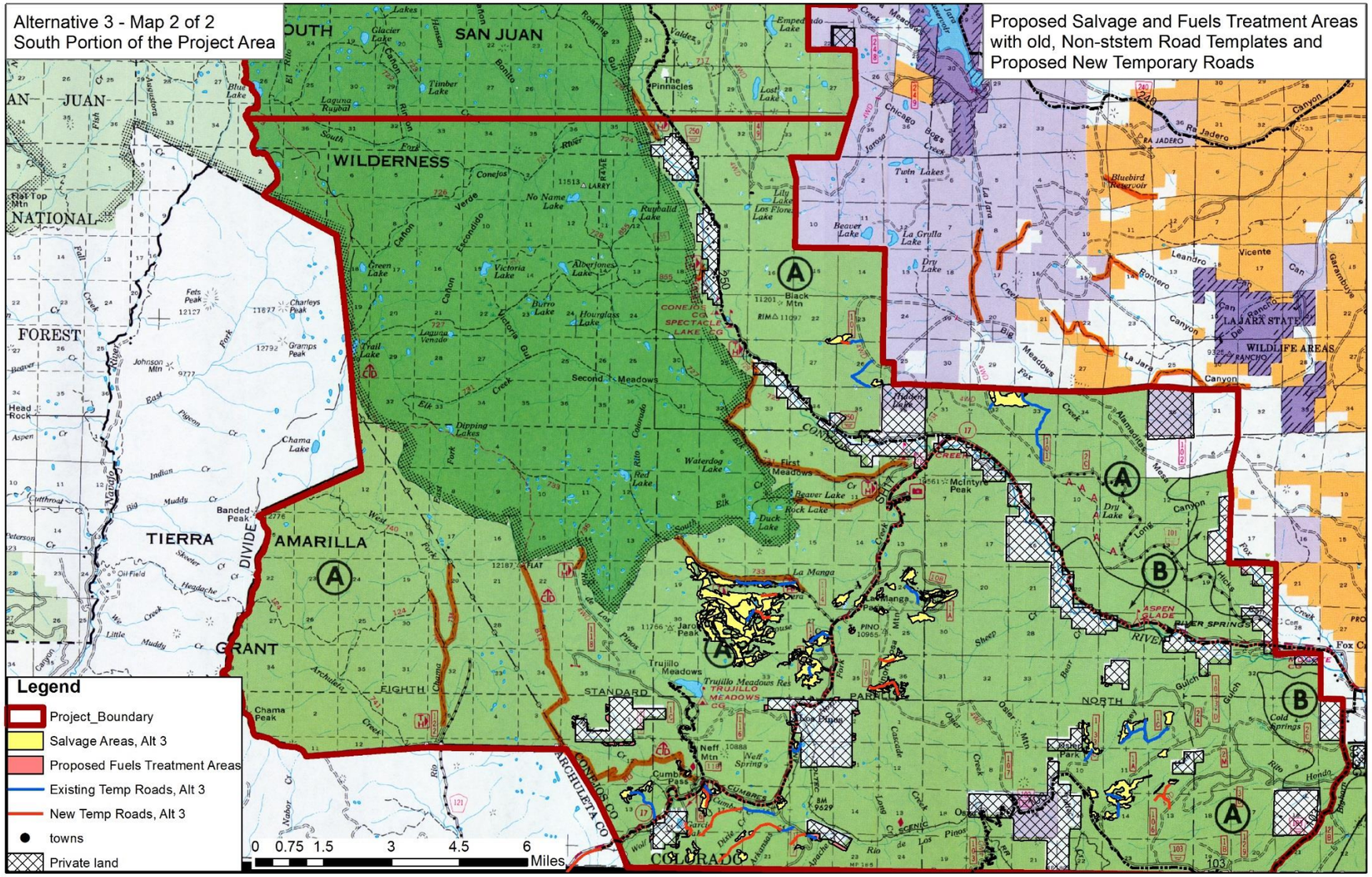

Figure 6. Proposed salvage and fuels treatment areas for the southern portion of the project area, Alternative 3.

Adaptive Implementation, Project Design Criteria, and Monitoring

In order to maintain flexibility, incorporate better field verified information as it is obtained, and to adjust to changes in agency policy, land management plan revisions, business rules, or directions over the life of this analysis, the approach of adaptive implementation will be incorporated and used. The goal of adaptive management and implementation is to promote effective decisions for any management activities that are implemented and to continually monitor, learn, and adapt during and after implementation of site-specific projects.

Elements of this adaptive strategy will include the iterative and integrated use of: Forest Plan standards and guidelines, project design criteria, the pre-implementation checklists (Appendix C), key resource monitoring requirements and the *Silviculture Guidelines* (Appendix D). In addition, other project design criteria have been included and have been found to be effective in reducing potential adverse impacts. Table 7 lists the specific project design criteria by alternative.

Prior to individual project implementation, a pre-implementation checklist process will also be completed by resource specialists. The pre-implementation checklist process may result in additional project specific design criteria or monitoring being applied to a project, if recommended by a specialist, reviewed by the implementation interdisciplinary team, and approved by the responsible official, in consultation with other resource specialists. The first checklist provides the mechanism for incorporating additional environmental mitigation and ensuring activities are within the scope of this analysis and decision. The second checklist in the process provides accountability by ensuring that mitigation measures were fully incorporated into subsequent contracts.

The *Silviculture Guidelines* (Appendix D) will be used as a summary guide for desired landscape conditions and provide sideboards for the silvicultural options analyzed for each alternative, including parameters for silviculture activities being proposed and their relationship to suitable lynx habitat.

Project monitoring is gathering information, observing processes, and examining the results of management activities to provide a basis for evaluation and sharing of results. Monitoring includes implementation monitoring and evaluation to ensure that standards and guidelines and/or best management practices are being incorporated properly during project implementation, as well as effectiveness monitoring and evaluation to determine whether project objectives are being met and if project design criteria and other processes are effective. Effectiveness monitoring and evaluation provides an opportunity for continued learning and adaptation to better results. Initial monitoring measures identified for this project are outlined in this chapter, Section 2.5.

Changed Circumstances or New Information

If new information or changed circumstances relating to the environmental effects of the selected alternative occur after a decision document is signed and during the life of this analysis, the responsible official and interdisciplinary team will review the new information or circumstances and determine if the effects are within the scope and range of effects considered in this environmental impact statement. If the effects are within the context considered in this analysis, this will be documented and included in the project file and any changes to the implementation process will be updated. If effects are determined to be outside the scope and range of effects considered in this analysis, the responsible official will determine the type of additional analysis that is necessary prior to additional implementation (Forest Service Handbook 1909.15, sec. 18.1).

As provided in 50 CFR §402.16, re-initiation of consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (3)

the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not previously considered; or (4) a new species is listed or critical habitat designated that may be affected by the action.

2.3 Comparison of Alternatives

This section provides a summary of the effects of implementing each alternative. Information in the following table is a comparison of the alternatives focused on activities or effects that could be distinguished quantitatively or qualitatively among alternatives. Effects to lynx habitat and specific LAUs are discussed based on the issue identified during scoping. There is additional discussion of consideration to the key issue identified for this project below. Alternative 3 was primarily developed in response to scoping and proposed excluding timber harvest in most high quality lynx habitat.

Table 6. Comparison of alternatives by proposed activities and issue indicators.

Resource and Unit of Measure	Alt 1 *No Action*	Alt 2 *Proposed Action*	Alt 3 *Limited Action*
Area of salvable timber expected to lose merchantability post mortality	17,000	0	8,580
Volume of commercial forest products recovered from insect mortality (CCF)	0	Up to 340,337	Up to 189,906
Acres of hazardous fuel treatment (acres)	0	1,000	1,000
Proportion of spruce forest landscape diversified in stand structure and/or composition as a result of project activities (%)	0%	up to 12%	up to 6%
Estimated lynx habitat acres treated that would contribute to SRLA exemptions & exceptions[11]	Spruce beetle salvage – 0; Fuels reduction – 0	Spruce beetle salvage – Up to 1,000 Fuels reduction – 1,000	Spruce beetle salvage –0 Fuels reduction – 1,000
Alamosa LAU - lynx habitat[2]			
Acres of spruce/fir salvage/Acres in lynx habitat	0	4,656	2,456
Acres of hazardous fuels treatment	0	418	418
Conejos Canyon LAU – lynx habitat			
Acres of spruce/fir salvage/Acres in lynx habitat	0	5,748	2,626
Acres of hazardous fuels treatment	0	361	361
La Jara LAU - lynx habitat			
Acres of spruce/fir salvage/Acres in lynx habitat	0	2,009	767
Acres of hazardous fuels treatment	0	2	2
Rito - Archuleta LAU - lynx habitat			
Acres of spruce/fir salvage/Acres in lynx habitat	0	2,973	1,939
Acres of hazardous fuels treatment	0	151	151
Victoria - Chama LAU - lynx habitat			
Acres of spruce/fir salvage/Acres in lynx habitat	0	1,142	565
Acres of hazardous fuels treatment	0	0	0
Miles of non-system road templates re-opened, followed by decommissioning	0	34	24
Miles of new temporary road construction, followed by decommissioning	0	30	23

[1] Lynx habitat acres are estimated based on modeling efforts described in the Wildlife Report. Actual acres may vary and will be tracked in project monitoring and reporting checklists.
[2] Most if not all fuels reduction treatments are anticipated to meet WUI exemption.

Alternative 1- No Action

Issue 1: Effects on Canada lynx habitat –The spruce mortality is not likely to directly or indirectly affect the primary prey species of the Canada lynx – the snowshoe hare. However, lynx population dynamics might be affected due to potential influences on the lynx's main alternate prey species, the red squirrel, particularly during periods when hare population cycles are low. Through 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. Alternative 1 would have the least effects on lynx habitat, since there would be no additional human-influenced habitat manipulation impacts on lynx habitat or movement in the analysis area. Existing levels of firewood cutting within 300 feet of open roads would continue.

Alternative 2- Proposed Action

Issue 1: Effects to Canada lynx – Since Alternative 2 has the most acres proposed for timber management activities in lynx habitat, it would be expected to have the most potential effects on lynx and lynx habitat and is anticipated to have adverse effects to lynx. Alternative 2 could have the most incidental impacts to dense horizontal cover and would most likely convert the most acres to temporarily unsuitable habitat (stand initiation structural stage) for all affected LAUs.

Though this alternative may affect lynx habitat on the most acres, all effects would be in compliance with the Programmatic Biological Opinion completed for the 2008 Southern Rockies Lynx Amendment. As applicable, the documents included in Appendix C will be the primary guidance for ensuring adherence to the Southern Rockies Lynx Amendment standards, objectives, and biological opinion requirements along with ensuring management consistency with conservation measures identified in the *Canada Lynx Conservation Assessment and Strategy* (LCAS 2013) for vegetation management on federal lands. All forest plan standards and guidelines will apply to all alternatives. Project design criteria, pre-implementation checklist process, and the Silviculture Guidelines were developed for this project to ensure adverse impacts to lynx habitats were minimized and to move toward landscape objectives for lynx habitat, to the extent possible for this project area.

Alternative 3 – Limited Action

Issue 1: Effects to Canada lynx – Since Alternative 3 has the fewest acres proposed for timber management activities in lynx habitat, it would be expected to have the least potential effects on lynx and lynx habitat of the two action alternatives. Alternative 3 could have the least incidental impacts to dense horizontal cover and would likely convert the fewest acres to temporarily unsuitable habitat (stand initiation structural stage) for each lynx analysis unit (see Wildlife, Canada lynx section, Chapter 3).

As with Alternative 2, all effects would also be consistent with the Programmatic Biological Opinion completed for the 2008 Southern Rockies Lynx Amendment. As applicable, the documents included in appendix D will be the primary guidance for ensuring adherence to the *Southern Rockies Lynx Amendment* standards, objectives, along with ensuring management consistency with conservation measures identified in the *Canada Lynx Conservation Assessment and Strategy* (LCAS 2013) for vegetation management on federal lands. All Forest Plan standards and guidelines will apply to all alternatives. Project design criteria, pre-implementation checklist process, and the *Silviculture Guidelines* were developed for this project to ensure adverse impacts to lynx habitats were avoided or minimized and to move toward landscape objectives for lynx habitat, to the extent possible for this project area.

2.4 Project Design Criteria for Alternatives 2 and 3

These project design criteria have been found to be effective in reducing potential adverse impacts to the respective resources. Each project design criteria action would apply to all management activities, as appropriate.

Table 7. Project design criteria for affected resources by alternative.

Protection Measure	Alt 2	Alt 3
Wildlife/TES/MIS/Botany		
• Snags: Retain a minimum of 4 spruce snags per acre in various conditions of decay. Snags will be retained in groups where possible. Snags are to be selected based on the following criteria: o Wildlife use – Snag groups may be centered surrounding trees with cavities, large cracks, broken tops, and defoliating bark as these provide the greatest use for cavity nesting and roosting species. o Biological legacies – These features take a long time to develop and should be retained whenever possible. For the purposes of this analysis these are to be defined as: ▪ Trees/snags with old growth character or defects ▪ Trees/snags generally larger than the stand average ▪ Snags that occurred prior to the spruce beetle infestation o Live trees – snag groups may be centered surrounding live trees to minimize potential for loss due to windthrow and provide additional cover. o Whenever possible, a Wildlife Biologist will assist with marking. As appropriate, a sample mark will be conducted if a sale will be implemented as Designation by Description (DxD); units will be reviewed to determine if objectives are met before progressing to the next. Examples of when a sample mark would be provided include when a purchaser is new, unfamiliar with DxD operation, or when their performance has been considered inadequate.	x	x
• Surveys for TES species will occur prior to project design; results of surveys will be incorporated into the project design and/or implementation per Forest Plan Standards. Known occurrences of sensitive species will be identified with an appropriate buffer for avoidance from salvage harvest and fuels reduction activities.	x	x
• Within salvage treatments, harvest spruce only, except for trees that otherwise need to be removed for operational/safety purposes.	x	x
• District wildlife personnel will be notified of any potential denning, burrowing, or nesting activities identified during operations. Upon discovery of a raptor nest location or other TES wildlife species nesting/breeding (or other critical) site, suspend any active logging or other contract operations underway in the immediate vicinity until a wildlife biologist assesses the situation to determine and recommend to District Ranger appropriate action(s) to take for protection of habitat or individual animals. Examples of appropriate actions include seasonal logging restrictions, nest buffers, and habitat protection measures.	x	x
• Winter logging is encouraged to limit direct disturbance to the fewest number of wildlife species, but will cease by May 1. Winter logging would also protect potential buried cultural deposits from ground disturbance, as well as soils and advance regeneration.	x	x
• As feasible, trees with wildlife cavities identified by qualified wildlife bios in consultation with District Ranger, even if unmarked, are not to be felled.	x	x
• Minimize or avoid to the extent practicable impacts to advance regeneration during layout and operations.	x	x
• All temporary roads will be decommissioned post-treatment	x	x
• Focus on protecting high quality advance regeneration (≥35% DHC) where it occurs in blocks of 0.3 acres or larger. To be applied in lynx habitat priority 1 and 2 areas where stands are essentially single-storied and regeneration is minimal. See appendix F for a detailed description of the lynx habitat priority areas.		x
• Four hundred to six hundred (400-600) foot wide movement corridors will be established within 6th-level watershed boundaries (HUC12) to provide within and between LAU connectivity and aid in movement across or around large openings created or enhanced by project activities. Openings that are created or enhanced by project activities are those where harvest units or portions of harvest units are separated only by road, AMZ, or open meadow; do not meet forest plan Guideline Silv-4 for big game cover in spruce-fir (RGNF		x

Protection Measure	Alt 2	Alt 3
Revised Land and Resource Management Plan, Table III-6); and are of sufficient size to create barriers to lynx and other wildlife movement.		
• Snags: Retain a minimum of 8 spruce snags per acre in various conditions of decay. Snags will be retained in groups where possible. Snags are to be selected based on the following criteria: o Wildlife use – Snag groups may be centered surrounding trees with cavities, large cracks, broken tops, and defoliating bark as these provide the greatest use for cavity nesting and roosting species. o Biological legacies – These features take a long time to develop and should be retained whenever possible. For the purposes of this analysis these are to be defined as: ▪ Trees/snags with old growth character or defects ▪ Trees/snags generally larger than the stand average ▪ Snags that occurred prior to the spruce beetle infestation o Live trees – snag groups may be centered surrounding live trees to minimize potential for loss due to windthrow and provide additional cover. o Whenever possible, a Wildlife Biologist will assist with marking. As appropriate, a sample mark will be conducted if a sale will be implemented as Designation by Description (DxD); units will be reviewed to determine if objectives are met before progressing to the next. Examples of when a sample mark would be provided include when a purchaser is new, unfamiliar with DxD operation, or when their performance has been considered inadequate.		x
• Where needed, leave islands consisting of up to 25% of harvest area will be designated within 6th-level watershed boundaries (HUC12) by a wildlife biologist or designee. These areas will include patches of advance regeneration, biological legacies, and wildlife movement corridors. Snag retention requirements may be captured in part through this project design criteria.		x
• A wildlife biologist will work with timber staff to designate all harvest units within ½ mile radius of any location where evidence of lynx reproduction has been documented within the previous 10 years.		x
Range Resources		
• Forest regeneration will be protected from livestock grazing by using adaptive strategies such as reducing livestock concentrations by avoiding salt/supplement placement in regenerating areas, avoid pushing large numbers of livestock into the area, use riders if needed to disperse/move large numbers, and maintaining pasture rotation to avoid season-long grazing.	x	x
• If current natural barriers are made ineffective by skid trails or tree removal, new fence locations would be identified on a sale area basis. Fences would be constructed as necessary to ensure allotment rotations are in compliance with individual Allotment Management Plans and Annual Operating Instructions.	x	x
• Rangeland management improvements, including fences & developed springs, will be protected from damage.	x	x
• If included within a cutting unit, stock driveways would be treated as protected features and coordination between range and timber managers should occur during timber operations and times of use by livestock. Opportunity to remove trees that have fallen or could fall on the driveway, along with hazard trees, should be incorporated into project design.	x	x
Noxious Weeds		
• Prior to activities, known sites of noxious weed infestations within the project area will be treated, dependent upon funding.	x	x
• Prior to moving off-road equipment onto a sale, purchasers will identify the location of the equipment's most recent operation. Purchasers will not move any off-road equipment that last operated in an area infested with one or more invasive species onto a sale without having first cleaned the equipment. If the location of prior operation cannot be identified, it will be assumed as being infested with invasive species.	x	x
• Harvest areas and haul routes will be treated for noxious weed infestations as needed for five years following harvest, dependent upon funding.	x	x
• Road fill and road base material brought in from off-site will come from a borrow source free of State Listed Noxious Weeds. The Forest Service will inspect and approve the borrow source location prior to materials being hauled to the project area.	x	x
Timber/Silviculture Resources		

Protection Measure	Alt 2	Alt 3
• In all salvage units that exceed 50 percent removal of overstory spruce, reforestation surveys will be conducted, and if the survey indicates that Forest Plan stocking Standards will not be met, these stands will be artificially reforested to meet or exceed Forest Plan Standards.	x	x
Aquatic Resources		
• No harvest equipment or skid trails will be allowed within the aquatic management zone (AMZ - 100 horizontal feet from the top of each stream bank) of all intermittent or perennial stream channels. Skid trail crossings within the AMZ of all streams (including ephemeral) will be minimized and must be approved in advance by the Forest Service. o Within the AMZ of ephemeral stream channels, harvest equipment can operate to remove trees. However, no skid trails are allowed in the AMZ and mechanical ground disturbance in or immediately adjacent to channels (within 25 feet) must be avoided.	x	x
• A no cut buffer of 100 feet will be maintained from each channels edge of perennial and intermittent streams. o Within the AMZ of ephemeral channels, trees within the defined channel/swale area may not be harvested.	x	x
• No heavy equipment will be operated within an approximate 50 foot buffer around field-verified wetlands; if trees are designated for harvest in these areas, they will be winched out with one end free from the ground.	x	x
• Riparian management zones (RMZ's) will be developed along streams containing core, conservation, and recreational populations of cutthroat trout. Within RMZ's, no salvage harvest will occur within 2 tree heights of the stream bank.	x	x
Soil Resources		
• Forest Plan Standards for soil productivity (15% detrimental soil impact to activity area), will be achieved through careful design of skid trails, operating during dry seasons or frozen soil conditions, and use of existing landings and skid trails where practical.	x	x
• Units with existing detrimental soil disturbance >15% will be treated as necessary to ensure post-treatment forest plan compliance, as determined by a soils or watershed specialist. Treatments would include subsoiling/ripping of skid trails, landings, and temporary road and seeding or covering with slash.	x	x
• If whole tree yarding is used, limbs and/or tops shall be returned to the unit if 15% or more of the unit has exposed mineral soil; this material shall be distributed in areas primarily comprised of bare mineral soils. Coarse woody debris will be retained per Forest Plan standards and guidelines.	x	x
• Landing and skid trail locations will be agreed to by the Forest Service in advance of construction; spacing will be approximately 100 feet apart, allowing for topographic variation and skid trail convergence. Place landings and skid trails away from areas of dense horizontal cover (i.e. >35%) where feasible.	x	x
• Logs will be skidded with the leading end free of the ground to reduce ground disturbance. Skid trails will be water-barred at least every 100 feet on gradients greater than 20 percent, otherwise where needed depending on slope and ground conditions as per BMPs. Slash will be placed on main skid trails as needed to control erosion.	x	x
• Avoid ground skidding on sustained slopes steeper than 40%.	x	x
• Existing vegetation on cut and fill slopes would be retained as much as possible to limit sediment movement away from road.	x	x
Recreation Resources		
• Notify the public of logging activity through appropriate media outlets	x	x
• Post caution signs at key intersections along the haul route to alert the public to logging activities	x	x
Scenic Resources		
• To the extent possible in sensitive viewsheds (i.e. recreation sites, sensitivity level 1 roads, and Scenic Byways): o Locate landing piles away from the observer's line-of-sight and burn as soon as safe and practical o Locate timber sale unit boundaries along natural openings to mimic the natural patterns of the landscape o Blend silvicultural treatments with characteristic landscapes o Avoid single-spaced trees along ridgelines post-treatment	x	x
Heritage Resources		
• Any new temporary road sections located between cutting units, except where	x	x

Protection Measure	Alt 2	Alt 3
anticipated on the proposed action map, will be surveyed for cultural resources prior to construction. Specific alignment and lengths of temporary road sections within cutting units may vary as appropriate for logging operational needs after coordination with the Forest Archeologist.		
• All persons in the area who are associated with this project shall be informed that any person who, without a permit, injures, destroys, excavates, appropriates or removes any historic or prehistoric ruin, artifact, object of antiquity, Native American remains, Native American cultural item, or archaeological resources on public lands is subject to arrest and penalty of law (16 USC 433, 16 USC 470, 18 USC 641, 18 USC 1170, and 18 USC 1361). Strict adherence to the confidentiality of information concerning the nature and location of archeological resources would be required of the proponent and all of their subcontractors (Archaeological Resource Protection Act, 16 U.S.C. 470hh).	x	x
• If subsurface cultural values are uncovered during operations, all work in the vicinity of the resource will cease and the Authorized Officer with the Rio Grande National Forest (RGNF) notified immediately. The operator shall take any additional measures requested by the RGNF to protect discoveries in place until they can be adequately evaluated by the Forest Archaeologist. Within three (3) working days of the discovery, the Tribes and the SHPO will be notified of the discovery and consultation will begin to determine an appropriate mitigation measure. RGNF in cooperation with the operator will ensure that the discovery is protected from further disturbance until mitigation is completed. Operations may resume at the discovery site upon receipt of written instructions and authorization by the authorized officer (36 CFR 800.110 & 112, 43 CFR 10.4); San Luis Valley Interagency and Intertribal NAGPRA MOU 2008.	x	x

2.5 Monitoring Plan for Alternatives 2 and 3

Monitoring is gathering information, observing processes, and examining the results of management activities to provide a basis for evaluation. Monitoring is done at both the project and Forest Plan level. This includes implementation monitoring and evaluation to ensure that Standards and Guidelines are being incorporated during the project activities, as well as effectiveness monitoring and evaluation to determine whether project objectives are being met and if Project Design Criteria (PDC) are effective. Below are the monitoring measures that were recommended for incorporation into this project. Ensuring that sufficient monitoring is completed to meet objectives would be the responsibility of the District Ranger in cooperation with appropriate Forest staff.

Timber Resources

Objective: In conjunction with other resource specialists, ensure all resource protection measures in are included in the timber sale or other contract and properly implemented.

Method: A detailed review and monitoring process will be utilized to ensure protection measures are incorporated and implemented.

Action: Timber sale or other contracts will be reviewed and certified by the District Ranger or Field Manager to ensure conformance with the decision prior to advertisement, ensuring that required protection measures are included in the contract.

Action: Implementation monitoring will be conducted through inspections on all contracted vegetation management activities. As a routine part of project implementation, contract administrators monitor harvest, thinning, and/or construction activities to ensure that project design criteria and standards and guidelines are followed and implemented as designed.

Action: For timber sale contracts, the timber sale administration team is responsible for administering the contract. If required, the team will initiate action to repair resource damage and suspend operations until problems have been corrected.

Objective: Ensure the stands with a regeneration harvest prescription are reforested to at least Forest Plan standards or as required by the silvicultural prescription.

Method: Stocking surveys will be conducted the first, third, and fifth year (if necessary) after project implementation to evaluate regeneration distribution, species mix, and trees per acre to ensure that the areas are successfully reforested.

Action: If existing regeneration is inadequate, artificial planting would be implemented.

Biodiversity

Objective: Evaluate whether Forest Plan standards and guidelines and project-specific biodiversity design criteria are being implemented as specified.

Method: Within 5 years following the harvest completion monitor, as part of the final stocking exam, the number of large snags retained and amounts of CWD remaining following salvage harvest. Ensure that this data is retained in the FSVeg database for future use.

Action: Document evaluation results including snag numbers, species and size and amount of large woody debris; determine what needs to be adjusted to meet objectives.

Wildlife

Objective: Evaluate whether Forest Plan standards and guidelines and project-specific wildlife design criteria are being implemented to examine if a need exists to modify specific wildlife design criteria for future projects.

Method: Perform site inspections during and/or following the vegetative management activities to determine compliance with project design criteria. Items important to monitor include:

- *Impacts to understory vegetation*
- *Acres of damage to Dense Horizontal Cover by project **
- *Percentage of damage to developing understory **
- *Skid trail designation*
- *Landing placement*
- *Timing of project activities*
- *Riparian area buffers*
- *Snag retention*
- *Impacts to cavity trees*
- *Raptor nest protections*

Soil Resources

Objective: Ensure project design criteria are being properly implemented and Forest Plan standards and guidelines are being met in regards to soils.

Method: Soil moisture conditions will be monitored during harvest activities by Forest Service personnel.

Action: Ensure that timber harvesting operations are being suspended when soil conditions are too wet to operate and would result in resource damage.

Method: Use accepted soil monitoring techniques to assess overall cumulative soil impacts after harvest is completed.

Action: Conduct traverses, spot soil sampling, or other soil management handbook methods to assess soil productivity and amount of mitigation needed on a subgroup of units that are currently above

12 percent detrimental soil disturbance within one year of harvest. Complete any rehabilitation measures needed within five years of harvest.

Watershed Resources

Objective: Ensure project design criteria are being properly implemented and that Forest Plan standards and guidelines or best management practices are being met in regards to stream health and levels of disturbance are acceptable.

Method: Conduct additional site inspections in watersheds of concern prior to project implementation and track and monitor levels of disturbance as needed to ensure watershed health.

Action: Focus additional monitoring of disturbance levels and of stream channels on watersheds and sub-watershed that may exceed levels of concern.

Method: Inspect road segments near and at stream crossings after reconstruction or maintenance operations have been completed. Inspections will occur prior to, during, and following vegetation management activities.

Action: Work with the timber sale administration team to ensure contract provisions are being implemented. Implement additional mitigation if necessary to minimize sediment or other negative impacts to streams.

Scenic Resources

Objective: Ensure project design criteria are being properly implemented and that Forest Plan standards and guidelines are being met in regards to scenic resources.

Method: Conduct site inspections to ensure prescribed project design criteria are being implemented.

Action: Review projects prior to and following implementation to ensure scenic objectives are met; use results to inform future actions.

Noxious Weeds

Objective: Ensure project design criteria are effective and that no additional noxious weed infestations occur within the project area.

Method: Site inspections before, during, and after project implementation to ensure that project design criteria are fully implemented. Perform annual surveys for noxious weeds in disturbed areas for up to five growing seasons to ensure new weed populations are not being established and if any existing populations are discovered, they are controlled and do not spread.

Action: Treat identified noxious weeds in a timely manner as part of the noxious weed treatment program.

Range Resources

Objective: Ensure range project design criteria are effective.

Method: Site inspections during and after project implementation to ensure that project design criteria are fully implemented.

Action: Perform site inspections during and after the project is complete to ensure livestock are not impacting regeneration within the project area and fences are still functional.

Botany

Objective: Ensure that botany project design criteria or mitigation are effective.

Method: Site inspections during and after project implementation to ensure that design criteria or mitigation are fully implemented and effective.

Action: Perform site inspections during and after the project is complete to ensure botanical resources, specifically Region 2 sensitive species (or Species of Conservation Concern), are protected as required.

Prescribed Burning and Fuels

Objective: Ensure that burn plans are implemented, as planned, to meet identified project objectives.

Method: Monitor fire behavior and smoke impacts throughout burning operations.

Action: Cease burn operations if fire behavior is not meeting objectives or smoke dispersal is unacceptable.

Heritage Resources

Objective: Protect known and undiscovered heritage resources.

Method: Follow programmatic agreement stipulations for evaluating potential for adverse effects and the need for protective measures.

Action: Appropriate action will be determined and implemented to protect affected heritage resources.

Transportation

Objective: Protect forest travelways

Method: Monitor and survey FS roads for deferred maintenance needs and real property inventory.

Action: Determine if illegal OHV use is occurring in connection with in treatment; take steps to prohibit illegal use, such as install signs and barriers, increase law enforcement patrol.

Objective: Survey area roads to determine if vegetation management has removed travel barriers and to determine if illegal off-highway vehicle use is occurring as a result of treatments.

Method: Periodic visual inspection

Action: Install additional signs, barriers, and increase law enforcement efforts, as appropriate.

Chapter 3. Affected Environment and Environmental Consequences

3.1 Introduction

Council on Environmental Quality regulations direct agencies to succinctly describe the environment that may be affected by the alternatives under consideration (*40 CFR 1502.15*). As such, this chapter summarizes the physical, biological, social, and economic environments of the project area and the effects of implementing each alternative on that environment.

The following chapter is organized by resource area with each resource section beginning with a description of the Affected Environment, or the existing conditions, then the analysis of direct and indirect effects, or Environmental Consequences, of implementing each alternative. Direct effects are caused by the action and occur at the same time and place. Indirect effects are caused by the action and occur later in time or are removed in distance, but are still reasonably foreseeable. Effects may be either beneficial or detrimental. Cumulative effects result from the incremental impacts of an action when added to other past, present, and reasonably foreseeable future actions regardless of who implements the action (Federal, non-Federal, or individuals); the effects of these actions must overlap in both space and time (considering the duration of effects) for a particular resource for there to be potential cumulative effects.

Two time frames are referred to throughout this analysis, short-term and long-term. Short-term is for a fifteen-year period (the term of the project) and long-term is considered beyond fifteen years.

A list of terms, definitions and common acronyms used in the analysis are located in appendix A.

3.2 Silviculture & Forest Products

Scope of Analysis

This section primarily analyzes the effects of proposed activities upon forest vegetation within the spruce forest portions of the project area boundary. Spruce forests were selected for analysis, due to the impacts of the ongoing disturbance agent (spruce beetle), as well as the subsequent proposed salvage and fuels treatment activities. Quantitative indicators are used to qualitatively evaluate how well each alternative would achieve the project purpose and need with respect to forest vegetation, forest products, and movement toward desired conditions.

Three elements will be addressed: Forest Health and Species Composition, Forest Structural Diversity and Resiliency, and Forest Products. The Timber and Silviculture specialist report can be reviewed for discussions concerning methodology, assumptions, information sources, and limitations of data and models.

Existing Conditions

The spruce forest landscape within the project area consists primarily of spruce-fir forests at the highest elevations (77% of the subset), with spruce-mixed conifer forests at mid-elevation (23% of the subset). These combined forest types represent 41% of the land cover within the project area and range from 8,400-12,600 feet in elevation. Other vegetation and land cover types represented in the Project Area can be grouped to include grasses & forbs (26% of the project area); rock, bare ground, & water (5%); cottonwood & shrubs (2%); aspen (17%); pine (2%); and mixed conifer (7%). See Figures 1 & 2 in Appendix H for maps of vegetation cover types and distribution across the project area.

All acres are approximate; acres for vegetation cover types and percentage are rounded to the near whole unit. Proposed activity acres are rounded up to the nearest 500 acres to allow the management flexibility intended with this type of landscape-level analysis.

Forest Health and Species Composition

Forest insects and diseases, along with fire, are important ecological disturbance agents and affect species composition within stands across entire landscapes. The major disturbance agents related to this project are spruce beetle (*Dendroctonus rufipennis*), western spruce budworm (*Choristoneura occidentalis*), Armillaria root disease (*Armillaria ostoyae*), and windthrow. Other native insect and disease agents are also present across the landscape, but without management implications.

As indicated in Chapter 1, the spruce beetle is currently the single greatest disturbance agent within the spruce forest landscape. Increased spruce beetle activity was first noted in the south in the Wolf Creek drainage (Cumbres Pass area) and Neff Mountain areas in 2003. A small salvage sale was implemented on Neff Mountain in 2004 and the County Line Vegetation Management Project was initiated the same year. Spruce beetle activity increased dramatically in the County Line area until 2010 and spread into and across the Project Area from the west at epidemic rates. Similar population build-up and spread was also noted in the Weminuche Wilderness Area on the Divide Ranger District during the same period.

Field surveys were completed in 2016 by Rio Grande National Forest timber personnel and compared with observations in active timber sale areas. Recent aerial flight data was also reviewed. Heavy spruce beetle activity has been found throughout the entire Project Area. According to Forest Service Entomologist Tom Eager, mortality of every infested spruce tree is a near certainty because of the immense population of beetles present. Susceptible spruce trees currently not infested are also very likely to become infested for the same reason.

The dramatic increase in spruce beetle activity in the Project Area highlights the severity of the prior drought conditions across the Forest, as well as extremely high spruce beetle populations. Various indicators of drought severity including water yields, fuel moisture content, and plant physiology all set records in 2002. It is likely that these conditions, as well as the prolonged drought, facilitated the rapid increase in beetle population and activity when this outbreak first began, helping create the existing condition.

Large spruce beetle populations throughout the Project Area are proving to be detrimental to the mature stands in this analysis. Once a full-blown outbreak is underway, extreme beetle populations can swarm entire landscapes and kill the majority of mature spruce trees. Such intense outbreaks are not unheard of. Landscape-scale outbreaks of spruce beetle have been recorded throughout the range of spruce, including locations in Alaska, New Mexico and Utah as well as numerous examples in Colorado. Due to the predominant presence of spruce stands within the Project Area, this outbreak has and is expected to continue to have broad impacts across the landscape. See Figure 3 in Appendix H for the spatial extent of spruce beetle activity detected by Forest Health Protection aerial surveys from 1996 through 2016.

Western spruce budworm and Armillaria root disease remain endemic within the spruce forest landscape and as such are not major factors in relation to forest health. Likewise windthrow has not been a noteworthy disturbance process on the analyzed landscape. See Figure 4 in Appendix H for the spatial extent of western spruce budworm activity from 1996 through 2016.

When evaluating existing conditions within the project area in terms of forest health, it is important to understand what standard the conditions are being measured against. A quick review of the Forest Plan definition of forest health will note that it is *a **condition** where **influences** do not threaten management **objectives** for a given Forest **unit now** or in the **future*** (text abbreviated and emphasized for clarity). With this definition, the standard for forest health is determined by the management objectives for the unit under consideration. If the existing condition is in alignment with the objectives for the unit, then forest health

meets the standard. If the existing condition is not in alignment with the objectives for the unit, then there is a disparity to be addressed. Some management units within the Forest are intended for events to be heavily managed for certain goals, while other units are intended to be very lightly managed for other goals. This definition does not deny the benefits of natural processes, but tends to the overlap between natural processes and desired conditions.

Within the project area lie fifteen Management Area Prescriptions (MAPs) defined by the Forest Plan. The majority of the spruce forests (89%) fall within MAPs for which forest health is influenced primarily by natural processes; these areas include Wilderness, Special Interest Areas, Backcountry, Scenic Rivers, and Recreation Rivers. No disparity is considered to exist within these MAPs. MAPs 5.11 (General Forest and Intermingled Rangelands) and MAP 5.13 (Forest Products) (7%) fall at the other end of the spectrum and were designed to manage specifically against the loss of forest products to insect and disease outbreaks. Within both of these prescriptions, forest insect or disease infestations are to be evaluated against the potential for loss of commercial forest product resources, with management emphasis on protecting the commercial resources (Rio Grande National Forest 1996). Greater losses of forest products occur over time after mortality, as wood deterioration increases. Within the forest health spectrum lie other MAPs (4%) which allow salvage harvest activity in alignment with their management objectives and are benefitted by the removal of snags and related hazards. These areas include Scenic Byways or Railroads, Dispersed Recreation, Deer and Elk Winter Range, Bighorn Sheep Range, and Grassland Resource Production. Within this 11% of the spruce forest, a disparity is considered to exist.

The effects of disturbance agents upon forest species composition are included in the descriptions of Forest Diversity and Resiliency, as well as the No Action alternative.

Forest Structural Diversity and Resiliency

Vegetation structural stage is an important consideration in prescribing management actions to preserve watershed values and wildlife habitat (Thomas 1979). The desired condition is to have an appropriate balance of vegetation structural stages within each vegetation zone to provide for greater forest resiliency and to maintain habitat and landscape diversity over time. The resiliency of a forest landscape to stressors and disturbance agents, such as insect and disease, fire, and climate changes, is closely tied to the diversity of forest structure and species across that landscape. Disturbance agents affect varying age classes and species differently or not at all; and therefore it is beneficial to maintain a balance, checking the movement of a disturbance process across the landscape and maintaining propagules for recovery after a disturbance event. This section will focus on structural diversity, with reference to dominant and codominant species presence within the stands.

Vegetation structural stage is a method of describing forest growth stages, including successional stage (O'Hara & Latham 1996)(Stage, Crookston, Long, & Keane 1995), and provides a tool by which to measure structural diversity. The time it takes for seedlings to become established as well as subsequent tree growth rates, influence forest progression through vegetation structural/seral stages. Tree life expectancy and disturbance regimes affect how long the oldest vegetation structural stage can be maintained.

The Rocky Mountain Vegetative Structural Stage (RM-VSS) that is incorporated into the FSVeg Spatial Data Analyzer model was used for this analysis to allow for comparison between alternatives into the future. The RM-VSS was developed for use in R3 (Arizona/New Mexico) and uses different size class divisions than the R2 Habitat Structural Stage (R2 HSS) classification system used in Region 2. Table 8 shows a comparison of the size class break downs between the two systems, based on average stand diameter.

Table 8. Comparison between RM-VSS and R2 HSS classifications for forested stands.

RM-VSS Code	Description	Size class Tree species[1]	Size class Woodland species[1]	R2 HSS	Description	Size class
1	Grass/forb/shrub	<1" dbh	<1" dbc	1T	Grass/forb	Non-stocked
2	Seedling/sapling	1-4.9" dbh	1-2.9" dbc	2T	Shrub/Seedling	<1" dbh
3	Young Forest	5-12" dbh	3-4.9" dbc	3	Sapling/Pole	1-9" dbh
4	Mid-aged forest	12-18" dbh	5-10.9" dbc	4	Mature	9"+ dbh
5	Mature forest	18-24" dbh	11+" dbc	5	Old Growth[2]	Variable
6	Old forest	24"+ dbh				

[1]Diameter for woodland species are measured at the root collar (drc);

[2]Old growth is discussed separately in the Biodiversity section.

Prior to spruce beetle outbreak, the structure of the majority of stands within the project area was primarily that of mid-aged or mature forest. Since the outbreak, stands in which Engelmann spruce is the primary species in the overstory have a forest structure of young forest or less (i.e. seedling-sapling or grass-forb/shrub); only 342 acres still model as mid-aged. Residual stocking in these stands range from sparse to dense and likewise have a wide range of dead spruce basal areas, generally between 10 and 260 square feet per acre. Prior to mortality, the age of the dominant and codominant trees within the spruce-fir stands across the district varied between 130 to 250 years. The stand age and high percentage of spruce in the overstory made the majority of these stands susceptible to spruce beetle attack under drought conditions. Spruce-mixed conifer stands in which spruce is not the primary species in the overstory are modeled as ranging from seedling-sapling structure all the way to mature structure. The following table displays forest structure representation across landscape, as modeled post-beetle outbreak.

Table 9. Current forest structure across the spruce forest landscape.

RM-VSS Code*	Percent of Spruce Forest Landscape	Dominant/Co-Dominant Species Composition**
1	19%	ES, SAF
2	6%	ES, SAF, AS
3SS	35%	ES, SAF, AS, DF, BS, LP
3MS	17%	ES, SAF, AS, BS, DF, WF, LM
4SS	17%	ES, SAF, DF, WF, AS, BS
4MS	4%	SAF, ES, AS, BC, DF, LM
5MS	2%	SAF, AS, DF, BC

* SS=single story structure, MS=two or more story structure

**AS=aspen; BC=bristlecone pine; DF=Doug-fir; ES=Engelmann spruce; LM=limber pine; LP=lodgepole pine; SAF=subalpine fir; WF=white fir

Past Silvicultural Activities – Past vegetation management activities have helped shape the existing condition of the spruce forests within the project area and create age, structural, and species diversity. Past harvest activities are listed in Appendix I and include commercial thinning and improvement cuts, shelterwood preparatory cuts (including preparatory and establishment/seed cuts), overstory removal cuts, patch clearcuts, stand clearcuts, salvage cuts, and single-tree selection cuts. Shelterwood preparatory cuts (light partial cuts) make up the largest portion of the previous timber harvest activity that occurred. These treatments opened up the stands (removing about ¼ to 1/3 of the basal area) to create windfirmness and begin natural regeneration establishment. The shelterwood cuts were essentially thinnings that reduced the stand density and improved tree vigor, thus reducing the susceptibility of the residual mature trees to spruce beetle

infestation. The sanitation/salvage treatments removed dead or dying trees, which may have reduced the basal area and increased tree vigor in localized areas.

Other silvicultural activities have included reforestation, site preparation for natural regeneration, pre-commercial thinning, tree release and weeding, rearrangement of fuels, broadcast burning, burning of piled material, and yarding of fuels.

These past management activities did reduce the risk of spruce beetle within the managed stands themselves, but could not protect against the elements of high beetle populations and drought-related stress beyond the managed stands. The influences of past activities upon the landscape are incorporated into the existing condition baseline, and existing conditions and potential effects of proposed activities are considered for the spruce forest landscape as a whole.

Direct and Indirect Effects

Direct and Indirect Effects analysis will address how each alternative influences forest health and species composition, forest structural diversity and resiliency, and forest product management over time. The following measures will be used:

- Vegetation structural stage representation across the spruce forest landscape in 50 years (% of area)
- Proportion of the spruce forest landscape diversified in stand structure and/or composition as a result of project activities (% of area)
- Area of salvageable timber expected to lose merchantability post-mortality (acres)
- Volume of commercial forest products recovered from insect mortality (Ccf)

Alternative 1 – No Action

Forest Health and Species Composition

As mature stands are killed by spruce beetle, two influences work together to shift species composition both now and into the future. The resulting trajectory of the structural and compositional changes, or forest reorganization, relies at least partly upon the species diversity present on the site prior to outbreak (DeRose & Long 2007). On the Conejos Peak Ranger District, species diversity is limited within the spruce-fir zone of the spruce forest landscape, being mainly restricted to Engelmann spruce and subalpine fir, with minor presence of bristlecone pine and aspen. At lower elevations, in the spruce-mixed conifer stands, there is greater presence of aspen and other conifer species, and reorganization is less noticeable. Because the disturbance event is primarily in the spruce-fir zone, which is the majority of the analysis area, measureable shift in composition is expected.

The first influence affecting reorganization is species-specific mortality, which is expected to shift current overstory composition strongly toward fir, while the predominantly fir understory (advance regeneration) is released to grow. Second, the fir seed sources are sustained for continued propagation, while the Engelmann spruce seed sources are greatly diminished. This aggregate affect is expected to favor a current and future stand composition dominated by fir, especially by subalpine fir within the spruce-fir forest type. Although exact compositional changes will vary from stand to stand, vegetation modeling indicates that the spruce-fir portion of the landscape will have a general combination of 65% fir, 34% spruce, and 1% other species, with fir dominating both the overstory and the understory. This shift in both stand structure and species composition has been observed before and could last as long as 125-175 years (Schmid & Mata, *Natural Variability of Specific Forest Insect Populations and Their Associated Effects in Colorado* 1996). Stands within the project area having an aspen component may experience an expansion of aspen clones, although this will likely be regulated by ungulate browsing pressure.

There is uncertainty related to the exact trajectory of forest reorganization across the spruce-fir landscape. A recent study on the Rio Grande National Forest (Savage, Lawrence, & Squires, 2017) described a process by with land managers may be able to accurately map post-disturbance stand composition across the landscape using readily-available technology. Field data for the study was collected in 2015, and Landsat data from 2015 and 2014 was used in the study. Although the primary purpose of the study was to determine a useful analysis process, conclusions were also drawn concerning forest composition in the spruce-fir zone of the Forest, including this project area. The study indicated that Engelmann spruce was still a dominant species within the overstory of the landscape, and likewise remained a dominant species in the sub-canopy of the same forests. When considered in application to this project, a few observations can be made about the study:

- The epidemic was (and is) still ongoing, and the study couldn't account for trees that were just infested and/or have been infested since that time. The map on page 16 of the article shows a fairly distinct transition between those areas further advanced in the epidemic vs. more-recently infested. This mid-disturbance evaluation could affect conclusions, and might also help explain why there was still relatively high canopy cover within portions of the study area. The model used in this project takes a post-beetle look at stand data, as imputed across the landscape. This approach moves stands to the end of the disturbance time scale, more similar to the older dead stands of the study. The usefulness of the process described in the study seems greater for short duration disturbance events like fire.

- Sub-canopy data within the study doesn't appear to be looking at regeneration, but rather intermediate and suppressed trees of the overstory. It would also include a 2nd developing cohort that has grown enough to reach the sub-canopy position, especially in the case of regenerated forest openings. In other words, a tree's crown had to be tall enough to be part of the overstory and be measured by the canopy measurement instrument (moosehorn). It is logical that these tree would mirror the canopy, because often the intermediate and suppressed trees are of the same cohort as the dominants and co-dominants. Such trees may/may not develop and establish dominance, but are not as likely to do so, due to long-term suppression (100 years plus).

- The dominant presence of a species within the sub-canopy layer doesn't necessarily represent demographic dominance across the entire population, because these trees are often low in number, when compared to other strata within the stand. Understanding a 30 meter x 30 meter Landsat pixel, with 6.7 trees/pixel, there are only 30 trees per acre of Engelmann spruce in the sub-canopy (on average), as presented by the study. Although these trees are less likely to die from beetle infestation, the Forest has experienced mortality down to 5" dbh fairly frequently, which relates back to the first observation.

- Natural regeneration results will vary by stand, as previously noted. On the Rio Grande National Forest, subalpine fir appears to have greater limitations related to elevation and/or moisture & site productivity, when compared with spruce. In areas that have a 'pure' spruce overstory, there will be a pure, or almost pure, spruce understory. As a result, reconnaissance data collected to date has noted several stands that appear to have greater presence of spruce regeneration than fir.

Understanding the uncertainties and limitations with both the model and the study, the model still appears to be the best predictor of the landscape as a whole, based on the above considerations as well as general observations in the field.

Various effects on western spruce budworm and Armillaria root disease occurrence could result from these predicted shifts in species composition. In the short-term, the loss of overstory spruce through mortality would increase dispersal distance of budworm from remaining overstory fir trees, thereby reducing insect survival. This reduction in pest survival, however, is expected to be less noticeable than in the action alternatives, due to snags within the stand limiting the dispersal distance by varying degrees. The overstory

mortality would also release the suppressed understory, making the advance regeneration and mid-story more resilient to budworm. In the long-term, future occurrence of budworm could actually be increased in the fir-dominated stands (a preferred food source). Subalpine fir is also less resistant to Armillaria root disease than Engelmann spruce, which could potentially increase the future occurrence of Armillaria root disease within the project area. Windthrow risk would be slightly increased for residual overstory trees in each stand due to the reduction in wind protection resulting from tree mortality.

As indicated by Table 3-3, species presence in the overstory is expected to remain diverse over the next 50 years; this, however is not a measure of species predominance.

Forest Structural Diversity and Resiliency

As the mature stands are killed by spruce beetle, their structure and appearance will also change dramatically. The stands will become more open, with limited overstory canopy closure for the next 30 years. Total average post-outbreak canopy closure is expected to drop to about 40% before increasing again, with the majority of canopy being represented by the lowest pre-beetle stand stratum, as indicated by an average stand diameter of 3.9" dbh. Snags will continue to increase, giving the landscape a grey tone. The forest canopy would close in over the next 30-50 years, and an overstory would be re-established within the next 100 years.

Table 10 shows the distribution of vegetative structural stages anticipated across the landscape after 50 years, as well as dominant and codominant species presence within the stands. This distribution indicates a greater presence of stands in the young forest stage (45%), with a shortage of stands in the mature and old-growth stage (14%). This prediction agrees with the outcome anticipated as a result of the large-scale disturbance experienced. Resiliency, as affected by age class distribution, would be moderate within the next 50 years. A long-term trend toward a repeated future widespread disturbance event is expected, however, as the demographics move into mature and old-growth structural stages.

Table 10. Modeled forest structure across the spruce forest landscape in 2066, No Action Alternative.

RM-VSS Code*	Percent of Spruce Forest Landscape	Dominant/Co-Dominant Species Composition**
1	2%	SAF, ES
2	13%	ES, SAF, AS
3SS	28%	SAF, ES, BC, AS, DF, WF, LP
3MS	17%	ES, SAF, AS, DF, WF, LM
4SS	12%	SAF, ES, AS, BS, DF, LM, WF, LP
4MS	14%	SAF, ES, AS, BS, DF, WF, LM
5SS	7%	AS, BS, CB, DF, LM
5MS	5%	SAF, ES, AS, BC, BS, DF, WF, LM
6SS	<0.03%	AS
6MS	2%	BC, CB, AS, DF, ES,

*SS=single story structure, MS=two or more story structure

**AS=aspen; BC=bristlecone pine; DF=Doug-fir; ES=Engelmann spruce; LM=limber pine; LP=lodgepole pine; SAF=subalpine fir; WF=white fir

The majority of snags are expected to fall within the next 50 years, producing large fuel loads (coarse woody debris). Moderate levels of coarse woody debris are desirable for soil development and regeneration establishment (shading), but excessive amounts of debris can diminish natural regeneration establishment (rooting) and increase burn severity, should a fire occur. For stands within salvage MAPs, the substantial increase in deadfall within the future stand condition is outside of desirable forest health conditions. Additional discussion of coarse woody debris can be found in the Fire/Fuels and Biodiversity sections of the

EIS. Forest Plan desired conditions for some MAPs would not be addressed under this alternative, and 0% of the landscape would be diversified in structure and/or composition as a result of harvest, planting, and fuels treatment activities. Hazardous fuels treatments would not occur adjacent to private land or other infrastructure. These areas would retain denser understory vegetation and higher fuel loadings, except where influenced by public firewood gathering.

Forest Products

In stands where timber production is the objective, stands dominated by subalpine fir rather than Engelmann spruce are less desirable for the following reasons: 1) fir has a shorter life span than spruce, 2) fir is more susceptible to more insect and disease attacks than spruce, 3) the structural characteristics of the wood fiber are inferior to spruce, and 4) it has less economic value than spruce. The No Action alternative is expected to increase the long-term presence of fir within forest product management areas over the next 100 years.

By not salvaging the dead spruce, up to 17,000 acres of salvageable timber would not be available for harvest and would lose merchantability post-mortality. As a result, approximately 340,337 Ccf of National Forest timber would not be available for utilization as wood products or contribute to sustained yield of forest products. The public would most likely obtain an equivalent amount of wood products from other sources, including private land, state land, other National Forest projects, or other countries.

Alternative 2 – Proposed Action

Alternative 2 represents the proposed action and focuses on maximizing the salvage of dead spruce. It includes harvest on up to 17,000 acres across the project area, with additional hazardous fuels treatments on up to 1,000 acres adjacent to private property and administrative sites. In areas where there is overlap between the two activities, salvage harvest would be utilized to accomplish hazardous fuels reduction objectives. Approximately 330 acres would be treated in this manner under Alternative 2. Salvage includes the removal of dead or infested trees that have been impacted by spruce beetles. Planting of native conifer species is also proposed in areas that are inadequately stocked or in order to diversify species composition. Chapter 2 of the EIS further describes this alternative; see also the *Silviculture and Hazardous Fuels Guidelines* in Appendix E for additional information.

Forest Health and Species Composition

As described in Alternative 1, species composition would shift in the portions of the landscape where harvest does not occur. Where harvest does occur, activity disturbance would promote seral species such as aspen and spruce, especially in areas where planting efforts focus on the retention of spruce in the species mix. Windthrow risk to residual overstory and mid-story trees would be increased by the removal of the snag wind protection, particularly on southwesterly exposures. This risk has been partially mitigated by past management activities but is still anticipated. Trees most susceptible to windthrow are the residual live overstory, which have greater wind resistance than snags. The potential loss of these trees to windfall would be assessed on a project-by-project basis and mitigated to the extent feasible through boundary layout and marking. It would not, however, affect management objectives or future management activities within the project area. Although undesirable, this event would create good microsites for natural and artificial regeneration establishment and would not contribute toward any insect or disease outbreaks.

Under Alternative 2, artificial regeneration by planting Engelmann spruce or other native conifer species is anticipated on approximately 860 acres. Other native species may be selected for ecotones between spruce-fir forest and spruce-mixed conifer forests, in response to climate change concerns. Seed would come from local seed sources, avoiding off-site assisted migration. Actual planting acres would be determined through post-treatment evaluations and be based upon desired species composition, distribution, and stocking levels, in an effort to maintain landscape diversity in composition, structure, and function. Desired stocking levels would likely be higher than, but would not be less than, the Forest Plan restocking standards of 150 trees per

acre, unless outside of suitable timber base and meeting specific objectives and prescriptions. See the Silvicultural Findings report for additional information concerning stocking levels.

Stands within harvest areas having an aspen component are anticipated to experience an increase and expansion in aspen sprouting as a result of the harvest-related disturbance. This diversity of species composition is considered beneficial when related to forest health. Unharvested areas may also experience an expansion of aspen clones, but to a lesser degree as described for Alternative 1.

The loss of overstory spruce through mortality and removal of snags would increase dispersal distance of western spruce budworm from remaining overstory fir trees, thereby reducing insect survival. This reduction in insect survival is expected to be greater within harvest areas than outside of them, as snags within the stand limit the dispersal distance by varying degrees and reduce predation. The loss of overstory would also release the suppressed understory, making the advance regeneration and mid-story more resilient to budworm impact.

Engelmann spruce is susceptible to Armillaria root disease, but this disease usually does not affect Engelmann spruce until it reaches later seral stages. Engelmann spruce shows greater resistance to Armillaria root disease than subalpine fir, which would otherwise be regenerated on most of these sites. Any increase in Armillaria root disease following salvage harvesting would not be the result of removing beetle infested or beetle killed trees. Root systems of beetle-killed trees would not be affected in their suitability as a food base by removal of the stem. Project design criteria for protecting existing regeneration and establishing new regeneration (EIS, Chapter 2) will be applied to all action alternatives.

Hazardous fuels treatment activities proposed under Alternatives 2 and 3 would focus on thinning or pruning understory trees (<8” dbh) and shrubs, as needed, to modify potential fire behavior, as well as removal of snags that threaten infrastructure. The effects of this action on spruce beetle will be insignificant as the spruce beetles preferred food source is a tree greater than 8 inch dbh, although some trees as small as 4” to 5” inches are being infested and killed by spruce beetle within the project area. Removing some of the dense smaller trees, especially fir, will help reduce western spruce budworm host trees, thereby making these treated areas less susceptible to the insect.

As indicated by Table 10, species presence in the overstory is expected to remain diverse over the next 50 years, similar to Alternative 1.

Forest Structural Diversity and Resiliency

Because of the scale of the bark beetle epidemic and resulting mortality, salvage harvesting within each affected unit would generally be extensive and the resulting stand structure would appear open as a result of removing snags. A minimal average of 4 snags per acre would be retained for wildlife habitat, as well as aspen, un-infested spruce, and all other conifer species. The forest structure would close in over the next 30-50 years, and an overstory would be re-developed within the next 100 years.

Part of the design for Alternative 2 is to set aside areas for public firewood gathering, wherein no commercial harvest would occur. Impacts upon forest vegetation and recovery are expected to be greatest within these areas, due to increased access needs and uncontrolled felling operations. These activities and effects, however, would be identical to the firewood gathering performed under Alternative 1, except that vehicles could be allowed further off the road within designated areas. Activities would remain within the scope of the management objectives for the affected units, and these areas would still be re-established with forest vegetation over time.

Table 11 shows the distribution of vegetative structural stages anticipated across the landscape after 50 years under Alternative 2. Like Alternative 1, this distribution indicates a greater presence of stands in the young forest stage (45%), with a shortage of stands in the mature and old-growth stage (14%). At the landscape

level, the only distinction between Alternatives 1 and 2 is Alternative 2 has 1% less representation in VSS 2, and 1% greater representation in VSS 4. Therefore, the same interpretations concerning resiliency and future disturbance in Alternative 1 would also apply to Alternative 2. The primary reason for the close relationship in outcome is the broad and severe disturbance event that has just occurred. Stands across the landscape, primarily the spruce-fir forests, were already moved toward early structural stages due to mortality caused by the spruce beetle. Removal of dead trees at this time does not affect structural stage nearly to the degree that similar volume removal would under green forest conditions. Had these stands been previously undisturbed, an approximate 12% shift in stand structure across the landscape would have occurred.

Table 11. Modeled forest structure across the spruce forest landscape in 2066, Alternative 2.

RM-VSS Code*	Percent of Spruce Forest Landscape	Dominant/Co-Dominant Species Composition**
1	2%	ES, SAF
2	12%	ES, SAF, AS
3SS	28%	LP, ES, DF, SAF, AS, WF, BS, BC
3MS	17%	SAF, LM, DF, AS, WF, BS, ES
4SS	13%	LP, ES, SAF, WF, DF, AS, LM, BS
4MS	14%	ES, SAF, DF, LM, AS, WF, BS
5SS	7%	DF, WF, AS, SAF, BC, ES
5MS	5%	DF, BC, LM, AS, ES, WF, BS, SAF
6SS	<0.04%	AS, BS, ES
6MS	2%	AS, ES, DF, SAF, BC

*SS=single story structure, MS=two or more story structure

**AS=aspen; BC=bristlecone pine; DF=Doug-fir; ES=Engelmann spruce; LM=limber pine; LP=lodgepole pine; SAF=subalpine fir; WF=white fir

Future fuel loads and deadfall (coarse woody debris) resulting from snag fall would be greatly reduced within harvest areas, but logging debris would still be evident within the stand. Additional discussion of coarse woody debris can be found in the Fire/Fuels and biodiversity sections of the EIS. Forest Plan desired conditions for identified MAPs would be addressed under this alternative. Although only minor changes to vegetative structural stages across the landscape would be observed, up to 12% of the landscape would still be diversified in species composition and coarse woody debris retention under Alternative 2 through harvest, planting, and fuels treatment activities.

Forest Products

The intent of the salvage harvest is to place timber on the market for the American public in time to capture the value of the beetle-killed spruce trees, before the effects of wood decay eliminates that value. Observations made during ongoing salvage sales indicate that local dead Engelmann spruce lose most of its sawlog value within 10 years of mortality. A recent wood deterioration study on the Rio Grande National Forest supports that conclusion, showing wood defect to rise to over 40% within a ten-year period (Webb 2015). The objective of the silvicultural prescription would be to harvest spruce trees eight inches Diameter at Breast Height (DBH) and larger within the salvage units, which were recently killed by, or are currently infested with, spruce beetle. Harvesting would be accomplished with ground-based (tractor) logging methods through a variety of large and/or small sales, including public/commercial firewood-gathering areas.

Under Alternative 2, up to 340,337 Ccf would be available for harvest from 17,000 acres. Between all alternatives, this alternative would contribute the most to long term sustained yield of forest products. Zero acres of salvageable timber would be unavailable for harvest or lose merchantability post-mortality. Likewise, 0 Ccf of National Forest timber would be unavailable for utilization as wood products or

contribute to sustained yield of forest products. The estimation of timber volume that would be removed is derived from three sources: 1) stand exam data stored in FSVeg Spatial, 2) stand exam data imputed across the landscape and projected to 2017 using FSVeg Spatial Data Analyzer (Central Rockies Variant), and 3) calibrations made within Data Analyzer for volume and mortality. All of these sources are subject to error. Therefore, these volumes must be considered a best estimate and subject to change. More precise data would come when the timber is actually cruised during the sale preparation process.

Alternative 3 – Vegetation Management – Limited Action

This alternative provides the opportunity to salvage dead and dying spruce on up to 8,500acres across the project area, with additional hazardous fuels treatments on up to 1,000 acres adjacent to private property and administrative sites. In areas where there is overlap between the two activities, salvage harvest would be utilized to accomplish hazardous fuels reduction objectives. Approximately 129 acres would be treated in this manner under Alternative 3. Planting of native conifer species is also proposed in areas that are inadequately stocked or in order to diversify species composition. Chapter 2 of the EIS further describes this alternative; see also the Silviculture and Hazardous Fuels Guidelines for additional information.

Forest Health and Species Composition

The effects of salvage harvesting would be the same as those described in Alternative 2, but would affect approximately one-half the acres, or 6% of the spruce forest landscape.

Under Alternative 3, artificial regeneration by planting native conifer species is planned for 420 acres of non-stocked or under-stocked areas, based on existing stand data and modeling. Actual planting acres would be determined through post-treatment evaluations based upon desired species composition, distribution, and stocking levels, in an effort to maintain landscape diversity in composition, structure, and function. Desired stocking levels would be established within treatment areas as described in alternative 2. The interaction between management activities and Armillaria root disease, budworm, windthrow, and deadfall would be the same as those described under Alternative 2, but over a smaller area. Outside of harvest areas and across the broader spruce forest landscape, forest health elements would function as described in Alternative 1.

Both hazard tree removal and fuels reduction treatments would be the same as described in Alternative 2, with the same number of acres considered for treatment.

Like Alternatives 1 and 2, species presence in the overstory is expected to remain diverse over the next 50 years.

Forest Structural Diversity and Resiliency

Although fewer acres are being treated within this alternative, the effects of salvage harvest upon individual stands would be the same as described under Alternative 2.

Table 12 shows the distribution of vegetative structural stages anticipated across the landscape after 50 years under Alternative 3. Like Alternative 1, this distribution indicates a greater presence of stands in the young forest stage (45%), with a shortage of stands in the mature and old-growth stage (14%). At the landscape level, no real distinction is discernable between Alternative 1 and Alternative 3. Therefore, the same interpretations concerning resiliency and future disturbance in Alternative 1 would also apply to Alternative 3. See Alternative 2 for further discussion concerning how closely the outcomes are related. Had these stands been previously undisturbed, an approximately 6% shift in stand structure across the landscape would have occurred.

Table 12. Modeled forest structure across the spruce forest landscape in 2066, Alternative 3.

RM-VSS Code*	Percent of Spruce Forest Landscape	Dominant/Co-Dominant Species Composition**
1	2%	ES, SAF
2	13%	ES, SAF, AS
3SS	28%	LP, ES, DF, SAF, AS, WF, BC, BS
3MS	17%	LM, SAF, ES, DF, WF, LM, AS
4SS	13%	LP, ES, SAF, DF, WF, AS, LM, BS
4MS	13%	ES, SAF, DF, LM, AS, WF, BS
5SS	7%	DF, WF, LM, AS, SAF, BS,
5MS	5%	DF, LM, BC, AS, SAF, ES, WF, BS
6SS	<0.04%	AS, BS, ES
6MS	2%	AS, ES, DF, SAF, BC

*SS=single story structure, MS=two or more story structure

**AS=aspen; BC=bristlecone pine; DF=Doug-fir; ES=Engelmann spruce; LM=limber pine; LP=lodgepole pine; SAF=subalpine fir; WF=white fir

Forest Plan desired conditions for identified MAPs would be addressed under this alternative, but not to the extent of Alternative 2. Logging slash left in the woods would be used to benefit young seedlings by protecting them from excessive sunlight, extremes of temperature, desiccation, and grazing animals (Smith, Larson, Kelty, & Ashton 1997), but would not create the large amounts of coarse woody debris equivalent to Alternate 1. Although only minor changes to vegetative structural stages across the landscape would be observed, up to 6% of the landscape would still be diversified in species composition and coarse woody debris retention under Alternative 3 through harvest, planting, and fuels treatment activities.

Forest Products

Under Alternative 3, up to 189,906 Ccf would be available for harvest from approximately 8,500 acres. This alternative would contribute to long term sustained yield of forest products, but not as much as Alternative 2. Approximately 8,500 acres of salvageable timber would not be available for harvest and would lose merchantability post-mortality. Likewise 150,431 Ccf of National Forest timber would not be available for utilization as wood products or contribute to sustained yield of forest products. Due to model error, volumes must be considered a best estimate and subject to change. More precise data would come when the timber is actually cruised during the sale preparation process.

Alternative 2 & 3 – Five-year Stocking Assurance

The 5-year stocking assurance requirement established by the National Forest Management Act of 1976 applies to all regeneration harvest treatments, but not to intermediate stand treatments such as thinning or intermediate sanitation/salvage. In relation to salvage harvesting, Forest Service Manual 2470 directs that "if salvage or sanitation cutting is heavy enough to require regeneration, it is considered a regeneration harvest rather than intermediate cutting, and steps should be taken to adequately restock the stand within five years of final harvest" (Forest Service Washington Office 2014). General guidance for extensive beetle mortality is to assign a final harvest system that would best represent the final stand conditions, taking into account previous management activities. To meet these directions, a Silvicultural Findings of Compliance document was created for the project, describing: 1) which silvicultural systems would be proposed to meet both the stand objective of salvage as well as guidance for addressing extensive beetle mortality and 2) whether or not the 5-year stocking assurance would apply.

All forest lands within the National Forest System are to be maintained in appropriate cover to achieve desired time and stocking level goals in a cost-efficient manner (Forest Service Washington Office, 2014).

As a result, stocking standards were set forth in the Forest Plan as a minimum of 150 trees per acre for spruce-fir and mixed conifer stands and 300 trees per acre for aspen. A timber suitability analysis was also conducted within the FEIS of the Forest Plan (p. III-160 to III-165) to determine which lands were suitable for timber production. Part of that analysis considered whether or not irreversible damage was likely to occur to soils and watersheds and whether adequate information was available to insure that areas could be restocked within 5 years.

In most treatment areas, adequate existing regeneration already exists as a result of previous management activities. The requirement to conduct first, third, and (if necessary) fifth year stocking surveys will be accomplished on all required units to assess and document progression toward certification as fully stocked. Areas not on trajectory to be fully stocked within 5 years (i.e. where existing regeneration is lacking or damaged due to logging activities) are planned for planting with Engelmann spruce or other native conifer seedlings. Sowing requests would be made after the first year stocking survey and planting would occur prior to the third year stocking survey. If additional fill-in planting were needed to meet the Forest Plan standards, it would be accomplished prior to the fifth year survey. Adequate seed inventory is currently available to meet all projected planting needs across the district's spruce zone.

Research, along with experience on the Forest, shows that the technology and knowledge exists to restock these stands within five years after final regeneration harvest. Publications acknowledge that natural regeneration is generally a slow process. However, advance regeneration is already present in many places, and artificial regeneration is effective in the Central Rockies when applied correctly (Shepperd, Jeffers, & Ronco, 1981). Local experience also indicates that project design is adequate and planting is effective in assuring restocking within the spruce zone of the Rio Grande National Forest. This is demonstrated by very local research (Jeffers, *Engelmann Spruce Super-Seedling Plantations, Rio Grande National Forest: Thirteenth Growing Season Survival and Height Growth* 1995) as well as successful plantation establishment in the Grouse Creek, Twister, and Blowout Mountain areas. Existing advance regeneration within the stands themselves also indicates that the site is conducive to seedling establishment. Old records indicate, however, that restocking of some 1960's clearcuts in the Elwood Pass area was difficult. Reconnaissance and file research indicates that heavy sheep grazing and lack of coarse wood debris were limiting factors which heavily influenced restocking success. Those factors are not an issue today under current management practices; however, project-level assessments will occur prior to harvest on a stand-by-stand basis to ensure that adequate advance regeneration is present or restocking objectives can otherwise be accomplished.

Cumulative Effects

The cumulative effects analysis includes all of the spruce forest landscape on public and private lands within and adjacent to the project area. The analysis considers spruce beetle infestations that have been observed in this area during the last 15 years and the potential for continued outbreaks over the next 5 years. The probability for ongoing spruce beetle outbreaks in this area is high, due to current spruce beetle populations, stand conditions, and observed ongoing patterns of tree mortality. It is expected to continue until the majority of mature Engelmann spruce trees on the landscape are dead.

The CP District-wide Salvage Project area is bounded on the north by the Divide Ranger District, on the east by BLM, state, and private lands, on the south by the Carson National Forest in New Mexico, and on the west by rugged private property lands and the San Juan National Forest's portion of the South San Juan Wilderness area. Backcountry and wilderness areas both within and adjacent to the Project Area would remain untreated and natural processes would continue in these areas without human intervention, while some degree of salvage activity would be expected on private lands.

Ongoing efforts to salvage spruce beetle mortality within the Project Boundary include sales and planting activities under the County Line Vegetation Management Project, the Rio de los Pinos Vegetation Management Project, the Cumbres Vegetation Management Project, the Burro Unit 15 Vegetation

Management Project, and various small sales. Some hazardous fuels treatments are also occurring next to private property under the Cumbres Vegetation Management Project. All of these activities are captured in the baseline for the CP District-wide Salvage Project and would contribute toward removing spruce beetle from the forest, but the sum total of these efforts would have very little impact on beetle populations. These sales may temper beetle-caused mortality on a localized (stand) level and allow some portions of the older age class spruce to survive the current wave of mortality, but this result is unlikely.

Other foreseeable future activities within the project area include the Fox Creek Vegetation Management Project, which proposes to thin, salvage, and broadcast burn within dry mixed-conifer stands, as well as regenerate aspen stands within the same ecosystem. This project would not affect the spruce forest landscape. Another proposal would be the Trail Gulch project, which is in early planning stages and proposes similar treatments to the Fox Creek project. It would primarily affect the dry mixed-conifer stands of the Osier Mountain area, but would also seek to perform pre-commercial thinning of older spruce plantations on Osier Mountain and begin the process of converting non-native lodgepole pine plantations back to spruce-fir. These plantations were established in the 1960's, 70's, and 80's to reforest the 1879 Osier burn area, and stand-tending activities are needed.

Past silvicultural activities adjacent to the project on the north have been included in the environmental baseline. These include the Burro-Blowout Vegetation Management Project and the Burro Unit 15 Vegetation Management Project. Foreseeable future projects in the spruce forest landscape to the north could include approximately 1200 acres of salvage in the Race Creek drainage, approximately 3-4 miles north of the project boundary. Other salvage activities would be further away from CP District-wide, being west of the Del Norte Peak/Hogback Mesa area.

Adjacent foreseeable projects to the south and east include ongoing salvage logging on private property near the southwest corner of the project area. Rancho del Oso Pardo and inholdings are currently salvaging approximately 80 acres of dead spruce per year from their property, and this activity is expected to continue over the next five years. The same private landowners are also performing aspen regeneration cuts at lower elevations on approximately 5-50 acres per year; this activity is expected to continue throughout the life of the CP District-wide project. The Colorado State Forest Service is conducting a 50 acre spruce salvage harvest on Osier Mountain, and anticipates performing 140 acres of aspen regeneration cuts, 50 acres of spruce salvage, and 20 acres of ponderosa pine restoration near La Jara Reservoir, over the next 10 year period. No treatments within the spruce forest landscape are currently planned on the adjacent Carson National Forest lands.

Forest Health and Species Composition

When considering the current major disturbance agent on the spruce forest landscape (the spruce beetle), one underlying cause of widespread mortality is the relatively homogeneous stand structure found throughout project area and surrounding lands. A primary goal of forest management is to increase stand heterogeneity so that large-scale outbreaks are not prevalent in the future forests. The effects of management activity must be viewed in two lights: the effect of salvage on current forest condition, as well as the potential impact upon future forest condition. When combined with other known activities in the spruce forest landscape, neither action alternative is expected to affect any of the current forest condition with either a positive or negative net change. Forest health issues will continue until checked by beetle habitat loss, and resulting species composition will remain the same. The combined actions are, however, expected to improve forest conditions in the future by increasing heterogeneity in species composition within the landscape. This influence would also include the structural element of coarse woody debris but not age class diversity. There are no known efforts on either public or private lands to introduce new tree species into the landscape.

Forest Structural Diversity and Resiliency

Because of the close relationship and timing between ongoing disturbance process and the project, no notable impacts to vegetative structural stages across the landscape would be expected as a result of the combined activities. However, in addition to species composition mix, coarse woody debris distribution and loading within the treated areas (both salvage and hazardous fuels) is expected to be improved in the future stand condition. As a result, improved landscape resiliency to insect and plant pathogens and changes in climate pattern is expected. Alternative 2 is expected to have the greatest influence on the spruce forest landscape heterogeneity (up to 12% of the landscape affected) and most effectively address the disparity between existing conditions and Forest unit management objectives. Alternative 1 would have the least influence on heterogeneity and would not address the disparity between existing conditions and management objectives, while Alternative 3 is expected to affect up to 6% of the landscape. None of the combined actions are expected to result in impacts to the general presence and persistence of forest vegetation across the landscape.

Forest Products

Two aspects must be considered when evaluating the effects of management activities: the effect of salvage on current forest management goals, as well as the potential impact upon future forest goals. Both action alternatives would contribute toward providing a sustainable supply of forest product to timber industry in the present, as well as into the future. When added to other past, present and future sales, the proposed harvest activities would not affect annual Forest Plan Allowable Sale Quantity (ASQ) for softwoods. Per the National Forest Management Act (NFMA), salvage harvest does not have to count against the Forest ASQ. It can either be considered substitute volume or it can exceed the Plan volume. It is anticipated that salvage volume from this project would be substituted for ASQ volume, as consistent with similar salvage projects over the past 12 years.

When combined with other actions on the spruce forest landscape, Alternative 2 is expected to provide the greatest contribution of forest resources. No activities associated with either alternative would affect the quantity nor type of forest product offered from other state, federal, or private lands. As assessed in the direct and indirect effects, forest products not salvaged under this project would be acquired by the public from other sources or Forest Service projects. Removing these areas from harvest consideration (Alternative 1) would greatly limit the district's ability to provide forest products into the next 10 years, as the majority of our timber base is within the spruce forest landscape. Unless specific salvage areas were reconsidered under new analysis, Conejos Peak would only be able to offer approximately 5,250 Ccf of forest products through firewood permits and the Fox Creek project over the next two years, until new NEPA analysis could be completed for the Trail Gulch project area.

3.3 Biodiversity

Scope of Analysis

The scope of the analysis for biological diversity is the federally managed, upland forested stands in the Conejos Peak District-wide Salvage project area focusing on snags, coarse woody debris, old growth, and aspen as a biodiversity species. More emphasis is place on the Engelmann spruce/subalpine fir (spruce/fir) forest type that would be effected by proposed activities. Other proposed activities such as road maintenance or reconstruction that would have minimal impact on biodiversity are addressed in other sections. Effects on forest biodiversity are considered for the no action alternative and action alternatives.

Desired Conditions

Forest-wide desired conditions (FP pg. 1-1) state: habitat composition (including seral stage), structure, pattern (including connection), and disturbance frequencies similar to those that result from natural

disturbances (insects, diseases, and fire) are maintained to the extent possible, given legal and policy limitations, and the desired condition for the area.

Resource Indicators and Measures

Resource indicators were used to measure change from existing conditions for each of the alternatives. For biodiversity, the indicators used in this analysis follow those described in the Forest Plan Standards and Guidelines (Forest Plan as amended 1996, III-12 to III-14), to the extent permitted by available data.

Table 13. Forest Plan standards and guidelines used as resource indicators and measures for biodiversity.

Resource Element	Resource Indicator(s)	Measure and Desired Conditions	Forest Plan
Snags	Snags/acre	Spruce-fir – 2/acre greater than 12 inches diameter Lodgepole pine – 2/acre greater than 10 inches diameter Aspen – 2/acre greater than 12 inches diameter Douglas-fir/mixed conifer – 2/acre greater than 12 inches diameter Ponderosa pine – 3/acre greater than 14 inches diameter	Standard
Coarse Woody Debris (CWD) greater than 3 inches diameter	Tons/acre by diameter class	Spruce-fir – 10 to 15 tons/acre Lodgepole pine – 5 to 10 tons/acre Aspen –3 to 5 tons/acre Douglas-fir/mixed conifer – 5 to 10 tons/acre Ponderosa pine – 4 to 9 tons/acre	Standard
Old Growth Inventory/ Retention	Number of large diameter trees/acre by forest type	Number of live trees/acre greater than 16 inches diameter for ponderosa pine, Douglas-fir, and Engelmann spruce; 14 inches for lodgepole pine and aspen	Standard/ Guideline
Aspen Maintenance on the Landscape	Acres	Acres dominated by aspen in the analysis area	Guideline

Methodology, information sources, and analysis process

Biodiversity in forested stands for the project area landscape were evaluated using FSVeg field sampled data and outputs from the FSVeg Spatial Data Analyzer. See the Silviculture Report for additional description of this data and the model.

For this analysis, the FSVeg Data Analyzer (DA) calculated *Forest Type* designations were used to describe biodiversity resources and evaluate changes from 2017 (existing conditions) through 2066 for the action alternatives and no action. Acres of the calculated *Forest Type* for 2016 (pre-spruce beetle) were compared to the acres of each *Local Type* used in the Forest corporate data layer with the following results:

- Non-forest acres – 1.7 percent less than combined Local types;
- Pinyon-juniper – DA did not classify this type, likely due to lack of field sampled data and few acres in the analysis area (410 Local type acres); this forest type is not included in this analysis;
- Ponderosa pine – 12.5 percent less than the Local type;
- Douglas-fir/mixed conifer (combined with white fir & blue spruce to reflect Local Type classification) – 3.9 percent more than Local type;
- Lodgepole pine – 6.5 percent less than Local type;

- Limber and bristlecone pines (combined to reflect Local Type classification) – 49.5 percent less than Local type (1,430 Local type acres); difference in acres likely due to lack of field sampled data in this Local type as well as the small number of acres;
- Spruce/fir (combined Engelmann Spruce, Engelmann Spruce/Subalpine Fir, and Spruce/subalpine fir Forest Types to reflect Local type) – 9.3 percent more acres than Local type;
- Aspen – 18.8 percent less than Local types;
- Non-stocked Forest Type – 448.3 acres – not reflected in Local type.

Since this analysis is focused primarily on the spruce/fir forest type, the greater than 90 percent consistency with the local type acres was considered adequate to assess and describe the effects of the alternatives.

Existing Conditions

Snags

Due to the recent high levels of insect and disease activity across the analysis area, larger diameter snags (10 to 12+ inches diameter at breast height (dbh)) are relatively abundant in most upland forested vegetation types. Based on the data used for this analysis, snags12+ inches dbh range from 0 to over 293 per acre with a landscape average of about 26 per forested acre. As shown in the Table 14 below, on average the most snags per acre are found in the spruce beetle affected Engelmann spruce/subalpine fir (spruce/fir) forest type. Firewood cutting is reducing the number of snags in the vicinity of open roads in areas with gentle slopes, but snags are generally common across the landscape and in most major forest types.

Table 14. Average and maximum numbers of snags per acre by forest type in 2017.

Forest type	average snags/acre 10+ inches	average snags/acre 12+ inches	range of snags/acre 12+ inches
Ponderosa pine	1.5	0.7	0 to 2.6
Douglas-fir/mixed conifer	7.3	4.6	0 to 43.5
Lodgepole pine	0.5	0.2	0 to 6.5
Bristlecone/limber pine	55.4	6.0	0 to 120
Aspen	38.1	25.2	0 to 144.5
Spruce/fir	104.8	77.3	0 to 293.1
Averages – all forest types	**36.5**	**26.3**	-----

Coarse Woody Debris (CWD)

Very little field sampled data has been collected on current levels of CWD (surface woody material greater than 3 inches diameter) across the landscape. Based on limited observations, conditions are variable across the analysis area for a variety of reasons. For stands close to open roads, cutting dead trees for firewood limits the accumulation of larger CWD. Away from open roads conditions, are more variable depending on the age, trees per acre, and disturbance history of the stand. Coarse woody debris can be increased or decreased over time by wind, fires, insects, diseases, thinning, or timber harvest.

To compare alternatives for this analysis, fuel loading by diameter class data generated by the Fire and Fuels Extension model to the Forest Vegetation Simulator (FFE-FVS) was used. The fuels sub-model dynamically tracks changes in aboveground woody biomass resulting from litter fall, tree breakage, snag fall, and timber harvest with initial fuel levels based on forest type, canopy cover, and other variables. These values are updated at each modelled cycle to account for activities and decay rates (USDA Forest Service 2015).

As shown in Table 15, most forest types likely meet the minimum tons per acre set in the Forest Plan Standards, though the size diversity of down material may be limited in some areas, especially the larger diameter down woody pieces that are most valuable for wildlife and as microsites for vegetation establishment.

Table 15. Average and total tons per acre of coarse woody debris by diameter class and forest type, 2017.

Forest type	Average fuel loading/tons per acre 3 to 6 inches	Average fuel loading/tons per acre 6 to 12 inches	Average fuel loading/tons per acre 12+ inches	Total tons/acre	Desired tons/acre
Ponderosa pine	1.51	1.50	0.38	3.39	4 to 9
Douglas-fir/mixed conifer	6.54	7.11	0.44	14.09	5 to 10
Lodgepole pine	5.99	6.82	0	12.81	5 to 10
Bristlecone/limber pine	7.53	8.46	0.1	16.09	NA
Aspen	9.62	8.51	0.32	18.45	3 to 5
spruce/fir	9.02	9.57	0.62	19.21	10 to 15

Old Growth

Old-growth or old-forest stands are unique ecosystems that occur in the later stages of stand development. As stands approach the old-forest stage, they develop a diversity of functions and interactions that do not exist in earlier stages. The Forest Plan references a paper by Mehl Mehl (1992) as a basis for evaluating the old growth stand characteristics for major forest types in Region 2. This paper identified a variety of stand structural characteristics, tree ages, and other attributes that would indicate a stand is providing old growth/late successional habitat values for the forest type.

Many of the desired characteristics or indicators for old growth stands such as tree age, decadence, and crown or bark characteristics need to be evaluated with field surveys. For this analysis, the potential for old growth forests was based on the average number of larger diameter (16 inches dbh for all forest types, except 14 inches aspen and lodgepole pine) trees likely present, based on the available data. There were no characteristics identified in the Mehl publication for bristlecone or limber pine, so these forest types are not included in this section.

The number of larger, older trees have been reduced in several forest types by some of the past forest management prescriptions (clearcuts, shelterwood preparation cuts primarily in spruce/fir forest type), large wildfires in the late 1800s (Douglas-fir/mixed conifer; spruce-fir), and most recently the widespread spruce beetle outbreak, and increases in other bark beetle activity levels following the regional drought in the early 2000s.

As indicated in the Table 16, considering the average number of large trees per acre across the landscape in context of the Mehl old growth criteria, there are likely ponderosa pine, Douglas-fir, and aspen stands that may have the potential to be evaluated for old growth characteristics, including the presence of old trees, decadence, and other features. Lodgepole pine is not native to this analysis area. It was planted following various wildfires and may not reach the age or develop the other attributes needed for old growth evaluation. Since mature Engelmann spruce has been greatly impacted by the spruce beetle outbreak, it is unlikely that any Engelmann spruce dominated stands would retain old growth potential, though transition stands with substantial mixes of other focus species may have some potential.

Table 16. Average numbers and ranges in values of large trees per acre by major forest species, 2017.

Forest type major species	average trees per acre greater than 16 inches dbh	range of large trees per acre	Desired number large trees per acre
Ponderosa pine	17.9	1.1 to 38.6	10
Douglas-fir/mixed conifer	22.6	0 to 73.0	10
Lodgepole pine (14 inches)	0.4	0 to 5.3	10
Aspen (14 inches)	22.5	0 to 65.7	20
Spruce/fir	1.5	0 to 27.9	10

Aspen

Aspen is a seral stage of many forest types across the analysis area and it remains a persistent component of many conifer stands throughout their development. The largest, most productive aspen clones are found in the spruce/fir and cool moist Douglas-fir/mixed conifer forest types from about 8,500 to 12,000 feet in elevation. Aspen can also be found in drier forest types in favorable microsites or in scattered patches, at much lower densities.

The spruce beetle outbreak has resulted in a complex shift in species dominance in heavily impacted stands. The mortality of Engelmann spruce has resulted in an increase in aspen dominance on approximately 26 percent in these acres, as shown in Table 17.

Table 17. Change in acres dominated by aspen due to spruce mortality 2016 and 2017.

Forest type	2016 (pre-spruce beetle)	2017 (post spruce beetle)	Percent change
Aspen dominated acres	44,175	59,936	+26%

Direct and Indirect Effects

Alternative 1 – No Action

Alternative 1 represents the continuation of current forest management activities, including any activities approved under prior NEPA decisions.

Snags

As indicated in Table 18, under this alternative, away from open roads accessible to firewood cutting, larger snags would continue to be relatively common in most forest types due primarily to insect or disease activity with the highest numbers in the spruce/fir dominated stands.

Over time, snags will fall and move into the coarse woody debris pool. As shown below, based on the stand data used for this analysis, average numbers of snags greater than 12 inches diameter would decline from the current analysis area average of over 26 trees per forested acre to an average of about 10 per acre by 2036 and to an average by 5.7 per acre in 2066, though acres with greater numbers of snags would still be present as indicated by the average maximum snags per acre values.

Table 18. Average and average maximum snags per acre greater than 12 inches diameter for 2017, 2036, 2066, Alternative 1.

Forest type	2017- average snags/acre	2036 – average snags/acre	2036 - maximum snags/acre	2066 – average snags/acre	2066 - maximum snags/acre
Ponderosa pine	0.7	0.9	5.3	1.7	10.0
Douglas-fir/mixed conifer	4.6	2.6	6.4	14.1	22.9
Lodgepole pine	0.2	0.2	2.0	2.7	17.2
Bristlecone/limber pine	6.0	19.1	30.1	9.4	14.7
Aspen	25.2	10.6	44.3	11.8	38.4
Spruce/fir	77.3	31.2	82.1	11.2	38.7
Average all forest types	**26.3**	**10.0**	**95.0**	**5.7**	**45.1**

Under this alternative, it is likely that the minimum Forest Plan standards for desired snag densities would be met for the next several decades.

Coarse Woody Debris (CWD)

Under this alternative, the greatest change factor in coarse woody debris levels (CWD) over time would be due to snag deterioration, breakage, and the eventual fall of these trees, especially in spruce beetle mortality areas. Though the fuel loading data used in the table below are modelled values based on forest type, they do indicate the general pattern of snag deterioration and eventual accumulation as coarse woody debris (CWD).

For example, in the spruce-fir forest type, by 2036 average CWD would increase by approximately 12 percent in the 3 to 6 inch diameter class, 50 percent in the 6 to 12 inch diameter class and 94 percent in the12+ inch diameter class, compared to existing conditions in 2017. However by 2066, the levels begin to decline in the smaller classes due to decay processes, but continue to increase in the 12+ inch diameter classes, reflecting the slow rate of snag fall of the larger snags.

Table 19. Average tons per acre of CWD by size class and forest type in 2036 and 2066, alternative 1.

Forest type	Average fuel loading/tons per acre 3 to 6 inches		Average fuel loading/tons per acre 6 to 12 inches		Average fuel loading/tons per acre 12+ inches	
	2036	2066	2036	2066	2036	2066
Ponderosa pine	1.29	1.57	1.27	1.41	0.55	0.75
Douglas-fir/mixed conifer	6.00	8.06	7.25	14.16	1.00	2.08
Lodgepole pine	5.87	5.63	7.17	8.11	0.02	0.17
Bristlecone/limber pine	7.22	6.49	14.71	11.70	4.61	3.81
Aspen	12.55	17.16	14.46	19.25	3.62	6.65
Spruce/fir	10.96	9.47	21.16	19.92	9.88	12.55

As indicated in Table 19, most forest types would likely continue to meet or exceed the minimum tons per acre set in the Forest Plan standards for CWD retention over time. Values for the ponderosa pine forest type may be less than desired in some areas, but these numbers may not accurately reflect actual conditions, due to the relative small acreage and less field sampled data for this forest type.

Old Growth

As indicated in Table 20 below, considering just the average number and range of values for larger trees per acre across the landscape, potential for old growth characteristics will likely continue to be present in ponderosa pine, Douglas-fir, and aspen forest types.

Most Engelmann spruce dominated stands would not likely not begin to redevelop old growth characteristics for 100 to 200 years, depending on current stand conditions. Stands with smaller understory spruce that have not been killed by the spruce beetle or that have other species present, would redevelop complex stand conditions more rapidly than single-storied stands that were dominated only by spruce.

Table 20. Potential for old growth characteristics in major forest types for 2036 and 2066, alternative 1.

Forest type	average trees per acre greater than 16 inches dbh		ranges of larger trees per acre	
	2036	2066	2036	2066
Ponderosa pine	14.0	17.9	1 to 40.7	3 to 45.7
Douglas-fir/mixed conifer	30.0	33.6	4.0 to 80.9	13.2 to 99.2
Lodgepole pine (14 inches)	4.1	37.0	0 to 47.4	0 to 165.1
Aspen (14 inches)	44.6	75.0	0 to 112.5	0 to 145.2
Spruce/fir	8.1	16.4	0 to 49.8	0 to 61.6

Aspen

As shown in Table 21 below, aspen would continue to dominate a large portion of the landscape over the next several decades. From 2017 to 2066 there would be approximately a 17 percent increase in acres dominated by aspen due to shifts in species dominance primarily caused by the loss of mature live Engelmann spruce trees due to spruce beetles.

Table 21. Acres dominated by aspen in 2016 through 2066, alternative 1.

Forest type	2016 (pre-spruce beetle)	2017 (post spruce beetle)	2036	2066
Aspen dominated acres	44,175	59,936	70,910	72,285

Alternative 2 – Proposed Action

Since proposed activities for this project are focused on salvaging spruce beetle killed trees, the effects of this alternative on biodiversity resources will only include the spruce-fir forest type that would be primarily affected by proposed activities.

There may be minor amounts of hazardous fuels thinning adjacent to private lands or infrastructure in the Douglas-fir/mixed conifer or aspen forest types, but these activities would have minimal effects to biodiversity resources in these forest types, since they would occur on relatively small acreages. Therefore, direct and indirect effects to the majority of the Douglas-fir/mixed conifer, aspen, ponderosa pine, lodgepole pine, limber pine, or bristlecone pine forest types would be the same as Alternative 1- No Action. Effects to aspen are described in the context of its presence and changes in dominance across the landscape over time for each action alternative.

Implementation of salvage harvest activities for Alternative 2 could affect up to approximately 14.5 percent of the spruce-fir forest in the analysis area, based on the local type acreages. Effects on the remaining 85.5 percent of the spruce fir forest type would be the same as Alternative 1.

Snags

Under this alternative, the number of large, sound snags would be reduced in salvage harvested stands on up to 17,000 acres. To meet Forest Plan snag retention standards or to meet other resource objectives, at least minimum numbers of large snags would be left within harvest units. Hazardous fuels treatments may also reduce the number of large snags near infrastructure or private structures in order to meet objectives to modify fire behavior, though these activities would occur at a much smaller scale.

Outside of salvage harvested areas for this alternative, snags will continue to be abundant as described under Alternative 1.

As shown in Table 22, following salvage harvest, the average number of larger snags will be reduced in this forest type from current conditions (2017), but snag numbers across the landscape would continue to exceed minimum Forest Plan standards for spruce-fir over the next several decades.

Table 22. Average snags per acre greater than 12 inches diameter (range of values) for 2017, 2036, 2066, alternative 2.

Forest type	2017 Average snags/acre (range)	2036 Average snags/acre (range)	2066 Average snags/acre (range)
Engelmann spruce/subalpine fir	77.3 (0 to 293.1)	25.7 (0 to 95.0)	10.1 (0 to 45.1)

In salvage harvested units, snag numbers will decline over time as retained trees fall with the larger snags generally remaining standing longer than smaller snags.

Coarse Woody Debris

Timber salvage activities affect the levels of coarse woody debris (CWD) primarily by removing a portion of the larger merchantable snags that would contribute to the future down woody material. Slash treatments may also affect CWD. If lop and scatter is used, CWD would be increased over modelled levels. Recently, most salvage operations have included whole tree skidding to the landing areas for later burning, which removes most of the larger portions of snags from harvest units. Existing CWD may also be affected during timber harvest operations by being crushed or moved, but would remain on site. Dead trees less than merchantable size, other tree species present, and any snags left to meet other resource needs would eventually become CWD over time.

Forest Plan standards for minimum amounts of CWD retention would be required to be met in all harvested units.

Hazardous fuel treatments would also be expected to reduce CWD amounts in order to meet desired fuel loading objectives, but since these activities are proposed on a relatively small portion of the project area, there would be minimal effects to overall levels of CWD.

As indicated by modelled data for in Table 23, though the size class of material on the ground may vary through time, the spruce-fir forest type would retain large amounts of CWD. In the spruce-fir forest type, by 2036 CWD increases by 13 percent in the 3 to 6 inch size class, 49 percent in the 6 to 12 inch size class and 93 percent in the12+ inch size class, compared to existing conditions in 2017. However by 2066, the levels begin to decline to some extent in the less than 12 inch classes, but continue to increase in the 12+ inch size classes. Under this alternative, average 12+ CWD levels increase from 2036 to 2066 by 26 percent.

Table 23. Average tons CWD per acre by diameter class (range of values) for 2017, 2036, 2066 in the spruce/fir forest type, alternative 2.

Forest type – spruce-fir	2017 Average tons/acre (range)	2036 Average tons/acre (range)	2066 Average tons/acre (range)
3 to 6 inches diameter	9.02 (8.3 to 9.52)	10.38 (9.22 to 11.98)	9.08 (7.95 to 11.25)
6 to 12 inches diameter	9.57 (9.19 to 9.84)	18.92 (17.04 to 21.43)	18.18 (14.91 to 22.71)
12+ inches diameter	0.62 (0.42 to 0.94)	8.38 (5.93 to 10.06)	11.29 (8.04 to 14.83)
Total average tons/acre	**19.21**	**37.68**	**38.55**

Old Growth

This alternative would be the same as Alternative 1 regarding the long timeframes for the redevelopment of old growth characteristics in Engelmann spruce dominated stands across the landscape. Since old growth characteristics need 100 to 200 years to develop, it is unlikely salvage harvest would have a measurable effect due to the large number of variables that would likely to occur over this long time period. As indicated in Table 24, over the next fifty years the average number of larger trees per acre will increase across the landscape, but the development of decadence, structural complexity, and other old growth characteristics will need longer periods of time. Therefore, this alternative would be expected to have no direct or indirect effects on the development of future old growth characteristics in salvaged units.

Table 24. Trees per acre greater than 16 inches diameter, spruce-fir stands for 2017, 2036, 2066, alternative 2.

Forest type – Spruce/fir	2017	2036	2066
Average all trees per acre > 16 inches dbh	1.5	8.3	16.5
Range of values, all trees per acre >16 inches dbh	0 to 27.9	0 to 49.8	0 to 74.0

Aspen

Under this alternative from 2017 to 2066 there would be approximately a 17 percent increase in acres dominated by aspen across the analysis area, which is the same as Alternative 1, No Action. On salvaged acres, there may be minor increases in the density of aspen suckering due to ground disturbance and increases in sunlight to the forest floor, but changes in aspen dominance are primarily due to the loss of the mature Engelmann spruce from the spruce beetle outbreak. Implementation of Alternative 2 would be expected to have limited or no direct or indirect effects to the presence and extent of aspen across the landscape.

Alternative 3 – Vegetation Management – Limited Action

As with Alternative 2, since proposed activities for this project are focused on salvaging spruce beetle killed trees, the effects of this alternative on biodiversity resources will only include the spruce-fir forest type that would be primarily affected by proposed activities. Any hazardous fuels thinning treatments would have minimal effects to other forest types, since they would occur on small acreages. Effects to other forest types

would be the same as alternative 1. Effects to aspen are described in the context of its presence and changes in dominance across the landscape over time.

Implementation of salvage harvest activities for Alternative 3 could affect up to approximately 7.2 percent of the spruce-fir forest in the analysis area, based on the local type acreages. Effects on the remaining 92.8 percent of the spruce fir forest type would be the same as Alternative 1.

Snags

Under this alternative, the number of large, sound snags would be reduced in salvage harvested stands on up to 8,500 acres, which is approximately 50 percent fewer acres than Alternative 2. To meet Forest Plan snag retention standards or to meet other resource objectives, at least minimum numbers of large snags would be left within any salvage harvest unit.

Outside of proposed salvage harvested areas for this alternative, snags would continue to be relatively abundant in the spruce/fir forest type and the ranges of average snag numbers per acre across the landscape would be similar to Alternative 2 following completion of salvage operations (0 to 95 per acre). In 2036, this alternative could result in about an average of 10 percent more larger snags per acre (an average of 29 snags vs. 26) across the spruce/fir forest type compared to alternative 2, due to fewer acres being harvested. However by 2066, average snag numbers would be similar to alternative 2, as the additional snags fall over time.

As with Alternatives 1 and 2, implementation of this alternative would meet or exceed the minimum average snag retention standards specified in the Forest Plan, at the landscape scale, over the long term.

Coarse Woody Debris

Alternative 3 would result in somewhat higher average levels of CWD in the spruce/fir forest type compared to Alternative 2, due to fewer acres being salvage harvested. As with Alternative 2, Forest Plan standards for minimum amounts of CWD retention would be required to be met in all salvage harvested units.

Compared to Alternative 2, in 2036 average CWD amounts would be about 2 percent higher in the 3 to 6 inch diameter class, 7 percent higher in the 6 to 12 inch diameter class and 10 percent higher in the 12+ inch diameter class. However by 2066, the differences begin to decrease to less than 1 percent additional for the total average CWD in the long term, reflecting the snag fall and wood debris decay processes.

Implementation of Alternative 3 would also meet or exceed Forest Plan retention requirements for CWD across the spruce-fir forest type over the short and long term.

Old Growth

Alternative 3 would be similar to Alternatives 1 and 2 regarding the 100 to 200 year timeframes for the redevelopment of old growth characteristics in Engelmann spruce dominated stands across the landscape.

As with Alternative 2, over the next fifty years the number of large trees per acre will continue to increase at similar rates, but the development of decadence, structural complexity, and other old growth characteristics will need longer periods of time. Therefore, this alternative would also be expected to have no direct or indirect effects on the development of future old growth characteristics in salvaged units.

Aspen

Implementation of Alternative 3 may result in somewhat less density of aspen across the landscape over the long-term compared to Alternative 2, due to less ground disturbance, but any difference would likely be unmeasurable across the spruce/fir forest type in the analysis area. As with Alternative 2, implementation of Alternative 3 would have no measurable direct or indirect effects on aspen across the landscape.

Comparison of Alternatives

Table 25 shows the comparison of the biodiversity resources in the spruce/fir forest type generated from the FVS outputs for 2036 which is the modelled year when all salvage and hazardous fuels implementation activities have been completed for the action alternatives.

Though limited amounts of hazardous fuels reduction treatments may occur in other forest types, since the scope of the activities is very small, there would be no direct and indirect effects to the biodiversity resources in the Douglas-fir/mixed conifer, aspen, ponderosa pine, lodgepole pine, limber pine, or bristlecone pine forest types under any alternative.

In the spruce/fir forest type, as indicated by the FVS data outputs, Alternative 1 would, on average, retain more large snags and coarse woody debris (CWD) per acre than Alternatives 2 and 3. None of the alternatives would likely measurably effect the potential for the future development of old growth in the spruce/fir forest type, since this process may take 100 to 200 years depending on the post-spruce beetle stand composition. There would likely be no measureable difference in effects between the alternatives on the acres of aspen on the landscape. The approximately 26 percent increase in aspen dominated acres has resulted from to the mortality of the mature Engelmann spruce which was incorporated into the existing condition description for 2017.

Table 25. Comparison of alternatives, biodiversity resources in the spruce/fir forest type in 2036.

Alternative	Average number of snags/acre greater than 12 inches	Total average tons/acre CWD	Potential for future old growth	Aspen acres
Alternative 1 – No Action	31.1	42.00	No effect	70,910
Alternative 2 – Proposed Action	25.7	37.68	No effect	70,399
Alternative 3	29.0	40.26	No effect	70,896

All alternatives would meet Forest Plan standards for biodiversity resources since salvage activities must provide for the effective retention of snags and CWD during implementation.

Cumulative Effects

Past, present, and reasonably foreseeable activities were considered for the forested lands within and adjacent to the analysis area boundary for cumulative effects over the next ten to fifteen years. Activities considered include livestock grazing, recreation use, timber harvest, prescribed burning, and firewood collection. Activities on private lands could include road construction, timber harvests, hazard tree removal, or home construction.

There would be no measurable direct or indirect effects to the extent of aspen dominated acres across the landscape or the rate of re-development of old growth characteristics in the spruce/fir from the action alternatives. Prescribed burning in other forest types may increase aspen acres to some level.

Past and current timber management activities have been incorporated into the existing condition for the number of large snags per acre and amounts of coarse woody debris. There are no other reasonably foreseeable vegetation management activities in the spruce/fir forest type, if an action alternative is implemented. Other vegetation management activities, in addition to those listed, may be proposed in other forest types, but are not identified at this time.

Firewood cutting is the activity that can have a direct effect on snag numbers and an indirect effect on coarse woody debris. In this analysis area, it is assumed that firewood cutting will continue in accessible areas along open roads, which could incrementally reduce the numbers of large snags and future large coarse woody debris (CWD) in these areas, especially if firewood cutting areas overlap salvage harvest units. It is also likely that snags and future CWD would be reduced on private lands, especially if structures are present, due to the hazard or risk of damage from falling trees. Across the landscape, this would likely be a minor cumulative effect, but there could be measurable reductions in local areas.

3.4 Wildlife

Scope of Analysis

This section discusses the potential influences of the proposed actions on the Rio Grande National Forest's Sensitive Species (S), Management Indicator Species (MIS) and Migratory Birds including local Birds of Conservation Concern consistent with the 2670 Manual, R2 Supplement August 23, 2016, Rio Grande Land and Resource Management Plan (1996), and the Migratory Bird Treaty Act. A summary of the Biological Assessment (BA) evaluating the projects potential impacts upon Threatened and Endangered Species (T&E) consistent with the Endangered Species Act (ESA) is included here. The complete BA and Wildlife Report is available in the project file.

The spatial analysis area varies by species and reflects the area within which the species could be directly or indirectly affected by the action (see 'action area' 50 CFR 402.2). For the purpose of this ESA analysis there are two spatial scales: treatment areas and LAUs (Lynx Analysis Units). The treatment area is defined as the spatial bounds in which treatments are proposed (i.e. unit boundaries). Treatment areas are used to describe and quantify project effects to habitat. Broad analyses such as these are based on estimates of treatment areas in Geographic Information Systems (GIS) and thus, may not be completely accurate to the stand level. The LAU is used to describe the effects to Canada lynx and are intended to reflect an average female lynx home range in size and landscape. LAUs serve as baseline landscape units from which long-term trends in lynx habitat condition and change can be tracked. Potential effects to lynx will be determined based on the impacts to habitat within the treatment area relative to the LAUs associated with this project. The project does not overlap a lynx linkage area. For other species, given the programmatic nature of this project, the analysis consists of the treatment areas and a relevant scale for species viability across the Forest. Site specific analyses are conducted at the time of implementation through implementation checklists contained herein and within the Wildlife Report.

Temporal bounding for the analysis is both short-term and long-term. Short-term consists of the time required for project implementation and the time in which vegetation begins to respond to treatments (usually within ten years of project implementation). Long-term extends to as much as 100 years into the future (canopy establishment).

Existing Conditions

The current condition of the spruce forest analyzed for this project is a result of the combined past management actions and the spruce beetle outbreak. Current stand conditions are summarized in Section 3.2 and described in detail in the Silviculture/Forest Products Report. Past timber management treatments within the CP District-wide Salvage Project area are listed in Appendix I.

Threatened, Endangered, Proposed and Candidate Species

A list of threatened, endangered, proposed, and candidate species was requested for this project (IPaC: 06E24000-2017-SLI-0889). No designated critical habitat occurs in the project area for any species. Fish species will be considered in the fisheries report. Those species with no habitat present are not evaluated further in this document.

Table 26. Threatened (T), Endangered (E), and Proposed (P) species list and habitat descriptions.

Species List	Suitable Habitat within Project Area/Project Site	Species documented within or near Project Area/ Project Site	General Habitat Description
Canada lynx (T) *Lynx canadensis*	Yes	Yes, multiple years of detections and evidence of reproduction in the project area	Primary habitat consists of various age classes of spruce-fir and spruce-fir/aspen. High-quality habitat consists of late-successional, multi-storied conifer stands with dense cover underneath. Secondary habitat consists of cool moist mixed-conifer stands, aspen and riparian-willow.
Mexican spotted owl (T) *Strix occidentalis lucida*	No	No Habitat	Steep canyons with adequate caves and ledges that provide nesting sites, often in association with late-successional Douglas-fir, white fir, ponderosa pine/pinyon-juniper components in the canyon bottoms for roosting.
Southwestern willow flycatcher (E) *Empidonax trailii extimus*	No	No Habitat	Riparian habitats along rivers, streams or other wetlands, where dense growths of willows or other shrub and medium sized trees are present, often with a scattered overstory of cottonwood. Primarily occurs below 8500’ in the SLV.
Uncompahgre fritillary butterfly (E) *Boloria acrocnema*	No	No Habitat	Alpine habitat above 11,000 with a snow willow component. Sites are generally found on north, northeast and east aspects.
Gunnison sage-grouse (T) *Centrocercus minimus*	No	No Habitat	Primary habitat associated with sagebrush – dominated plant communities. Lek sites important to reproduction and characterized by openings and sparse vegetation within sagebrush dominated plant communities usually below 9200' elevation. Brood rearing habitat characterized by riparian vegetation of intermittent and perennial streams, springs, seeps and meadows within upland vegetation communities. Only population in the SLV occurs near Poncha Pass.
New Mexico meadow jumping mouse (E) *Zapus hudsonius luteus*	No	No Habitat	Primarily associated with tall grass and sedge component in riparian areas along perennial streams; elevation limit suspected to be about 9000 feet locally.
North American Wolverine (P) *Gulo gulo luscus*	Yes	No, other than a dispersing individual from Wyoming, not known to occur in Colorado.	Primarily associated with remote subalpine and alpine habitats, utilizes large rock talus areas for denning; may utilize spruce-fir forested areas. Marmots and carrion possible key food resources locally. Utilizes a wide range of upper montane habitat types as it is very mobile.
Yellow-Billed Cuckoo (T) *Coccyzus americanus*	No	No Habitat	Valley lowland species locally; primarily associated with deciduous riparian woodland with a well-developed understory; nests in cottonwood and willow riparian woodland.

The pre-field reviews indicated, and field surveys verified, that there is either no habitat present in the proposed treatment areas or the species isn’t present in the project area for the following terrestrial species: Mexican spotted owl, Southwestern willow flycatcher, Uncompahgre fritillary butterfly, New Mexico

meadow jumping mouse, yellow-billed cuckoo, or the Gunnison sage grouse. The project, as proposed, will therefore have *"no effect"* on these species and they are evaluated no further in this document.

There are no known occurrences of wolverine on the RGNF and there is an exceptionally low probability of a wolverine population occurring in the state and much less in the project area. Therefore, the effects of this project to wolverine are considered negligible and will not be considered further in this document.

Canada lynx is the only T&E Species which has suitable habitat and is known to utilize portions of the project area. As a result, it is the only T&E species further evaluated in this document.

Environmental Baseline for Canada Lynx

The lynx is a highly specialized predator, adapted to prey on snowshoe hares. Lynx inhabit coniferous forests in the spruce-fir zone that experience cold, snow winters and provide a snowshoe hare prey base. Throughout North America, the distribution of lynx is closely tied to habitats that support an abundant population of snowshoe hare. The Southern Rocky Mountains are at the southern margin of the range of lynx. Historically, there was a record of lynx presence in the Southern Rockies. However, after conducting statewide surveys beginning in 1978, the Colorado Division of Wildlife concluded that the resident population was extremely small, and probably too small to be self-sustaining. In 1999, the Colorado Division of Wildlife initiated a reintroduction project to augment the population (Shenk 2006). To date, 218 lynx have been released into southern Colorado, primarily on the RGNF (85%), and at least 103 kittens have been born in the wild soon after reintroductions (Shenk 2007). Recent efforts have also confirmed successful breeding via tracked individuals and camera traps on the Forest. While success of the reintroduction effort looks promising, whether the lynx population in Colorado will become self-sustaining is still unknown (Colorado Division of Wildlife 2010). The extensive habitat change associated with the recent spruce beetle outbreak adds additional uncertainty to maintaining and managing habitat to support viable populations of lynx and other species that are closely associated with the spruce-fir ecosystem type.

Canada lynx habitat in Colorado primarily occurs in the subalpine and upper montane forest zones, typically between 8,000 and 12,000 feet in elevation. Forests in these zones typically contain deep winter snows and are dominated by subalpine fir, Engelmann spruce, and lodgepole pine although several mixed-conifer species may occur at lower elevations. A preference for these forest types, particularly spruce-fir associations, has been documented by radio-telemetry and tracking techniques associated with lynx reintroduced to Colorado (Shenk 2006). Other habitats used by reintroduced lynx include spruce-fir/aspen associations and various riparian and riparian-associated areas dominated by dense willow. While some lynx established home ranges in other parts of the state, the majority remain in southwestern Colorado.

Canada lynx have been documented within the project area to varying degrees, however survey efforts have not been rigorous enough to rule out presence in any particular area and thus we consider the entire project area occupied. Recent efforts in collaboration with CPW have documented increasing lynx use from the south to the northern portion of the district within the spruce-fir zone. Use diminishes in the eastern portion of the project area based on an elevational gradient associated with lower quality mixed-conifer and ponderosa pine habitats. Telemetry data from the reintroduction has shown core population areas within the project area and breeding has been documented recently in the Lake Fork and Saddle Creek drainages in the northern end of the district. This part of the Forest has more green trees remaining than other areas on the District and Forest as a whole, although beetles are continuing to impact the overstory.

Research is currently being conducted on the RGNF in collaboration with Rocky Mountain Research Station (RMRS) Science Application and Integration staff and CPW to aid in determining lynx use of beetle-killed spruce-fir forests. The study includes two individuals in the lake fork and saddle creek drainages on the district. The results are still preliminary, however one individual lynx made extensive use of the area and have ranged as far (to date) as Hilman Park and south fork Conejos.

At the southern end of the district, lynx have been observed on camera in the elk creek and red lake drainages, with several tracks in the past few years observed further south towards Trujillo reservoir and Cumbres Pass. This is likely a north-south movement zone into New Mexico as shown in (Theobald and Shenk 2011). Habitat conditions at the southern end of the District are generally poor, with >90% mortality in the overstory and minimal advanced regeneration in the understory. This area has been the focus of timber management the past decade; however, survey efforts have not been extensive.

Lynx Habitat Conditions Within Project Area

Methodology

To provide the best available environmental baseline for each LAU affected by the Conejos Peak District-wide Salvage Project, an estimation of the post-beetle habitat conditions was required. A process was developed to assist in providing the estimate and emphasizes field-verification of habitat suitability where feasible and then estimating conditions within the forest matrix by professional judgement, taking into account common stand exam (CSE) data, aerial photos, and other data to evaluate the habitat suitability for the remaining acres within each LAU.

Results from ongoing research on the Forest was also incorporated into assessing habitat conditions Forest-wide. While results are still preliminary, lynx are utilizing remnant large green trees, high stem densities (live and dead, particularly larger sizes), increased canopy closure (live and dead), high horizontal cover, and higher snowshoe hare densities.

Field surveys completed by wildlife biologists and experienced wildlife technicians helped determine the relative quality of lynx habitat. Following field review, forested stands within the area have been roughly classified into four different categories described below and in Appendix F. Field-verified stands were incorporated into the baseline and were used as reference stands for comparison, using CSE data, aerial photos, and Data Analyzer outputs to perform a meta-analysis to stands that have yet to be field-verified. Where breaks in the data reflected differing habitat suitability, these were modeled across the LAUs to come up with an estimate for post-beetle habitat suitability highlighting the differences between low-quality and high-quality habitat. These categories were meant to differentiate habitat quality more so than ‘suitable’ vs. ‘unsuitable’ and also provide the basis for differentiating treatments between alternatives.* These categories can be grouped into two sets, low-quality (1 and 2) and high-quality lynx habitat (3 and 4).

These categories consist of:

1. ***Single story stands (one dead) with little or no advanced regeneration present within the stand and <25% live overstory trees*** *(Currently unsuitable/SISS)*
2. ***Single or two-story stands (one dead) with patchy regeneration, but overall forested stand does not contain DHC*** *(may or may not be currently suitable). Stands are considered suitable if containing >25% live canopy with or without understory, or if they contain 0-25% live canopy and contain live understory trees that provide at least 20% horizontal density in winter snowshoe hare foraging habitat condition.*
3. ***Two-story stands (one dead) with >20% horizontal density in winter snowshoe hare foraging habitat condition, but not S6*** *(Currently suitable, good quality habitat). Most stands may exceed 35% DHC (high quality foraging habitat).*
4. ***Multistoried stands (2+), 40% canopy and >35% DHC, currently S6 or stands that continue to provide high-quality habitat in a changed condition due to spruce beetle*** *(High-quality stands, Implementation Guide Tab 3 page 23).*

LAU Baseline Conditions

The current condition of these stands are a result of the combined past management actions and spruce beetle outbreak. Past timber management treatments within the CP District-wide Salvage Project Area are listed in Appendix B of the Silviculture Report and include commercial thinning and improvement cuts, shelterwood preparatory cuts (including preparatory and establishment/seed cuts), overstory removal cuts, patch clearcuts, stand clearcuts, salvage cuts, and single-tree selection cuts. Other management activities have included reforestation, site preparation for natural regeneration, pre-commercial thinning, tree release and weeding, rearrangement of fuels, broadcast burning, burning of piled material, and yarding of fuels. The shelterwood cuts were essentially thinnings that reduced the stand density and improved tree vigor, with the purpose of reducing the susceptibility of the residual mature trees to spruce beetle infestation. The sanitation/salvage treatments removed dead or dying trees, which may have reduced the basal area and increased tree vigor in localized areas. These past management activities did reduce the risk of spruce beetle within the managed stands, but could not protect against the elements of high beetle populations and drought-related stress, thus have experienced extensive mortality as well. For more information, see the Silviculture Report.

Uneven-aged management at the stand and landscape scales helps retain a diversity of habitat conditions that maintain lynx and snowshoe hare habitat over time (Ruggiero et al. 2000). Some past management activities on the district created relatively young (<50 years old) stands of advanced regeneration, which are currently high-quality hare habitat and may serve as source populations for the surrounding area. Given the severity of beetle impacts, these stands may provide crucial habitat for lynx prey in the coming decades.

The Victoria-Chama LAU primarily consists of wilderness, and thus has been minimally affected by past timber management activities on federal or private lands. Such activities have only been conducted in the south-eastern portion of the LAU on federal lands and minimally on private. The LAU was last impacted by the Cow Camp Salvage Project.

The Rito-Archuleta LAU comprises the southernmost portion of the district and is the most likely to be affected by timber management activities due to close highway access and agreeable terrain. Much of the district's recent timber management has occurred within the Rito-Archuleta LAU. Some timber management has also occurred on private lands within the LAU. The LAU was last impacted by the Cow Camp Salvage Project.

Victoria-Chama and Rito-Archuleta have had extensive beetle mortality, upwards of 90% of spruce >8"dbh have been affected. Most of these stands could be presumed 'post-beetle', with extensive mortality already evident. Due to site conditions, lower proportions of fir, and recent management activities, much of the southern portion of the district is relatively low-quality lynx habitat.

The Alamosa LAU comprises the northernmost portion of the San Juan Mountains on the district and has been minimally impacted by recent timber management activities. The area has evidence of past timber harvest >20 years ago. Habitat quality is considered moderate, however due to the remoteness of the LAU and lack of recent timber management, field-verification of habitat is quite minimal to date. Most recently, the LAU has been impacted by the Burrow Blowout Vegetation Management Project.

The Conejos Canyon LAU comprises some of the best habitat on the district, as evident in current lynx monitoring and research studies. There has not been federal timber management activities in the area in over 10 years, some areas much longer than that. There is evidence of past clearcuts from 20+ years ago and mining activity throughout. Spruce beetles are still working their way through the mature overstory, thus some green spruce currently remain in the canopy. However, it is anticipated that the area will see >90% spruce mortality at >8"dbh in the next few years.

The La Jara LAU comprises the eastern edge of the project area, covering much of our lower-elevation spruce-fir and mixed conifer areas. Because of the preponderance of mixed-conifer, these stands have not

been as significantly impacted by spruce beetles as the other LAUs. Thus, habitat conditions are comparatively stable. However, western spruce budworm has been a disturbance agent in the LAU and the mixed conifer stands of the district as a whole. This LAU was last impacted by the Hot Creek/Piederosa Wildlife Habitat and Fire Restoration Project. The Fox Creek Timber Stand and Wildlife Habitat Improvement project is currently being analyzed through the NEPA process.

Table 27. Baseline habitat for the LAUs affected by the CP District-wide Salvage Project.

LAU Name	Old LAU #	New LAU #	Total LAU Acres	Acres Primary Veg	Acres Secondary Veg	Total Suitable Habitat	Unsuit. Habitat (SISS)	Total Lynx Habitat	Total Non-Habitat	% Un-Suitable Habitat
Victoria Chama	20919	20925	71,806	34,688	4,794	39,482	2,412	41,896	29,910	5.8%
Rito Archuleta	20920	20915	87,002	24,847	9,839	34,686	7,165	41,851	45,326	17.1%
Alamosa	20916	20902	53,308	23,815	5,574	29,388	3,491	32,879	20,429	10.6%
Conejos Canyon	20918	20906	58,175	29,861	4,322	34,183	2,095	36,278	21,897	5.8%
La Jara	20917	20912	86,659	39,377	17,347	56,724	368	57,092	29,567	0.6%

Note: These are estimates based on the process outlined above to determine effects to post-beetle lynx habitat and are subject to be updated as additional field verifications occurs throughout the life of the project. Updates will be recorded in project monitoring and accountability checklists.

Sensitive and MIS Species

Sensitive Species

Pre-field reviews and habitat analysis determined that suitable habitat exists for nine sensitive species within the project area (western bumble bee, boreal toad, northern leopard frog, northern goshawk, boreal owl, flammulated owl, olive-sided flycatcher, wolverine, pine marten and hoary bat). These nine species are further analyzed for the Conejos Peak District Wide Salvage Project. *While species specific presence/absence surveys did not occur for most species, surveys will occur as needed prior to implementation in order to inform application of project design features.*

Species having no suitable habitat and/or having no reasonable probability of occurring within or near the salvage units are not analyzed in further detail. This project will have *"no impact"* on these species which include: the Great Basin silverspot butterfly, Monarch butterfly, Ferruginous hawk, northern harrier, sage sparrow, Brewer's sparrow, Lewis's woodpecker, peregrine falcon, loggerhead shrike, white-tailed ptarmigan, mountain plover, burrowing owl, black swift, Townsends's big-eared bat, fringed myotis, Gunnison's prairie dog, bighorn sheep and river otter.

Table 28. Sensitive species, Rio Grande National Forest (August 29, 2015).

Species	Suitable Habitat within the Project area?	Species Documented within the Project Area?	Basic Habitat Description
INSECTS			
Great Basin silverspot butterfly	No	No	Spring fed and/or subirrigated wetlands at low (7500 feet or less) elevation; larval food plant *Viola*

Speyeria nokomis nokomis			*nephrophylla*; wet meadows interspersed with willows and other woody wetland species; adult nectar sources (mostly composites).
Western Bumble Bee *Bombus occidentalis*	**Yes**	**No, however no surveys in the project area. Extremely rare in Colorado.**	**The species is associated with meadows and openings where they occur in forested areas. Habitat includes flowering plants for foraging and rodent burrows for nesting.**
Monarch Butterfly *Danaus plexippus plexippus*	**Yes**	**Not documented on the RGNF.**	**The species is associated with grasslands and openings in forested areas, particularly at lower elevation. Habitat includes flowering plants for foraging and is closely tied to milkweed species for breeding.**
AMPHIBIANS			
Boreal toad *Bufo boreas boreas*	**Yes**	**No, rare and not documented on the Conejos Peak District. However no species-specific surveys.**	**Spruce/fir near water and alpine meadows.**
Northern leopard frog *Rana pipiens*	**Yes**	**No, rare on forest and not documented on the Conejos Peak District. However no species-specific surveys.**	**Riparian and wetland areas generally below 9,000 feet. However, breeding population observed near 10,500 feet on the Conejos Peak District.**
BIRDS			
Black swift *Cypseloides niger*	No	No	Nests behind or next to waterfalls and wet cliffs. Forages over forests and open areas.
Boreal owl *Aegolius funereus*	**Yes**	**No, however no surveys in the project area. Likely present in the northern end of the project area.**	**Mature spruce/fir and mixed conifer forested areas with preference for wet situations (bogs or streams) for foraging**
Burrowing owl *Athene cunicularia*	No	No	Open grasslands associated with prairie dogs. Nests and roosts in burrows dug by mammals or other animals.
Ferruginous hawk *Buteo regalis*	No	No	Open grasslands and shrub steppe communities. Nests in tall trees or shrubs along streams or on steep slopes
Flammulated owl *Otus flamineolus*	**Yes**	**No, however minimal surveys in the project area. May be present at the peripheries of the project area in lower elevations.**	**Depend on cavities for nesting, open forests for foraging, brush for roosting. Occupy open ponderosa pine or forests with similar features (dry montane conifer or aspen, with dense saplings).**
Sage sparrow Amphispiza belli	No	No	Grasslands and open situations with scattered brush and riparian scrub; preferring to feed near woody cover; strongly associated with sagebrush for breeding. Positively correlated with big sagebrush, shrub cover, bare ground, above-average shrub height, and horizontal patchiness; negatively correlated with grass cover.
Brewer's sparrow Spizella breweri	No	No	Strongly associated with sagebrush in areas with scattered shrubs and short grass; to lesser extent in mountain mahogany, rabbit brush, and bunchgrass grasslands with shrubs or large openings in pinyon-juniper.
Northern goshawk *Accipter gentiles*	**Yes**	**Yes**	**Mature forest generalist. On the Rio Grande, often found in mixed conifer/aspen stands.**

Lewis's woodpecker *Melanerpes lewis*	No	No	Open pine forests, burnt over areas with snags and stumps, riparian and rural cottonwoods, and pinyon-juniper woodlands.
Loggerhead shrike *Lanius ludovicianus*	No	No	Grassy pastures that are well grazed. Nests in shrubs or small trees, preferably thorny such as hawthorn.
Olive-sided flycatcher *Contopus borealis*	**Yes**	**Yes**	**Mature spruce/fir or Douglas-fir forests with preference for natural clearings, bogs, stream and lake shores with water-killed trees, forest burns and logged areas with standing dead trees.**
Northern harrier Circus cyaneus	No	No	Marshes, meadows, grasslands, and cultivated fields. Nests on the ground, commonly near low shrubs, in tall weeds or reeds, sometimes in bog; or on top of low bush above water, or on knoll of dry ground, or on higher shrubby ground near water, or on dry marsh vegetation.
American peregrine falcon *Falco peregrinus anatum*	No	No	Cliff habitat over 200 feet high with suitable ledges for nest construction.
White-tailed ptarmigan Lagopus leucurus	No, harvest is not proposed in alpine tundra	No	Alpine tundra, especially in rocky areas with sparse vegetation. Summer habitats - moist, low-growing alpine vegetation. Canopy cover of willow at winter feeding sites preferred.
Bald eagle *Haliaeetus leucocephalus*	No	No	Nests and roosts are usually found in open-branched trees near larger lakes, streams, rivers and reservoirs.
Mountain Plover *Charadrius montanus*	No	No	High plains/short grass prairie habitats, often associated with prairie dog towns. Nesting areas characterized by very short vegetation with significant areas of bare ground.
MAMMALS			
American marten *Martes Americana*	**Yes**	**Yes, however limited surveys in the project area. Presumed present in all mature stands.**	**Spruce/fir and mixed conifer forests with complex physical structure.**
Towsend's big-eared bat *Corynorhinus townsendii townsendii*	No	No	Forages in semi-desert shrublands, pinyon-juniper woodlands and open montane forests. Roosts in caves, mines and mature forests.
Fringed myotis *Myotis thysanodes*	Yes	No. All observations have occurred below 9600', all lower than proposed activities. Presence not assumed around project activities.	Desert, grassland, and woodland habitats. Roosts in caves, mines, rock crevices, buildings, and other protected sites.
Hoary Bat *Lasiurus cinereus*	**Yes**	**Yes. Presumed presence wherever there are trees.**	**Primarily a solitary tree-foliage roosting bat; may be associated with any habitat type that contains trees, up to timberline.**
Gunnsion's prairie dog *Cynomys Gunnison (Candidate)*	No	No	High mountain valleys and plateaus at 1830-3660 m; open or slightly brushy country, scattered junipers and pines. Burrows usually on slopes or in hummocks.
Rocky Mountain Bighorn Sheep *Ovis Canadensis*	**Yes**	**Yes**	**High-visibility habitat dominated by grass, low shrubs, and rock cover, areas near open escape terrain, and topographic relief.**
River Otter *Lontra canadensis*	No	No	Major river drainages, larger perennial streams with at least 10 cfs of stream flow (generally 4th order or larger); lakes and reservoirs.

Both the monarch butterfly and the Rocky Mountain bighorn sheep have habitat within the project area, however, because the effects to these species and their habitat are anticipated to be negligible, they will not be discussed further in this document. See the Wildlife Report in the project file for the complete effects analysis.

Direct and Indirect Effects

Threatened and Endangered Species

Alternative 1 - No Action

The stands identified for treatment are composed predominantly of Engelmann spruce. The degree of beetle infestation in the area is generally 90-100% mortality for spruce trees greater than 8" DBH. A reduction in canopy closure is occurring regardless if salvage occurs or not and is resulting in more open stand conditions that will release existing understory vegetation (shrubs, seedlings, and aspen). The species-specific mortality may shift current live overstory composition towards increasing subalpine fir and some aspen components; however, a recent study on the forest suggests persistence of Engelmann spruce in the understory, so future stand composition is anticipated to be more variable depending on existing understory composition and limited spruce cone crop in the coming decades (Kulakowki and Veblen 2003, Savage et al. 2017).. In general, species other than spruce comprise up to 25% of the dominant species composition pre-beetle and thus, live overstory would be limited for some time within and outside of the proposed treatment units. (Schmid et al. 1974). Observed average Engelmann spruce snag fall rates are between 1.3% and 3.0% per year over the first 25 to 30 years after initial mortality, though the longevity of standing spruce snags is uncertain. As the spruce overstory declines, advanced regeneration composed predominantly of subalpine fir and Engelmann spruce would be released to grow. Engelmann spruce seed sources would be substantially diminished until advanced regeneration reaches cone bearing age. An overstory is anticipated to be established within the next 100 years. The resulting stand in the long-term would be more variable and composed with a greater proportion of subalpine fir than current conditions. For more information on future expected stand conditions, refer to the Silviculture and Biodiversity Reports.

Lynx prefer to forage in spruce-fir forests with dense horizontal cover, abundant hares and secondary prey, deep snow and large diameter trees during the winter (Ruggiero et al. 2000). Red squirrels make up a sizable proportion of prey items when snowshoe hare abundance is low, as high as 66% of prey items found (Shenk 2009). Red squirrels are experiencing a decline due to the bark beetle outbreak, however snowshoe hares appear less affected (Ivan and Seglund 2015). Based on the stand conditions described above, late-successional spruce-fir habitat is anticipated to decline within the project area. It is anticipated that the southern portion of the district (Rito Archuleta and southernmost part of Victoria Chama LAUs) would continue to be of lesser value to lynx for several decades due to current stand conditions until regeneration reaches >35% dense horizontal cover (DHC). The northern LAUs (Alamosa, Conejos Canyon) may have enough advanced regeneration and green stem densities to provide enough refugia such that lynx will continue to persist as stands regenerate.

Alternative 2 - Proposed Action

The effects presented here are analyzed under the assumption that all project design features will be in place and final layout of treatment units are within the scope of the project as described herein.

The project proposes to salvage up to 17,000 acres of spruce-fir forest, of which approximately 16,529 acres are currently identified in GIS. Additionally, the proposed action includes up to 1,000 acres of hazardous fuels treatments, of which 941 acres are currently identified. Differences may be made up in the implementation phase including during unit layout, however it is not currently anticipated that all of the proposed areas would be feasible to salvage and therefore represents the maximum allowable harvest under

this EIS. All proposed treatments occur within mapped lynx habitat on the Conejos Peak Ranger District and would affect up to 5 LAUs[3] (Tables 6, 7). No treatments are proposed in a lynx linkage area.

Though project harvest objectives are to salvage dead and dying spruce, the extent of mortality in most stands would resemble a regeneration harvest. Following removal of the dead or dying spruce, the Forest Service would plant seedlings on those areas where post-sale reforestation surveys indicate that stocking is below desired levels. The desired species mix and stocking levels will be determined by existing density on a stand-by-stand basis, but will be not less than the minimum Forest Plan standard of 150 trees per acre and is anticipated to be predominantly spruce. However, not every acre is uniformly stocked; some areas are moderate, some areas are low. In such cases, spot planting may be an option at the unit level if recommended by the Silviculturist. Additionally, 150 trees per acre would not become high-quality hare habitat until the stands naturally fill in further, which may take several decades.

Treated stands are expected to have susceptibility to windthrow as a result from this treatment due to the extensive nature of the mortality and resulting salvage of dead spruce. Trees most susceptible to windthrow would be residual live overstory fir, which have greater wind resistance due to the live crown. The snag retention Project Design Feature may be used to provide shelter to residual trees where wildlife objectives may be met simultaneously.

Table 29. Acres of lynx habitat affected by the salvage component of Alternative 2 by LAU.

LAU	Primary Suitable	Unsuitable (SISS)	Secondary Suitable	Total
	Acres	*Acres*	*Acres*	*Acres*
ALAMOSA	3,896.84	760.25		4,653.84
CONEJOS CANYON	5,129.90	613.19	4.71	5,747.80
LA JARA	2,000.76	8.54		2,009.31
RITO-ARCHULETA	1,976.37	996.90		2,973.27
VICTORIA-CHAMA	582.77	558.19	0.61	1,141.56
Total	**13,586.64**	**2,937.08**	**5.31**	**16,529.03**

[3] Approximately 3 acres overlaps the Trout-Handkerchief LAU, however for the purposes of this analysis is considered a mapping error and is included in the effects to the Alamosa LAU.

Table 30. Acres of lynx habitat affected by the hazardous fuels component of Alternative 2 by LAU.

LAU	Primary Suitable	Unsuitable (SISS)	Secondary Suitable	Total
	Acres	*Acres*	*Acres*	*Acres*
ALAMOSA	414.6	3.8		418.4
CONEJOS CANYON	275.4	85.3	<0.01	360.6
LA JARA	1.3			1.3
RITO-ARCHULETA	111.1	40		151.1
VICTORIA-CHAMA				
Total	**802.4**	**129**	**0**	**931.5**

The effects to habitat suitability are dependent on the quality of habitat pre-treatment (density of regeneration, preponderance of green trees, etc.). To qualify these effects, see habitat categories described in the Wildlife Report. Because field-verification of such a large amount of area cannot occur in a timely manner prior to completing NEPA, habitat quality has been modeled where not already accounted for either by monitored past projects or field verification (Wildlife Report). Habitat conditions on the ground will be assessed prior to implementation and reflected in project-level monitoring and reporting checklists.

Effects to Lynx

Direct impacts may range from temporary disturbance/displacement and possible but highly unlikely direct mortality resulting from salvage or fuels activities (i.e. trees or machinery crushing individuals). Lynx kittens are vulnerable when very young. Project design features are in place to protect lynx kittens when they are most vulnerable from May 1 to July 15th, however locating lynx dens without collar data is nearly impossible. It is unlikely that lynx would den within the treatment area given the habitat components preferred by denning lynx. Those areas most likely to provide denning habitat (high amounts of DHC, heavy downed wood component, and steeper slopes) are typically not harvested due to slope and they are not harvested during denning time periods due to access and wet soils. While some areas are close, no past known denning location on the district is within a proposed treatment area. However, project design features to prevent direct impacts to newly borne lynx are in place and will be used where needed based on field verification during implementation.

Disturbance is possible, particularly within the Alamosa and Conejos Canyon LAUs, due to recent evidence of occupancy and breeding. Lynx are generally tolerant of human disturbance, however high noise levels present during harvest activities may preclude use of an area (Ruggiero et al. 2000). Additionally, manipulation of foraging habitat close to den sites may reduce foraging ability and the potential for future, short-term use, reducing the occupancy and subsequent breeding capacity in the area. In collaboration with CPW, remote cameras have documented breeding success within the Lake Fork and Saddle Creek areas of the Conejos Canyon LAU. This area is overlapped with proposed timber harvest areas under this alternative and thus is likely to negatively affect breeding success in the area by reducing cover and foraging resources within the core home range of known breeding individuals before research on lynx use of post-beetle stands on the forest is completed. Preliminary reports determined that high amounts of regeneration and higher stem densities (live or dead) are important components of lynx habitat post-beetle, which is currently abundant in this area.

Temporary roads are may have minor impacts to lynx or lynx habitat, as most are within timber harvest units and the effects are considered within the effects of the unit as a whole. Little is known of the impacts of

temporary roads on lynx, however it is not anticipated to impact lynx and lynx may actually use them as movement zones during the winter (Ruggiero et al. 2000). Temporary roads outside of harvest units are approximately 12ft wide and therefore can be less than average tree spacing in some areas. Additionally, project design criteria minimize the impacts of temporary roads through placement away from dense horizontal cover and pockets of advanced regen, where feasible. Impacts to lynx and lynx habitat are therefore anticipated to be negligible. Temporary roads may last for several years during normal harvest operations and will be decommissioned after use.

Effects of Salvage to Lynx Habitat

Lynx habitat categories 1 and 2 (i.e. low-quality lynx habitat)

The effects to habitat described in this section applies to those areas modeled or field-verified as low-quality lynx habitat, which represents approximately half of the proposed treatment areas (8,396 acres). Field verification of stand conditions will occur prior to implementation, however because the majority of the LAUs have not been field-verified modeling was used as a tool to aid in the effects analyses and represents the best available information at this time for post-beetle habitat conditions. Information from ongoing research would be incorporated as feasible through the life of the project.

As described above, the proposed treatment areas are dominated by Engelmann spruce (80% or more of trees >8" DBH) and the vast majority of the these areas lack sufficient large green trees to leave an intact overstory, particularly taking into account incidental damage from harvest activities and wind effects post-treatment. It is therefore anticipated that, other than in small pockets of mature aspen or subalpine fir, the overstory would be largely removed in treatment areas within habitat categories 1 and 2 and stands would resemble a shelterwood or seed tree with reserve snags prescription. Post-treatment canopy closure is expected to drop to about 7% before increasing again (Silviculture Report). These areas lack sufficient advanced regeneration to be currently suitable (SISS, category 1) or have some regeneration but are low-quality suitable habitat that does not contain dense horizontal cover at the stand scale (DHC, category 2). Regeneration in these conditions is typically patchy and based on field observations there is sparse evidence of snowshoe hare use.

The salvage harvest would reduce habitat attributes preferred by lynx and their primary prey species (snowshoe hare) including future coarse woody debris and some advanced regeneration. Red squirrel densities would be expected to decrease in abundance due to the spruce beetle influence and lack of mature overstory trees, with the addition of incidental damage to residual trees during harvest activities. Red squirrels may already be absent in some areas of category 1 stands. Small pockets and strips of regeneration that reach DHC conditions may provide holdover areas for snowshoe hares or squirrels within treatment areas and are a focus of project design features (Fisher and Bradbury 2006). Lynx habitat is not expected to be suitable post-treatment at the stand scale and category 2 habitat stands would be converted to stand initiation structural stage (SISS, unsuitable) primarily due to the lack of advanced regeneration in the majority of the treatment area, incidental damage impacts to regeneration from harvest activities, and blow-down of remaining green trees (Figure 6). However, at the LAU scale these impacts are anticipated to be minimal, as habitat quality is low and thus less likely to be used by, or critical, for lynx.

Benefits of harvesting in low-quality lynx habitat include subsequent planting of conifer seedlings, such that stand conditions preferred by snowshoe hares would return faster than natural regeneration in these areas, thus promoting future lynx habitat consistent with the intent of the Southern Rocky Lynx Amendment (SRLA). The stands would require further natural seeding over time to reach sufficient densities for high-quality hare habitat.

Effects of Salvage to Lynx Habitat Categories 3 and 4 (i.e. high-quality lynx habitat)

These stands represent the higher quality lynx habitat, those that contain DHC and greater diversity in canopy layers and species. As evident in current research on the forest, these are the stands lynx are utilizing post-beetle and are thus important to the persistence of lynx on the Forest. As currently modeled, these areas represent approximately 8,133 acres of the identified 16,529 acres of proposed salvage area. As mentioned before, field verification will occur prior to implementation for all lynx habitat.

These areas are anticipated to have greater amounts of advanced regeneration and mixed-aged trees than categories 1 and 2. Based on post-project monitoring, incidental damage to advanced regeneration from harvest activities is approximated to be up to 30%. These stands, too, have a high proportion (>80%) of spruce in the overstory, such that with salvage the majority of the overstory would be removed. Some damage may occur to remaining fir or other green trees, however equipment operators have been quite good at minimizing damage due to PDC. Blowdown is anticipated here, as remaining green trees are not wind-hardened and easier to blow down when the dead spruce are removed.

In some cases, blowdown, incidental damage to the understory, or height of understory may result in insufficient cover post-harvest to remain suitable habitat for lynx or lynx prey. In other cases, the understory is of sufficient height and density such that even with these negative effects the stand remains suitable habitat post-treatment, albeit reduced in quality. *Therefore, salvage effects on these stands is highly dependent on pre-harvest conditions and operator skill in avoiding damage to green trees and regeneration.* A range of potential effects is provided in Table 31. Based on post-project monitoring and discussions with other biologists on the Forest, it is assumed that approximately 70% of stands remain suitable post-harvest depending on preexisting site conditions. Project monitoring will occur and baseline adjustments made accordingly. Information from ongoing research on the Forest will also be incorporated as appropriate.

Summary of Effects from Salvage Harvest

For snowshoe hare, red squirrel, and consequently lynx, harvest impacts could last until understory conditions once again provide security, forage and overall quality winter snowshoe hare habitat (generally 30-50 years), depending on site conditions (Thompson et al. 1989). The effects from harvesting combined with the spruce beetle influence are expected to cause a reduction in lynx prey resources. Improvements in red squirrel densities are also not expected for up to 40 years, or until sufficient trees reach the reproductive capacity to bear cones. Overall, this potential reduction in prey abundance (primary and secondary) could result in reduced lynx use within treatment areas particularly during low snowshoe hare population cycles when lynx are more reliant on red squirrels, which could be absent from areas due to beetles, incidental damage, and blowdown.

Project design features act to minimize incidental damage to the advanced regeneration and provide for future habitat characteristics. Project design features for snags will retain pockets of snags, providing for future CWD recruitment and potential denning sites. Additionally, these retention pockets can be used around existing advanced regeneration sites, where they exist, protecting them further from damage during logging operations and keeping legacy features in the stands. Areas with higher regeneration densities would be expected to have some incidental damage from harvest activities.

Effects of Fuels Treatments to Lynx Habitat

Hazardous fuels treatments would occur within 200 feet of administrative sites and facilities or within 400ft of private lands within the project area and include hazard tree felling, some thinning of dense saplings (approximately 20ft spacing), pruning to approximately 5ft, and pile-burning of slash, where needed. These non-commercial mechanical treatments will impact habitat, but will not have the same magnitude as commercial salvage treatments. Incidental loss of saplings and pole size trees will be minimal as will impacts to soils, shrub, and herbaceous vegetation except where deemed necessary for hazard fuels management. Thinning and pruning of saplings and advanced regeneration will reduce habitat quality, particularly during fall and spring transitions when snow depths preclude use of herbaceous vegetation but is not deep enough

for pruned trees to provide cover. *Habitat will therefore be reduced in quality, but is not expected to result in a complete loss of habitat.*

Effects of fuels treatments include a reduction of cover for hares and of security cover for lynx movement. Since public safety is the primary objective, retention of understory vegetation will occur to the greatest extent practicable that would meet shaded fuelbreak objectives. While some cover will be retained, hare habitat retained will generally be of low quality following harvest. In areas that support a mixture of spruce and aspen, removal of hazard trees will disturb the soils through mechanical operations and increase sun exposure to the forest floor. Aspen is expected to be regenerated in such circumstances, creating dense stands of young aspen. Hazard tree removal may occur in some areas and would result in a loss of large down wood, if removed. In some cases, particularly in low-quality habitat, felling hazard trees could create an opening 400 feet across. However, retention of understory vegetation will provide some cover allowing lynx movement in these areas. Forest Plan standards for big game will also help maintain connectivity in these areas. While impacts to lynx movement could occur at a small scale with fuels treatments, it is not anticipated to be measureable at a LAU scale.

Effects on Habitat Connectivity

Of the action alternatives, Alternative 2 has the greatest potential impact on connectivity. Lynx require cover for security and for stalking prey and typically avoid large, open areas (Ruggiero et al. 1994). While lynx will cross openings <100m in width, they would not hunt in these areas (Koehler 1990). Suitable travel cover consists of coniferous or deciduous vegetation >2m in height with a closed canopy close to foraging habitats (Ruggiero et al. 1994). Alternative 2 has the potential to create large openings through salvage harvest, particularly in habitat categories 1 and 2 (low-quality lynx habitat). Since these stands have limited regeneration, they may be sporadically used already and further degradation through harvest may further limit connectivity. Lynx movements during the reintroduction documented core areas and movement zones on the district that may be affected by the project, see Figure 4 in (Theobald and Shenk 2011).This particularly may affect the Rito Archuleta LAU as it has a higher proportion of low-quality habitat and the spatial arrangement of suitable habitat and past and proposed timber harvest units may limit connectivity into New Mexico. While still poorly understood, anthropomorphic effects on lynx occupancy of an area may be mediated by the relationship between pre-existing habitat conditions and intensity of habitat loss, but the beetle influence in this relationship is unclear (Hornseth et al. 2014). One benefit of harvesting in these areas is to promote future forests through subsequent planting providing connectivity in the future through re-establishing foraging habitat faster than would occur naturally. Stands that retain suitable habitat characteristics post-harvest are not anticipated to measurably impact connectivity, such as some category 3 or 4 stands.

The spatial arrangement of harvest units within Conejos Canyon and Alamosa LAUs may also have an effect on connectivity, particularly between the two LAUs, however these LAUs have greater amounts of high-quality lynx habitat (i.e. more advanced regeneration, categories 3 and 4) and may leave some harvest areas suitable post-harvest. Where these conditions meet those described in (Koehler 1990) above, impacts to connectivity are fewer. Additionally, several potential corridors exist that don't have proposed harvest units that may aid in movement between the two LAUs.

The spatial arrangement of harvest units within the La Jara LAU are not anticipated to impact connectivity within or across the LAU, given that the proposed sale areas are smaller and of the lower-quality habitats that make up the majority of the LAU. Also, the LAU is along the periphery of high lynx use on the district, with higher use areas to the west in the Alamosa, Conejos Canyon, and Victoria Chama LAUs (Theobald and Shenk 2011). Thus impacts to connectivity are less in this LAU.

The Victoria Chama LAU is primarily composed of either wilderness area or backcountry, such that the only proposed harvest is an area of lower-quality habitat along the southern border of the LAU (See map,

Appendix C). Thus, within-LAU connectivity is not limiting and between-LAU connectivity may have some impacts, mostly from current habitat suitability, in combination with the proposed harvest in the Rito Archuleta LAU.

Under both action alternatives all live conifers and aspen where present, will not be harvested except where safety and operational conditions warrant. Riparian buffers are in place to protect riparian areas but may also help to facilitate movement, however are questionable whether they are sufficient as movement corridors across larger openings. These measures will help to provide additional cover and security for movement across the project area. Patches of regeneration should not only provide for snowshoe hare holdover habitat, but will help to provide some level of cover and habitat connectivity.

Alternative 3 – Vegetation Management – Limited Action

Effects of Salvage Logging to Lynx Habitat

The effects to lynx habitat under Alternative 3 are similar to those under Alternative 2, however only low-quality lynx habitat would be salvaged under this alternative, approximately 8,500 acres. This alternative was modeled after Vegetation Objective O4 of the SRLA, balancing between providing opportunities for salvage harvest and prioritizing salvage harvest within areas that are currently poor snowshoe hare habitat that could benefit from harvest and subsequent conifer planting. A denning model was developed and applied to further identify blocks of 20 acres or greater with habitat elements used by denning lynx (steep slopes, northerly aspects, high elevations, spruce-fir habitats (Topolewski 2017)). This had minor impacts to proposed salvage units, however, as most areas were already precluded due to steep slopes. Because activities are emphasized outside of high-quality lynx habitat, the potential for impacts to lynx are therefore significantly less, as crucial habitat components and stands that lynx are utilizing post-beetle would be retained. Additional project design features would also ensure greater protections of advanced regeneration and snags, promoting important future forest characteristics including biological legacies along with promoting greater connectivity within and between LAUs. Impacts from temporary roads would also be less.

This alternative provides further retention emphasis to the Conejos Canyon and Alamosa LAUs where the most recent evidence of breeding lynx has occurred, thus providing known refugia into the future. Proposed harvest in these LAU's is approximately half of what is proposed under Alternative 2. This is due to the large amount of high quality habitat in these LAU's that would not be harvested under Alternative 3.

Differences in potential salvage harvest acres between Alternatives 2 and 3 are reduced in the Rito-Archuleta and Victoria Chama LAUs given the amount of lower quality habitat (category 1, currently unsuitable) and less lynx use. Emphasis for harvest would occur within these LAUs to promote future lynx habitat through planting.

Effects to Lynx

Effects to lynx are similar under Alternative 3 given that the same prescriptions would occur in the areas identified for harvest, however the probability of direct impacts would be notably less since lynx are not expected to use lower quality habitat areas as heavily. Additional project design features, as well as only harvesting within low-quality lynx habitat would notably reduce potential impacts to lynx using the area. Disturbance is still possible, particularly within the Alamosa and Conejos Canyon LAUs, due to recent evidence of occupancy and breeding. However, additional protections and reduced harvest act to ensure sufficient habitat refugia for lynx to persist in the area. Additionally, as forest-wide research into lynx use of post-beetle spruce-fir stands is completed and integrated, both action alternatives allows time for understanding and incorporating the information prior to planning projects within the Alamosa and Conejos Canyon LAUs, which appear to be key LAUs on the district.

Cumulative Effects

Baseline conditions for lynx habitat have been described previously in the No Action Alternative and Environmental Baseline sections in this analysis. Baseline conditions have been updated as possible to incorporate changes associated with the spruce beetle outbreak on the district. It is anticipated that baseline conditions due to the spruce beetle will continue to change over the life of this project, however, the amount, distribution, and site-specificity of this change is unknown. From a Forest-wide perspective, the spruce beetle outbreak has already influenced all of the spruce-fir ecosystem type, sometimes dramatically. Uncertainties associated with the effects of this change have been incorporated into the implementation and monitoring checklists so that baseline conditions can be updated for each project as applicable prior to implementation. These updates will need to be coordinated at the Forest level for assessing a broader array of cumulative effects including adjacent LAUs. Outcomes from on-going studies involving lynx and prey species on the Forest are anticipated to be finalized and incorporated into this project as they become available in the near future.

Foreseeable future activities within the Project Area include the Fox Creek Vegetation Management Project, which proposes to thin, salvage, and broadcast burn within dry mixed-conifer stands, as well as regenerate aspen stands within the same ecosystem. This project would not affect the spruce forest type. Another upcoming proposal is the Trail Gulch project, which is very early in the planning stages. It proposes similar treatments to the Fox Creek project and would likely begin implementation in 2022. It is currently premature to include in this analysis, however, given how far into the future project planning would occur. Fuelwood gathering, grazing, recreation, and other previously permitted activities are expected to continue, however have negligible impacts to lynx. These are federal proposed projects that will be subject to individual section 7 consultation in the future.

Foreseeable activities adjacent the Project Area include ongoing salvage logging on private lands within the Chama Basin. Rancho del Oso Pardo and inholdings are currently salvaging approximately 80 acres of dead spruce per year from their property, and this activity is expected to continue over the next five years. The same private landowners are also performing aspen regeneration cuts at lower elevations on approximately 5-50 acres per year; this activity is expected to continue throughout the life of the CP District-wide project. However, all these areas are outside of any LAU affected by the Project.

The Colorado State Forest Service is conducting a 50 acre spruce salvage harvest on Osier Mountain, and anticipates performing 140 acres of aspen regeneration cuts, 50 acres of spruce salvage, and 20 acres of ponderosa pine restoration near La Jara Reservoir, over the next 10 year period. Only the 50 acre spruce salvage harvest may occur within the same LAU as the CPDWS project, the Rito Archuleta LAU. This area is spatially isolated and fragmented from much of the lynx habitat within the LAU and thus is likely to only receive light use by lynx as they disperse or have exploratory movements through the area. Salvage harvest in this area would therefore have negligible cumulative impacts to lynx.

Summary of Effects to Lynx Habitat

Under Alternative 2, a maximum of 17,000 acres could be salvaged and 1,000 acres of hazardous fuels treatments could occur. These effects are distributed across several LAUs and are described as identified in GIS. It is anticipated that ≥30% of categories 3 and 4 may be converted to SISS through harvest and/or fuels activities, given observed post-project monitoring on the forest. The tables below take into account the assumed conversion of low-quality suitable habitat (category 2) to SISS from salvage activities and describes the range of conversion, including an approximately 30% incidental damage estimate through the maximum treatment scenario (30% conversion to 100% conversion) of high-quality habitats (categories 3 and 4) to SISS from salvage activities under Alternative 2. For the sake of this analysis, the maximum treatment scenario was included to show that even if 100% conversion to SISS occurred within all salvage harvest and fuels treatment units, all LAUs are anticipated under current modeling to meet SRLA standards S1 and S2. Standard S5 is also anticipated to be met as well (see 2.3 Southern Rockies Lynx Amendment, below) and S6

will be monitored through the project's lifespan to ensure compliance with the SRLA. *It must be noted that effects to high-quality habitat are anticipated to be significantly less than the maximum treatment scenario as areas may retain suitable habitat characteristics post-harvest. Similarly, the effects to lynx habitat from hazardous fuels treatments is described under the maximum treatment scenario, although as described above, actual effects are anticipated to be less.*

Similarly, under Alternative 3 the table assumes conversion of low-quality habitat (category 2) to SISS and the maximum treatment scenario of 100% conversion of fuels treatments to SISS. Project monitoring and compliance checklists will ensure that all standards and guidelines would be met through the life of this project.

Table 31. Summary of effects to lynx habitat under each alternative by LAU.

Alamosa LAU **53,308 acres** **32,879 acres of lynx habitat**	**Existing Baseline**	**Alternative 2 Impacts to Suitable Habitat**	**Alternative 3 Impacts to Suitable Habitat**
Description	***Acres (%)***	***Acres (%)***	***Acres (%)***
Acres of Suitable	29,388 (89.4% of lynx habitat)	The project may convert 2,377.9 – 3,893.6 acres to SISS (7.2% – 11.8% of lynx habitat) from salvage and up to approximately 414.6 acres (1.2%)[4] from hazardous fuels treatments	The project may convert 1,728.4 acres to SISS (5.3% of lynx habitat) and up to approximately 414.6 acres (1.2%) from hazardous fuels treatments
Acres of Unsuitable (SISS) Post-Project	3,491 (10.6%)	6,283.6 – 7,799.2 (19.1% - 23.7%, salvage and fuels)	5,634 (17.1% salvage and fuels)
Conejos Canyon LAU **58,175 acres** **36,278 acres of lynx habitat**	**Existing Baseline**	**Alternative 2 Impacts to Suitable Habitat**	**Alternative 3 Impacts to Suitable Habitat**
Description	Acres (%)	Acres (%)	Acres (%)
Acres of Suitable	34,182.8 (94% of lynx habitat)	The project may convert 2,991.6 – 5,134.6 acres to SISS (8.2% – 14.1% of lynx habitat) from salvage and up to approximately 275.4 acres (<0.01%) from hazardous fuels treatments	The project may convert 2,073.2 acres to SISS (5.7% of lynx habitat) and up to approximately 275.4 acres (<0.01%) from hazardous fuels treatments
Acres of Unsuitable (SISS) Post-Project	2,095.3 (5.8%)	5362.3 – 7,505.3 (14.8% - 20.7%, salvage and fuels)	4443.6 (12.2% salvage and fuels)
La Jara LAU **86,659 acres** **57,092 acres of lynx habitat**	**Existing Baseline**	**Alternative 2 Impacts to Suitable Habitat**	**Alternative 3 Impacts to Suitable Habitat**
Description	Acres (%)	Acres (%)	Acres (%)
Acres of Suitable	56,724 (99.4% of lynx habitat)	The project may convert 1005.8 – 2,000.8 acres to SISS (1.8% – 3.5% of lynx habitat) from salvage and up	The project may convert 759.4 acres to SISS (1.3% of lynx habitat) and up to approximately

[4] Hazardous fuels treatments depicted here include both WUI and non-WUI areas.

		to approximately 1 acre (<0.01%) from hazardous fuels treatments	1 acre (<0.01%) from hazardous fuels treatments
Acres of Unsuitable (SISS) Post-Project	368 (0.6%)	1374.8 – 2368.8 (2.4% - 4.1%, salvage and fuels)	1,128.4 (2% salvage and fuels)
Rito-Archuleta LAU 87,002 acres 41,851 acres of lynx habitat	**Existing Baseline**	**Alternative 2 Impacts to Suitable Habitat**	**Alternative 3 Impacts to Suitable Habitat**
Description	Acres (%)	Acres (%)	Acres (%)
Acres of Suitable	34,686 (83% of lynx habitat)	The project may convert 1,283.8 – 1976.4 acres to SISS (3.1% – 4.7% of lynx habitat) from salvage and up to approximately 111.1 acres (0.3%) from hazardous fuels treatments	The project may convert 987 acres to SISS (2.4% of lynx habitat) and up to approximately 111.1 acres (0.3%) from hazardous fuels treatments
Acres of Unsuitable (SISS) Post-Project	7,165 (17.1%)	8559.9– 9252.5 (20.5% - 22.1%, salvage and fuels)	8263.1 (19.7% salvage and fuels)
Victoria Chama LAU 71,806 acres 41,896 acres of lynx habitat	**Existing Baseline**	**Alternative 2 Impacts to Suitable Habitat**	**Alternative 3 Impacts to Suitable Habitat**
Description	Acres (%)	Acres (%)	Acres (%)
Acres of Suitable	39,482 (94.2% of lynx habitat)	The project may convert 276.1 – 583.4 acres to SISS (0.7% – 1.4% of lynx habitat) from salvage and no hazardous fuels treatments proposed	The project may convert 144.4 acres to SISS (<0.3% of lynx habitat) and no hazardous fuels treatments proposed
Acres of Unsuitable (SISS) Post-Project	2,412 (5.8%)	2,688.1 – 2,995.4 (6.4% - 7.1%)	2,526.4 (6%)

There are negligible differences between alternatives for salvage within currently unsuitable (SISS) stands.

Southern Rockies Lynx Amendment (SRLA)

In October of 2008, the Southern Rockies Lynx Amendment (SRLA) was finalized (USDA Forest Service 2008). The purpose and need for the amendment was to establish management direction that conserves and promotes the recovery of lynx, and reduces or eliminates potential adverse effects from land management activities and practices on national forests in the Southern Rockies, while preserving the overall multiple-use direction in existing plans.

The amendment (SRLA) allows for some possible adverse effects on lynx to occur. By placing certain limits on the activities that could have adverse effects to lynx, the amendment provides for long-term persistence of lynx while accommodating other multiple uses (USDA Forest Service 2008).

The vegetation management direction set forth in the SRLA focuses on conserving the most important components of lynx habitat: a mosaic of young and mature multistory forests with high levels of horizontal cover and coarse woody debris. These components will sustain lynx habitat and the snowshoe hare prey base across all seasons. The standards will be applied for all vegetation management actions in lynx habitat, with

exceptions that may be applied. Collectively, application of the standards for vegetation management is expected to minimize adverse effects on lynx and promote the survival and recovery of lynx populations.

Objectives and Standards in the SRLA pertaining to the CP District Wide Salvage Project and how they are addressed are included in Table 32 Below:

Table 32. Lynx objectives and standards.

Objectives and Standards	Description	*Alternative 2*	*Alternative 3*
Objective VEG O1	**Manage vegetation to mimic or approximate natural succession and disturbance processes while maintaining habitat components necessary for the conservation of lynx.**	*Meets: Proposed salvage activities occur in areas close to roads with >80% mortality of the overstory and represents approximately 11% of the spruce-fir on the district. It will provide a mosaic of habitat ages and patterns across the landscape. Tree planting post-harvest will promote hare habitat where it would otherwise be insufficient to support snowshoe hare for decades or centuries. The small patches that have regeneration will be protected through the application of PDFs. Additionally, course woody debris would be maintained within both the project area and landscape scales through snag and woody debris PDF and minimal potential for salvage harvest in the surrounding areas.*	*Meets: Proposed salvage activities occur in areas close to roads with >80% mortality of the overstory and represents approximately 6% of the spruce-fir on the district. It will provide a mosaic of habitat ages and patterns across the landscape. Tree planting post-harvest will promote hare habitat where it would otherwise be insufficient to support snowshoe hare for decades or centuries. The small patches that have regeneration will be protected through the application of PDFs. Additionally, course woody debris would be maintained within both the project area and landscape scales through snag and woody debris PDF and minimal potential for salvage harvest in the surrounding areas.*
Objective VEG O2	**Provide a mosaic of habitat conditions through time that support dense horizontal cover, and high densities of snowshoe hare. Provide winter snowshoe hare habitat in both the stand initiation structural stage and in mature, multi-story conifer vegetation.**	*Meets: Tree planting post-harvest will promote hare habitat where it would otherwise be insufficient to support snowshoe hare. The combination of existing openings that support healthy immature trees, the proposed treatment areas, and the existing untreated spruce-fir stands in the project area suggest that a mosaic of habitat conditions will be provided through time.*	*Meets: Tree planting post-harvest will promote hare habitat where it would otherwise be insufficient to support snowshoe hare. The combination of existing openings that support healthy immature trees, the proposed treatment areas, and the existing untreated spruce-fir stands in the project area suggest that a mosaic of habitat conditions will be provided through time.*
Objective VEG O4	**Focus vegetation management in areas that have potential to improve winter snowshoe hare habitat but presently have**	*Partially Meets: While salvage harvest represents 11% of the spruce-fir forest in the project area and some project design features are included to aid in the protection of snags and understory*	*Meets: Alternative 3's design is based on this objective, where focus is placed on low-quality habitats across the district and subsequent planting will promote future habitat.*

	poorly developed understories that lack dense horizontal cover.	*components, Alternative 2 represents salvage harvest in all feasible areas and does not document a design that focuses unit placement on lower quality habitats.*	
Standard VEG S1	**If more than 30% of the lynx habitat in an LAU is currently in a stand initiation structural stage that does not yet provide winter snowshoe hare habitat, no additional habitat may be regenerated by vegetation management projects.**	*Meets: No LAU is anticipated to exceed 30% SISS under this alternative given estimated post-beetle habitat conditions and proposed activities. Monitoring checklists will ensure compliance with S1.*	*Meets: This alternative has even less potential to exceed 30% in SISS given that there are fewer proposed salvage activities. Monitoring checklists will ensure compliance with S1.*
Standard VEG S2	**Timber management projects shall not regenerate more than 15% of lynx habitat on NFS lands within an LAU in a ten-year period. * Salvage harvest within stands killed by bugs does not add to the 15%, unless the harvest treatment changes the habitat to unsuitable.**	*Meets: Even assuming under the maximum treatment scenario of 100% conversion of all proposed salvage in suitable habitat, Conejos Canyon LAU has the highest percentage at approximately 14.1%, however no other projects have occurred in the prior 10 years and actual regeneration from salvage would be less. Second most is the Alamosa LAU with approximately 11.8% (Table 8). Alamosa LAU was last affected by the Burrow Blowout project, with 330 acres or 1% converted to date. All other LAUs are well below the standard. Project compliance and monitoring checklists will ensure compliance with S2.*	*Meets: Alternative 3 proposes approximately half the salvage harvest as Alternative 2 and similarly will meet this standard. Additionally, monitoring and compliance checklists will ensure compliance with S2*
Standard VEG S5	**Precommercial thinning practices and similar activities intended to reduce seedling/sapling density are subject to limitations from the stand initiation structural stage until the stands no longer provide winter snowshoe hare habitat.** *(See SRLA implementation guide for exceptions and exemptions).*	*Meets: Precommercial thinning is being conducted under the hazardous fuels component of the project. Suitable habitat exists in most of the proposed fuel treatments, however is not anticipated to exceed the 3% WUI exemption or additional 1% under exception 5 in any LAU. Approximately 556 acres would count towards the WUI exemption, leaving approximately 375 acres under the 1% cap per LAU under exception 5. Conejos Canyon would be the closest at 0.55%. Monitoring and compliance checklists will ensure compliance with S5.*	*Meets: Precommercial thinning is being conducted under the hazardous fuels component of the project. Suitable habitat exists in most of the proposed fuel treatments, however is not anticipated to exceed the 3% WUI exemption or additional 1% under exception 5 in any LAU. Approximately 556 acres would count towards the WUI exemption, leaving approximately 375 acres under the 1% cap per LAU under exception 5. Conejos Canyon would be the closest at 0.55%. Monitoring and compliance checklists will ensure compliance with S5.*

Standard VEG S6	**Vegetation management projects that reduce winter snowshoe hare habitats in multi-story mature or late successional conifer forests may occur only (VEG S6 Exceptions):** **1. Within 200 feet of administrative sites, dwellings, outbuildings, recreation sites, and special use permit improvements, including infrastructure within permitted ski area boundaries; or** **2. For research studies or genetic tree tests evaluating genetically improved reforestation stock; or** **3. For incidental removal during salvage harvest (e.g., removal due to location of skid trails); or** **4. Where uneven-aged management (single tree and small group selection) practices are employed to maintain and encourage multi-story attributes as part of gap dynamics. Project design must be consistent with VEG O1, O2 and O4, except where impacts to areas of dense horizontal cover are incidental to activities under this exception (e.g., construction of skid trails).**	*Meets: The primary component of this project is spruce salvage, which would meet exception 3. Hazardous fuels treatments meet the WUI exemption and exceptions would include #1, within 200ft of administrative sites or other structures.*	*Meets: No salvage harvest would occur in stands that meet VEG S6.* *Hazardous fuels treatments meet the WUI exemption and exceptions would include #1, within 200ft of administrative sites or other structures.*
Objective ALL O1	**Maintain or restore lynx habitat connectivity in and between LAUs, and in linkage areas.**	*May meet: Timber harvest represents approximately 11% of the spruce-fir on the Conejos Peak RD. While within-LAU connectivity may be limited in some areas, overall the available untreated forest should retain sufficient connectivity across the district. Designated lynx linkage areas are not involved in the project.*	*Meets: Timber harvest represents approximately 6% of the available spruce-fir forest on the district. Less harvest in combination with additional connectivity and leave island PDC's act to ensure sufficient connectivity within and between LAUs. Designated lynx linkage areas are not involved in the project.*

Effects Determination Summary

It is my determination that the proposed action under Alternative 2 "*May affect, and is likely to adversely affect"* Canada lynx for the following reasons:

- Habitat within the proposed treatment units includes high-quality lynx habitat that may be converted to lower quality habitat.
- Presence of lynx is determined to be likely or otherwise known.
- Although effects on lynx are expected, Standards and Guidelines within the SRLA will continue to be met within the LAU.
- Potential human disturbance associated with implementation of the project will occur for a limited period of time (weeks or months depending on size of unit and harvesting efficiency).
- The project is not located within a lynx linkage area.
- There will be a change to the Environmental Baseline within the LAUs as the result of the project, however, all LAUs are anticipated to meet the Conservation Measures and management direction within the SRLA and the conditions of the programmatic concurrence.

It is my determination that the proposed action under Alternative 3 "*May affect, and is likely to adversely affect"* Canada lynx for the following reasons:

- Habitat within the proposed treatment units are of lower quality, suggesting that potential effects to lynx from silvicultural treatments may be reduced as compared to Alternative 2.
- Evidence of snowshoe hares is rare within low-quality lynx habitat suggesting that potential effects on primary prey species from silvicultural treatments may be reduced.
- Lynx use of the proposed treatment units is likely to occur but concentrated use is presumed to be low.
- Standards and Guidelines within the SRLA will continue to be met within the LAU.
- Potential human disturbance associated with implementation of the project will occur for a limited period of time (weeks to months), however the effects are presumed to be less as concentrated use areas would have reduced silviculture treatments.
- The project is not located within a lynx linkage area.
- There will be a change to the Environmental Baseline within the LAUs as the result of the project, however, all LAUs will continue to meet the Conservation Measures and management direction within the SRLA and the conditions of the programmatic concurrence.

As provided in 50 CFR §402.16, re-initiation of consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not previously considered; or (4) a new species is listed or critical habitat designated that may be affected by the action.

Table 33. Effects determination for Threatened, Endangered and Proposed species.

Species	Determination	Rationale	PDFs
Canada lynx (T) *Lynx canadensis*	May Affect, Likely to Adversely Affect	>8,000 acres of lynx habitat may be affected by the project, including in areas known to harbor breeding lynx. However, the project only proposes to harvest in 11% of the spruce forest type on the district as a maximum under Alternative 2.	See App. A
Mexican spotted owl (T) *Strix occidentalis lucida*	No Effect	No habitat within project area.	N/A
Southwestern willow flycatcher (E) *Empidonax trailii extimus*	No Effect	No habitat within the project area.	N/A

Uncompahgre fritillary butterfly (E) *Boloria acrocnema*	No Effect	No habitat within the project area.	N/A
New Mexico Jumping Meadow Mouse (E) *Zapus Hudsonius Luteus*	No Effect	No habitat within the project area.	N/A
Yellow-Billed Cuckoo (T) *Coccyzus americanus*	No Effect	No habitat within the project area.	N/A
Gunnison Sage-Grouse (T) *Centrocercus minimus*	No Effect	No habitat within the project area.	N/A
North American Wolverine (P) *Gulo gulo luscus*	No Effect	Not known to occur in Colorado, let alone the project area.	N/A

Analysis of Effects to Sensitive Species

Pre-field reviews and habitat analysis determined that suitable habitat exists for nine sensitive species within the project area (western bumble bee, boreal toad, leopard frog, northern goshawk, boreal owl, flammulated owl, olive-sided flycatcher, American marten, and hoary bat). These nine species are further analyzed for the Conejos Peak District Wide Salvage Project. ***While species specific presence/absence surveys did not occur for most species or in all areas, surveys will occur prior to implementation in order to inform application of project design features. Survey results will be documented on project checklists and in the project file.***

Species having no suitable habitat and/or have no reasonable probability of occurring within or near the salvage units are not analyzed in further detail. This project will have ***no impact*** on these species which include: the Great basin silverspot butterfly, Monarch butterfly, Ferruginous hawk, Northern harrier, Sage sparrow, Brewer's sparrow, Lewis's woodpecker, Peregrine falcon, Loggerhead shrike, White-tailed ptarmigan, Mountain plover, Burrowing owl, Black swift, Townsends's big-eared bat, fringed myotis, Gunnison's prairie dog, Bighorn sheep and River otter.

Spatial and Temporal Context

The spatial analysis area varies by species and reflects the area within which the species could be directly or indirectly affected by the action (see 'action area' 50 CFR 402.2). For the goshawk, for instance, the analysis area consists of the treatment areas (footprint of project activities) plus a distance representing a median home range (1.0 miles around known goshawk nests).

Temporal bounding for the analysis is both short-term and long-term. Short-term consists of the time required for project implementation and the time in which vegetation begins to respond to treatments (ten to fifteen years of project implementation). Long-term extends to as much as 100 years into the future (canopy establishment).

Alternative 1. No Action

Effects to species are dependent on habitat needs and the timeframe involved. Species requiring mature, late-successional spruce-fir habitat are anticipated to decline in abundance and distribution forest-wide as a result of the beetle outbreak and other subsequent timber salvage projects. These include species such as the boreal owl, brown creeper, and American marten. Species experiencing negligible or minor effects may include the northern goshawk and olive-sided flycatcher. The northern goshawk rarely nests within the spruce-fir zone and nest trees are typically in aspen. While some negative effects to foraging habitat and some prey species may occur over time, the goshawk is a mature-forest generalist and is anticipated to adapt to the changed condition. The olive-sided flycatcher prefers openings within the spruce-fir zone, and thus may benefit from the changing conditions. While the forest structure is anticipated to close in the next 30-50 years, species that require forest openings or open canopy stands would generally benefit in the short- to mid-term as sunlight hitting the forest floor increases. Species such as the western bumble bee may benefit from the increase in

flowering plants. Other species like elk or deer may benefit from the increased available forage in the short- to mid-term.

One important consideration for the effects of no action is timeframe. While the beetle outbreak spread quickly across the forest, impacts to stand structural conditions are more gradual. Individuals and populations have time to adapt, and over time the stand conditions are anticipated to be more varied in age classes, structural complexity, and species composition than current conditions.

Effects of Action Alternatives 2 and 3 on Sensitive Species

Table 34. Effects of Alternatives 2 and 3 on sensitive species where presence is documented or presumed and suitable habitat occurs within or near the proposed action.

Species	Determination	Rationale
INSECTS		
Western Bumble Bee ***Bombus occidentalis***	May Impact Individuals, but is not likely to cause a trend towards Federal listing or result in loss of viability in the planning area. Long-term beneficial.	Project activities could result in limited short-term loss of flowering plants during harvest activities. Net gain in understory productivity and flowering plants the long-term.
AMPHIBIANS		
Boreal toad ***Bufo boreas boreas***	No measurable effect.	No known populations nearby and treatment areas are not in close proximity to standing water.
Northern leopard frog ***Rana pipiens***	No measurable effect.	Incredibly rare on district, though one known population close to a proposed treatment area. Project design and PDC would result in negligible impacts to the species.
BIRDS		
Boreal owl ***Aegolius funereus***	May Impact Individuals, but is not likely to cause a trend towards Federal listing or result in loss of viability in the planning area.	There is a remote possibility that nesting birds could be temporarily displaced and may possibly abandon nests due to project activities. Some loss of nesting and foraging opportunities within the treatment area.
Flammulated owl ***Otus flamineolus***	May Impact Individuals, but is not likely to cause a trend towards Federal listing or result in loss of viability in the planning area.	Project activities could result in limited disturbance to this species.
Northern goshawk ***Accipter gentiles***	May Impact Individuals, but is not likely to cause a trend towards Federal listing or result in loss of viability in the planning area.	There is a remote possibility that nesting birds could be temporarily displaced and may possibly abandon nests due to project activities. Some loss of nesting and foraging opportunities within the treatment area.
Olive-sided flycatcher ***Contopus borealis***	May Impact Individuals, but is not likely to cause a trend towards Federal listing or result in loss of viability in the planning area.	Project activities could result in limited disturbance to this species.
MAMMALS		
American marten ***Martes Americana***	May Impact Individuals, but is not likely to cause a trend towards Federal listing or result in loss of viability in the planning area.	There is a remote possibility that denning individuals could be impacted. Some loss of denning and foraging opportunities within the treatment area.
Hoary Bat ***Lasiurus cinereus***	May Impact Individuals, but is not likely to cause a trend towards Federal listing or result in loss of viability in the planning area.	Project activities could result in limited disturbance to this species.

Effects to Management Indicator Species

The Forest Plan, as amended, contains 9 Management Indicator Species (MIS). All MIS with habitat in the analysis area that could be potentially impacted by the project were evaluated. MIS

species not addressed either have no habitat in the area or have limited habitat and are not expected to be impacted by the project. Such species include pygmy nuthatch, Wilson's warbler, Lincoln's and vesper sparrows and Rio Grande cutthroat trout.

The rationale for level of analysis of MIS for this project is summarized below, followed by a more detailed discussion.

Species Further Evaluated

For avian MIS, project level population information is an estimate of potential densities, based on species biology and suitable habitat that is presumed to be occupied. Because MIS were fairly recently amended into the Forest Plan and avian MIS surveys specific to the Forest were only initiated in 2004, available trend data is derived from existing sources, such as the Rocky Mountain Bird Observatory (RMBO) Monitoring Colorado Birds (MCB) program, the Colorado Land Bird Conservation Plan, and the Colorado Breeding Bird Atlas project, which are currently the primary sources of multi-year monitoring data. Until Forest-wide trend data are established via Forest-wide monitoring protocols, avian MIS population data at the Forest level are of necessity, estimated from known acreages and distributions of habitat types and structural associations, and species habitat affinities, but are considered within the context of available trend data at larger scales. Project level surveys documented species presence and habitat occupancy for all four of these species.

For deer and elk, population trends are tracked by the Colorado Division of Wildlife at the Data Analysis Unit level. Specific habitat, risk factors and project potential effects for the four selected MIS is as follows.

Table 35. Summary of the Forest's MIS species and rationale for their analysis for the CP District-wide Salvage Project.

MIS	Habitats Represented	Rationale for Selection in Forest Plan	Rationale for Detailed Evaluation for the Analysis Area	Rationale for Dismissal From Detailed Analysis
Brown creeper	Mature to late successional spruce/fir and mixed conifer (LTAs 1, 3, 13;	Species has a close association with structural elements that occur under older forest conditions, including large tree diameters and older snag component. May respond to certain threats, management, and conservation activities in spruce/fir forests (Colorado Bird Conservation Plan).	To assist in monitoring whether Forest Plan standards and guidelines for biodiversity are being met, with an emphasis on snag management.	Further Analyzed
Hermit thrush	Mature to late successional spruce/fir and mixed conifer (LTAs 1, 3, 13;	Species primarily associated with spruce/fir and is commonly associated with, but not restricted to, older forest structure. May respond to certain threats, management, and conservation activities in spruce/fir forests (Colorado Bird Conservation Plan). Tied to complex structural forest elements; may represent mature to late successional forest floor characteristics. Timber and/or fire management may affect quantity and/or quality of habitat, such as coarse woody debris.	To assist in monitoring whether Forest Plan standards and guidelines for biodiversity are being met, with an emphasis on coarse woody debris and understory vegetation.	Further Analyzed
Elk	Forest-wide (All LTAs)	Special interest locally (i.e., economic and recreational value). May be competing with other native ungulates and livestock. Sensitive to roads and related disturbance.	To assist in monitoring whether Forest Plan standards and guidelines are being met for wildlife, with an emphasis on roads.	Further Analyzed

MIS	Habitats Represented	Rationale for Selection in Forest Plan	Rationale for Detailed Evaluation for the Analysis Area	Rationale for Dismissal From Detailed Analysis
Mule deer	Forest-wide (All LTAs)	Special interest locally (economic and recreational value). Sensitive to roads and related disturbance. A habitat generalist but also associated with early successional stages for forage.	To assist in monitoring whether Forest Plan standards and guidelines are being met for wildlife, with an emphasis on forest management issues that influence the early successional stages of plant communities.	Further Analyzed
LTA = Landtype Association (defined in Appendix B and in the Forest Plan FEIS page 3-41).				

Table 36. Summary of effects to Management Indicator Species by Alternative 2.

SPECIES	Proposed Action
BIRDS	**Mature to late successional spruce/fir and mixed conifer**
Brown Creeper To assist in monitoring whether Forest Plan standards and guidelines for biodiversity are being met, with an emphasis on snag management.	Disturbance and displacement could occur from human activities on 18,000 acres (2.8%) of the Forests potential habitat. Some nest destruction could also occur. Some mature green trees will remain. Individuals may disperse into other nearby habitat due to significant structural change in the treatment area. No discernable effect on population persistence or viability at the Forest Level.
Hermit Thrush To assist in monitoring whether Forest Plan standards and guidelines for biodiversity are being met, with an emphasis on coarse woody debris.	Disturbance and displacement could occur from human activities on 18,000 acres (2.8%) of the Forests potential habitat. Some nest destruction could also occur. Some mature green trees will remain, however, individuals may disperse into other nearby habitat due to significant structural change in the treatment area. No discernable effect on population persistence or viability at the Forest Level.
MAMMALS	
Elk - To assist in monitoring whether Forest Plan standards and guidelines are being met for wildlife, with an emphasis on roads.	Activities will most likely result in temporary displacement or temporary changes in elk behavioral patterns. This displacement is expected to be short term with elk use returning to the same level or even greater level due to an increase in forage quality and quantity. Open road density under the proposed action will remain the same as if no action were taken; therefore the proposed action is not expected to have any lasting effect on habitat effectiveness. There would be no discernable change in population trends at the DAU level.
Mule Deer - To assist in monitoring whether Forest Plan standards and guidelines are being met with an emphasis on management issues that influence the early successional plant communities.	Activities will most likely result in temporary displacement or temporary changes in mule deer behavioral patterns. This displacement is expected to be short term with use returning to the same level or even greater level due to an increase in early successional forage quality and quantity. There would be no discernable change in population trends at the DAU level.

MIGRATORY BIRDS

Neotropical migratory land birds (NTMB) are those that breed in the U.S. and winter south of the border in Mexico, Central and South America. Resident landbirds include those that remain during the winter period, or move to winter habitats that occur primarily within the U.S. border.

Direction concerning land bird conservation in Forest Service Region 2 is to reference the 2008 Birds of Conservation Concern list produced by the U.S. Fish and Wildlife Service for Bird Conservation Regions (BCRs) when completing National Environmental Policy Act (NEPA) evaluations for project activities. Furthermore, Forest Service units are encouraged to interface with the State and Bird Conservation Region working groups for actions and objectives to pursue concerning migratory bird conservation.

Bird Conservation Regions consist of a hierarchical framework of nested ecological units that allow for the use of multiple scale-specific approaches to on-the-ground management. Bird Conservation Regions encompass areas that become progressively more ecologically similar as the units are stepped-down to a smaller scale. At the smallest and most local scale, the physiographic area is used for bird conservation efforts. State groups such as local Partners-In-Flight Chapters are the primary workforce involved with translating the BCR information into conservation action at the local scales.

There are 37 BCRs in North America with four of these occurring at least partially in Colorado. The Rio

Grande National Forest occurs within the Southern Rockies Colorado Plateau Bird Conservation Region (BCR 16), which encompasses portions of Colorado, New Mexico, Arizona, Utah and Wyoming. Information from BCR 16 was synthesized for use in Colorado through the development of the Birds of Conservation Concern list and the Colorado Landbird Conservation Plan (Beidleman 2000, Rich et al. 2004). Thus, at the finest scale of analysis, the Rio Grande National Forest occurs within the Southern Rocky Mountains Physiographic Area (Area 62) of the Southern Rockies Colorado Plateau Bird Conservation Region. The following table displays the Birds of Conservation Concern for BCR 16, their status within the project area, and projected influence from the Conejos Peak District Wide Salvage Analysis.

Table 37. FWS Birds of Conservation Concern for BCR 16 and the anticipated influence of the action and no action alternatives on their conservation needs (USFWS 2008).

Species	General Habitat	Occurrence in Analysis Area	Effect of Alternatives
Northern Harrier	Grasslands	Yes (observed during fall migration @ Red Lake)	Evaluated as an R2 sensitive species; No Effect (No habitat present).
Swainson's Hawk	**Grasslands**	**Yes, several known territories @ record high elevations**	**Several known high-elevation territories may be impacted by project activities.**
Ferruginous Hawk	Prairie	No	Evaluated as an R2 sensitive species; No Effect (No habitat present)
Golden Eagle	**Cliffs/grasslands**	**Possible, wide ranging**	**No Effect; No known nests in the area. Only spruce-fir zone impacted.**
Peregrine Falcon	Cliffs	No	Evaluated as an R2 sensitive species; No Effect.
Prairie Falcon	Cliffs	No	No Effect. (No known nests near project areas).
Gunnison sage-grouse	Sagebrush	No	Evaluated as an R2 sensitive species; No Effect (No habitat).
Snowy Plover	Shorelines	No	No Effect (No habitat present)
Mountain Plover	Prairie	No	Evaluated as an R2 sensitive species; No Effect. (No habitat present).
Solitary Sandpiper	Shorelines	No	No Effect (No habitat present).
Marbled Godwit	Wetlands	No	No Effect (No habitat present).
Wilson's Phalarope	Waterbodies/Shorelines	No	No Effect (No habitat present).
Yellow-billed Cuckoo	Deciduous Riparian	No	Evaluated as an FWS TEP species; No Effect. (No habitat present).
Flammulated Owl	**Ponderosa pine/snags**	**Possible**	**Evaluated as an R2 sensitive species; May Affect.**
Burrowing Owl	Plains/grasslands	No	Evaluated as an R2 sensitive species; No Effect. (No habitat present)
Short-eared Owl	Parks/grasslands	No	No Effect. (No habitat present).
Black Swift	Waterfalls/wet cliffs	No	Evaluated as an R2 sensitive species; No Effect. (No habitat present)
Lewis's Woodpecker	Riparian Cottonwood	No	Evaluated as an R2 sensitive species; No Effect (No known occurrences.
Williamson's Sapsucker	**Montane forests/snags**	**Possible**	**May Effect. Potential for direct mortality and disturbance.**
Gray Vireo	Oak woodlands/scrub	No	No Effect. (No habitat present).
Pinyon Jay	Pinyon/Juniper	No	No Effect. (No habitat present).
Bendire's	Rare spp of arid areas	No	No Effect. (No habitat present).

Thrasher			
Crissal Thrasher	No records in CO.	No	No Effect. (No habitat present).
Sprague's pipit	No records in CO.	No	No Effect. (No habitat present).
Virginia's warbler	Riparian shrub	No	No Effect. Species occurrence unlikely and no impact upon this habitat type.
Black-throated gray warbler	Oak scrub/riparian	No	No Effect. (No habitat present).
Grace's warbler	Ponderosa pine	No	No Effect. (No habitat present).
Sage sparrow	Sagebrush	No	No Effect. (No habitat present).
Chestnut-collared longspur	Plains	No	No Effect. (No habitat present).

The Colorado Landbird Conservation Plan identified priority species and habitats for each physiographic area in the state based on the Partners-In-Flight Species Prioritization Process (Beidleman 2000, Rich et al. 2004).

Priority habitats identified for the Southern Rocky Mountains Physiographic Area include alpine tundra, aspen, cliff/rock, high elevation riparian, lowland riparian, mixed-conifer, mountain shrubland, ponderosa pine, sagebrush shrubland, spruce-fir, and wetlands.

Several of these habitat types occur within the project area (aspen, high elevation riparian, mixed conifer, spruce fir, alpine tundra, cliff/rock, etc.), *with only spruce-fir and a minor aspen occurring within the treatment area.* The priority habitats and species that occur within the project area are included below.

Table 38. Priority habitats and species of the Southern Rocky Mountains province and their relationship to the CP District-wide Salvage Project area.

Priority Habitat Type	BCP Priority Species	BCP Potential Issues(s)	Potential Influence from Project Activities	Effect of Alternatives
Alpine Tundra	White-tailed ptarmigan American pipit Brown-capped rosy finch	Fragile habitats; Specialized Species.	N/A	Priority habitat is not present in the proposed treatment areas.
Aspen	**Red-naped sapsucker Purple martin Violet-green swallow**	**Grazing, snag habitat, Altered disturbance regimes**	**YES**	Decrease in snags surrounding aspen and potential for direct mortality in spruce snags. Project will benefit aspen in the long-term.
Cliff/Rock	Peregrine falcon Black swift	Rock climbing; mining	N/A	Priority habitat is not present in the proposed treatment areas.
High Elevation Riparian	**Cordilleran flycatcher American dipper MacGillivray's warbler Wilson's warbler**	**Grazing, Recreation impacts**	**No major issues identified from the proposed project.**	Minimal influences anticipated overall because riparian areas are protected by PDC's and are not proposed for treatment. Some edge influence from nearby harvest areas.
Lowland Riparian	Lewis' woodpecker Lazuli bunting	Development, roads, grazing, recreation	N/A	Priority habitat is not present in the proposed treatment areas.
Mixed Conifer	**Dusky grouse Williamson's sapsucker**	**Altered disturbance regimes, snags, timber mgmt.**	**Possible**	Decrease in snags in nearby spruce-fir, no anticipated impacts to mapped mixed-conifer stands.
Mountain shrubland	Virginia's warbler Green-tailed towhee	Recreation, development, fire, grazing.	N/A	Priority habitat is not present in the proposed treatment areas.
Ponderosa Pine	Band-tailed pigeon Flammulated owl Mexican spotted owl Lewis's woodpecker Grace's warbler	Timber mgmt, snags, altered disturbance regimes, prescribed fire	N/A	Priority habitat is not present in the proposed treatment areas.

Sagebrush Shrubland	Sage-grouse Brewer's sparrow Sage sparrow	Conversion of sagebrush, grazing.	N/A	Priority habitat is not present in the proposed treatment areas.
Spruce/Fir	**Boreal owl Olive-sided flycatcher Hammond's flycatcher**	**Timber mgmt., snags, altered disturbance regimes**	**YES**	Boreal Owl and Flycatcher Evaluated as R2 sensitive species; May Impact individuals. Hammonds flycatcher = decrease in snags/mature spruce-fir and potential for direct mortality.
Wetland	Willet Short-eared owl	Wetland loss, development	N/A	Priority habitat is not present in the proposed treatment areas.

Summary of Effects of Alternatives on Migratory Birds

There are no major issues identified to the High Elevation Riparian group as a result of the Project as most project activity does not occur in this habitat type and existing Project Design Features are in place protecting riparian areas. Forest Plan Standards and Guidelines are in place to further protect and provide guidance for migratory birds including Forest Plan Standard 21:
"*Consider the effects of proposed management activities (forest and rangeland management, prescribed and wildland fire use, recreation, etc.) on resident and migratory birds. Incorporate conservation measures and principles, as appropriate, from local bird conservation plans (NABCI) and/or other references into project designs so that adverse effects are minimized."*

The Red-Naped sapsucker, Purple martin, Violet Green swallow, Dusky grouse, Williamson's sapsucker and Hammond's Flycatcher are species of migratory birds not already addressed in the Wildlife Report under another wildlife grouping. These species are typically found in aspen (Red-naped, purple martin and violet green swallow) mixed conifer (Dusky grouse) and spruce fir (Hammond's flycatcher) habitat types.

A decrease in snag habitat, decrease in post-disturbance structural complexity, and potential for direct mortality mainly upon nestlings is likely for these species from salvage logging. However, project design features are in place to protect snags and protect known active bird nests/cavities to reduce this potential threat. Some benefits of spruce beetle include the potential for additional forage for some species (Dusky grouse) as reduced cover means increased light hitting the forest floor with a subsequent flush in vegetation. Activities associated with the project - May Impact Individuals, but is not likely to cause a trend towards Federal listing or result in loss of viability in the planning area. There may be beneficial impacts to ground-nesting birds, such as grouse, due to an increase in understory shrub cover and blowdown or slash creating increased nesting opportunities.

These species will continue to be tracked in the Monitoring Colorado's Birds (MCB) Program, which includes transects on the Rio Grande National Forest, to determine population trends over time.

Cumulative Effects

Foreseeable future activities within and adjacent to the project area are discussed in detail in the Direct and Indirect Effects to Threatened and Endangered Species subsection of 3.4 Wildlife Section (page 79). Future federal activities include: Fuelwood gathering, grazing, recreation, and other minor permitted activities. The CP7 Cattle and Horse Allotment Project is concurrently moving forward and the proposed action will be adaptive and respond to resource conditions on the ground. It is expected that allotment conditions would improve with this project. Another upcoming proposal is the Trail Gulch project, which is very early in the planning stages. As previously stated for Threatened and Endangered species, including lynx, foreseeable future activities and activities adjacent to the project area are anticipated to have negligible impacts on sensitive species, management indicator species and migratory birds.

3.5 Aquatics and Fisheries

Scope of Analysis

The proposed activities associated with the CPDWS Project require a Biological Evaluation (BE) and Management Indicator Species (MIS) report to determine potential effects on endangered, threatened, proposed, and sensitive species (FSM 2672.42). The BE is intended to document the steps necessary to ensure a proposed management action will not likely jeopardize the continued existence or cause adverse modification of habitat for species listed or proposed to be listed as endangered or threatened by the USDI-Fish and Wildlife Service nor contribute to the loss of viability for species listed as sensitive by the USDA-Forest Service Region 2; nor cause any species to move toward federal listing (FSM 2672.41 and R2 Supplement 2600-2015-1). The BE also ensures that recommendations to reduce negative impacts for sensitive wildlife species are incorporated into the NEPA process, as well as opportunities for habitat enhancement. There are no federally listed or proposed fish species present in the project area so no Biological Assessment (BA) or Section 7 consultation is needed.

The Management Indicator Species (MIS) Report evaluates the potential effects of vegetative management treatments on aquatic MIS within the project analysis area in relationship to the diversity objectives and Standards & Guidelines in the Rio Grande National Forest Land and Resources Management Plan (Forest Plan). Input required to meet MIS objectives and Forest Plan Management direction is provided in more detail within the Fisheries Specialist Report and can be found in the project record.

Existing Condition

Major perennial streams within the project area include the Conejos River, Alamosa River, and the Rio de Los Pinos. Many other smaller streams are within the analysis area and have varying fisheries values depending on flows and elevation. There are numerous other small intermittent/ephemeral channels within the analysis area that do not sustain adequate flows to support a viable fishery but may have other riparian habitat values.

Access into and through the analysis area is via the primary Level 3 roads that are considered suitable for passenger cars and Level 2 roads more suitable for high-clearance vehicles. Both road levels are comprised of native surface material although Level 3 roads also often contain gravel. There are approximately 365 miles of system roads within the project area. Road systems in the project area often follow stream channels and are a primary concern for sedimentation delivery to stream systems. The road density for each watershed varies from 0.4 miles/square mile in the Elk Creek watershed to 2.5 miles/square mile in the Bighorn Creek and Fox Creek watersheds.

Riparian areas that support aquatic habitats occur on approximately 14% of the CPDWS Project area. Many of these areas in particular have a history of grazing and road-related impacts to aquatic habitats (see Watershed Section, DEIS). However, current baseline information suggests that most perennial streams and riparian areas within the project area are considered to be in fair to good condition, with an upward improving trend noted in most areas. Still, current impacts are evident with grazing and sediment-related road issues a primary concern.

Species information is based on the Update to the 1996 Revised Forest Plan Biological Evaluation in Support of the MIS Amendment (USDA Forest Service 2003a), RGCT Species Assessment (USDA Forest Service 2003b; USFWS 2014); USFS Technical Conservation Assessments and other information for Rio Grande Cutthroat Trout (*Oncorhynchus clarkii virginalis*), Rio Grande Sucker (*Catostomus plebeius*), and Rio Grande Chub (*Gila pandora*) (CPW 2017; Bestgen, et al. 2003; Fausch, et al. 2006; Reese et al. 2005; Reese and Miller 2005; Zuckerman and Langlois 1990); Conservation Agreement for Rio Grande Cutthroat Trout (RGCT Conservation Team 2013a); Rio Grande Cutthroat Trout Conservation Strategy (RGCT Conservation

Team 2013b); Colorado Division of Wildlife Fisheries Inventories; Range-wide Status of Rio Grande Cutthroat Trout (Alves, et al. 2007); Inland Cutthroat Trout Viewer/Editor database (2017) (http://icp.wygisc.org/) and internal records, documents, and field surveys.

Three USFS Region 2 sensitive fish species occur on the Rio Grande National Forest. The status of these species in relationship to the CPDWS Project is displayed below in Table 39.

Table 39. Region 2 Sensitive fish species and their relationship to the CP District-wide Salvage Project.

Sensitive Fish Species	Suitable habitat within the analysis area?	Species documented within the analysis area?	Basic Habitat Description
Rio Grande Cutthroat Trout *Oncorhynchus clarkii virginalis*	**Yes**	**Yes**	Streams, rivers and lakes. Most frequently found in headwater streams.
Rio Grande Chub *Gila pandora*	No	No	Flowing pools of headwaters, creeks and small rivers, often near inflow of riffles and in association with cover such as undercut banks and plant debris.
Rio Grande Sucker *Catostomus plebeius*	**Yes**	**Yes**	Pools, runs and riffles of small to moderately large streams; usually over gravel and/or cobble.

Existing information indicates that two R2 sensitive fish species – the Rio Grande Cutthroat Trout and Rio Grande Sucker – occur within the analysis area and may be influenced by activities associated with the action alternatives. These species will be analyzed in detail in the biological evaluation.

The Rio Grande Chub is not present and the analysis area is outside the estimated historical range for this species. Therefore, there will be *No Impact* on Rio Grande Chub or its habitat and no further evaluation is warranted.

Self-sustaining non-native trout populations are also found in the perennial streams throughout the analysis area. When not in conflict with native fish objectives, these populations are of high-value to local communities from a recreational fishery standpoint.

Local Survey/Occurrence Information

Core and Conservation populations of RGCT are typically restricted to smaller 6th and 7th-level streams and occupy approximately 154 miles in 30 streams and 14 surface acres in 3 lakes on the Rio Grande National Forest (Alves et al. 2007). Core populations are >99% genetically pure and represent the historic genome of the native trout. Conservation populations are self-sustaining RGCT populations that are >90% genetically pure and are managed at the same conservative level as core populations. Several recreational RGCT populations also occur within the CPDWS but are not part of conservation planning for the species and are not discussed in detail further.

There are seven Core RGCT populations and one Conservation RGCT population within the CPDWS Project area. Core Conservation populations of RGCT are found in Jim Creek, Torsido Creek, Lake Fork Conejos River, Rio de Los Pinos, Wolf Creek, Cascade Creek, and Osier Creek. One Conservation population of RGCT is found in Rhodes Gulch. A full discussion of these occurrences is in the Aquatics and Fisheries Report for this project.

Some fish populations within the project area appear to be affected by alterations in habitat conditions resulting in changes in population numbers, density, and biomass. Populations in Lake Fork Conejos River,

Wolf Creek, and Rhodes Gulch may have been impacted by timber management. Roads, permitted livestock, and other large ungulate use (i.e. elk, moose, and deer) have impacted some sections of the riparian areas leading to increased stream sedimentation from runoff and bank degradation in all populations. Concerns for Jim Creek, Torsido Creek, and Wolf Creek continue because of the presence of non-native trout and/or failed barriers, while overall stream condition in these streams appear to be good with only isolated areas of concern and habitat does not appear to be a limiting factor for their continued existence.

Baseline conditions for RGCT in the analysis area also involve the presence of nonnative trout that had been stocked historically. Brook Trout and/or brown Trout currently can be found co-existing with Core RGCT populations in Jim, Torsido, and Wolf creeks. These nonnatives can pose a threat to RGCT existence due to competition for space and food. Fish stockings and angling can also increase the risk of introduction of various fish diseases (whirling disease, bacterial kidney disease, etc.) and invasive species (e.g., zebra mussels). The CPDWS Project do not have applicability to interactions between RGCT and non-native species, and other focused fisheries related projects will be required to address this issue in the future. Concerns for Jim Creek, Torsido Creek, and Wolf Creek continue because of the presence of non-native trout and/or failed barriers, while overall stream condition in these streams appear to be good with only isolated areas of concern and habitat does not appear to be a limiting factor for their continued existence.

Local Survey/Occurrence Information – Rio Grande Sucker

Rio Grande Sucker (RGS) are known to occur in 12 streams within the Rio Grande Basin in Colorado. Only three of these streams are historic self-sustaining populations (none on Forest), the remaining populations were initially reestablished through stockings. Historic populations rarely occurred higher than 8,200 feet in elevation. Eight of the attempts for reestablishment were located on the Rio Grande National Forest, including Cascade Creek, Osier Creek, and Lake Fork Conejos River. Of these, only the population in the Lake Fork Conejos River remains. Rio Grande Sucker have been introduced into Lake Fork Conejos River within the CPDWS Project analysis area. Rio Grande Sucker have been stocked into this stream in 2005, 2007, 2015, and 2016, with another stocking in 2017. Rio Grande Sucker are only present between Big Lake and the barrier just above Rock Lake. Multiple age classes have been observed, including young of year indicating successful spawning and recruitment. Similar to RGCT, RGS in Lake Fork Conejos River have been or potentially impacted by many of the same issues including livestock grazing, mining and road construction/maintenance, which negatively impact riparian habitat and increases sedimentation (CPW 2003, 2005, 2017). Impacts to riparian and instream habitat from grazing, mining and road construction/maintenance can reduce instream and overhead cover and increase sedimentation, which in turn can reduce food availability, impact instream habitat and increase stream temperatures (Reese, et al. 2005).

Direct and Indirect Effects

Alternative 1 – No Action

Under the No Action alternative, an improving trend in aquatic habitat is likely to continue assuming that grazing management improvements and road drainage projects continue to be implemented and are successful. However, issues involving aquatic habitats remain in some areas and have the potential to prolong impacts to existing RGCT reproduction and population recruitment.

Native surface roads along the streams and within the riparian corridors are a primary influence on aquatic habitats in the CPDWS Project area. These concerns vary by watershed, with the percent of key RGCT watersheds with activity proposed varying from 0% (Headwaters of La Jara Creek watershed – Jim Creek and Torsido Creek) to 39% (Lake Fork Conejos River watershed). Existing culverts and stream crossings also contribute to aquatic habitat issues within the analysis area, and can be estimated by existing road density. Existing road density by watershed varies from a low of 0.7 miles/square mile in the Headwater La Jara Creek watershed (Jim Creek and Torsido Creek) to 1.7 miles/square mile in the Lake Fork of Conejos River watershed, the latter of which is of primary concern for both RGCT and RGS. The No Action

alternative would not contribute to these issues through additional disturbance associated with timber harvest and log haul.

From a spatial and temporal point of view, this alternative may have both positive and negative influences on aquatic habitats for fisheries. For example, the amount and distribution of standing dead and dying trees in various forest cover types may have the potential to influence physical attributes involving water flow and timing, thus increasing stressors on the fisheries resource during times of drought and late season flows. However, the potential effects associated with the loss of live tree basal area may be somewhat offset by increased growth in forest understory vegetation and riparian vegetation. Also, dead and dying trees along the riparian corridor will provide a source for large wood contributions to the stream and floodplain which is important for many aquatic species including trout and macroinvertebrates. Very high stand-level mortality rates may also lead to increased runoff and higher flows which can increase streambank instability and rates of soil erosion if streambanks are not in good condition. Increased sediment loading in the streams could lead to loss of spawning and overwintering pool habitat which could be detrimental to trout and aquatic insects which are important as a food source (Samman and Logan 2000). Thus, streambank stability as related to on-going activities and background sediment transport from native surface roads is important to aquatic habitat resiliency in response to forest health changes from insect and disease outbreaks and/or management responses.

Baseline conditions associated with existing forest vegetation concerns noted in DEIS also have implications for increased fuel loads that may be considered uncharacteristic for lower to mid-elevation fire regimes. Thus, although downed wood contributions to streams and floodplains can be beneficial to aquatic habitat values for fisheries, high tree densities and fuel loads can contribute to increased wildfire severity. Wildfires are a natural disturbance in the watersheds and their behavior and intensity can have a detrimental effect on stream conditions and fish populations. Floods following fires can contribute large amounts of ash and debris into stream channels resulting in fish kills and changes in stream channel geomorphology. Current baseline conditions suggest that a large portion of the analysis area may contribute to a moderate to high risk for wildfire and debris flows (see Appendix A: RGCT Wildfire Risk Assessment in the Fisheries BE and project folder (Nature Conservancy 2013)). Under the No Action alternative, fuel load trends associated with these risks may be expected to continue until a wildfire eventually does occur on a landscape scale.

Alternative 2 – Proposed Action

Project design does not allow mechanical treatments to take place on slopes steeper than 40%, and most proposed harvest activities are outside of the Aquatic Management Zone (AMZ) of most of the fish bearing streams and should therefore have minimal direct effect on the fishery resources, or potential RGCT habitat, within the project area. However, the potential for indirect effects from sedimentation that may influence aquatic habitats and fish-bearing streams is considered moderate under this alternative. This is due to the increase in activities in some watersheds, especially those with RGCT including Lake Fork Conejos River, which is estimated to have up to 39% of the watershed planned for treatment. In addition, disturbance will increase due to previously closed roads that will be opened to access the harvest areas, landings, log haul, burn areas, and other activities associated with Alternative 2. Forest Plan Standards & Guidelines and project design criteria associated with Alternative 2 (and all action alternatives) are intended and expected to minimize potential influences. However, the amount of activity proposed under Alternative 2 suggest a higher risk of negative influence which in turn will require increased sale administration, monitoring, and quick mitigation response in various weather conditions over several years of activity.

A primary means of meeting riparian and aquatic habitat objectives in Alternative 2 and all action alternatives involves the protections expected to be provided by buffers associated with the AMZ. For example, no commercial timber harvest or skid trails will occur within 100 feet of perennial and intermittent streams within the AMZ unless certain exceptions such as designated stream crossings apply.

Approximately 1,000 acres of fuels reduction is associated with Alternative 2. The fuel reduction treatments being proposed in WUI's are outside of AMZ areas and should have minimal if any effect on aquatic habitats or fisheries resources. The intent of these treatments is to reduce the potential for high-intensity wildfires near private or administrative sites, which typically would not impact watershed and aquatic habitats.

Road work is included in all action alternatives and some surface disturbances would occur during pre-haul road maintenance, during old road reconstruction, and construction and/or relocation of new temporary roads. Potential impacts associated with increased road use are a primary concern associated with the action alternatives. Negative impacts are expected to be controlled and minimized by implementing PDC's and Forest Plan standards; however, risks associated with sedimentation issues could be moderate to high depending on site-specific conditions and will need to be closely monitored. Any stream crossings needed for access will be coordinated with the forest hydrologist and/or fish biologist to minimize impacts to the stream/riparian areas and designed to provide aquatic species passage.

There are opportunities to meet a variety of integrated resource improvement objectives with the CPDWS Project, including completing additional road maintenance to reduce erosion and improve watershed condition. Some projects may be funded with Knutson-Vandenberg monies collected from timber sale receipts, if available, though additional funds will be requested from other sources as appropriate. All potential impacts associated with Alternative 2 are intended to be minimized to the extent that any negative influences on aquatic habitats and fisheries are non-measureable or short-term. Table 40 displays the level of treatment activities associated with Alternative 2 within key fisheries watersheds.

Table 40. Alternative 2 treatment activities in key RGCT watersheds.

Watershed (key stream)	Total Watershed Acreage in Analysis Area	Salvage Harvest (acres)	Fuels Treatment (acres)	Percentage of Watershed Treated
French Creek – Alamosa River (Rhodes Gulch)	18,302	2,106	160	12.4%
Headwaters La Jara Creek (Jim and Torsido creeks)	9,6645	0	0	0%
Lake Fork (Lake Fork Conejos River)	6,222	2,400	27	39.0%
Headwaters Rio de Los Pinos (Rio de Los Pinos)	16,356	1,189	31	7.5%
Toltec Creek – Rio de Los Pins (Cascade and Osier creeks)	18,055	929	46	5.4%
Wolf Creek (Wolf Creek	4,824	176	74	5.1%

The percentage of watershed acres treated in Alternative 2 is larger than Alternative 3 and may therefore require more administration and monitoring to ensure potential influences on streams and aquatic habitats are minimized as intended. Given the amount of area and activity proposed, at least moderate short-term risks might be associated with Alternative 2. However, effects are expected to be acceptable if Forest Plan standards and guidelines, project design criteria, and Watershed Conservation Practices Handbook practices are fully implemented and complied with, with response taken to mitigate unanticipated impacts or needs such as summer storm events or soil freeze/thaw conditions. Alternative 2 provides an opportunity to salvage timber while reducing existing road impacts, improving stream/riparian habitat, and sustaining and/or improve habitat for fish populations. Therefore, although short-term risks may be highest with Alternative 2,

the long-term risks can be minimized with focused administration and monitoring in RGCT and RGS streams, particularly in Lake Fork Conejos River.

Alternative 3 – Vegetation Management – Limited Action

Proposed harvest activities associated with Alternative 3 include activities on approximately 8,500 acres with similar erosion potential as Alternative 2. Alternative 3 also reduces the amount of the currently closed NFSR roads and old non-system roads that will need to be reopened for activities, thereby reducing the risk associated with required stream crossings and potential sedimentation issues. In Alternative 3, 31% fewer or 23.0 miles of old temporary road will need to be reopened, compared with 33.5 miles in Alternative 2. In addition, 22.5 miles of new temporary roads will need to be constructed, compared with 29.4 miles in Alternative 2. Thus, potential disturbances are reduced 27% overall from those proposed under Alternative 2.

Potential effects from Alternative 3 on aquatic habitats and fisheries values are expected to be less than Alternative 2, and involve much less risk of contributing to some of the negative baseline conditions associated with some aquatic habitats and fisheries resources in the CPDWS project area. A primary benefit of Alternative 3 is the reduction in salvage within key lynx habitats, which also includes key fisheries watersheds, while still addressing the need to move stand densities and fuel loads towards conditions associated with the historic fire regime in mid to lower elevation forest cover and vegetation types. In regards to management activities, all potential impacts associated with Alternative 3 are subject to the same design criteria and standards and guidelines as discussed for Alternative 2. Thus, potential impacts are expected to be controlled and minimized to the extent that any negative influences on aquatic habitats and fisheries are non-measureable or short-term in nature. However, given the reduced amount of activity area, the risk associated with potential negative influences is lower for Alternative 3. Table 41 displays the level of treatment activities associated with Alternative 3 within key RGCT watersheds.

Table 41. Alternative 3 treatment activities in RGCT watersheds.

Watershed (key stream)	Total Watershed Acreage in Analysis Area	Salvage Harvest (acres)	Fuels Treatment (acres)	Percentage of Watershed Treated
French Creek – Alamosa River (Rhodes Gulch)	18,302	1,028	160	6.5%
Headwaters La Jara Creek (Jim and Torsido creeks)	9,645	0	0	0%
Lake Fork (Lake Fork Conejos River)	6,222	851	27	14.1%
Headwaters Rio de Los Pinos (Rio de Los Pinos)	16,356	1,057	31	6.7%
Toltec Creek – Rio de Los Pins (Cascade and Osier creeks)	18,055	183	46	1.3%
Wolf Creek (Wolf Creek	4,824	110	74	3.8%

The percentage of watershed acres treated is much less than Alternative 2, thus fewer short-term risks to aquatic systems may be associated with alternative 3. However, effects are expected to be similar if Forest Plan standards and guidelines, project design criteria, and Watershed Conservation Practices Handbook practices are fully implemented, provide the intended effectiveness, and successfully complied with. As in Alternative 2, this alternative provides an opportunity to reduce wildfire risk, reduce road impacts, improve stream/riparian habitat, and sustain and/or improve fish populations.

Rio Grande Sucker

Extensive activity is proposed for the Lake Fork Conejos River watershed (up to 39%), which could impact RGS as well as RGCT as mentioned previously. This is the only RGS population within the Conejos Peak Ranger District and one of only a few on the Rio Grande National Forest. No effect is anticipated from the No Action alternative, but it is likely that this watershed will undergo some amount of impacts related to the timber salvage activity. With design criteria and conservation measures in place, it is possible that impacts can be mitigated to the RGS population in Lake Fork Conejos River. The overall effects of all action alternatives are expected to be similar to those described for the RGCT.

Cumulative Effects

Cumulative effects on aquatic habitats within the planning area are analyzed in the context of potential incremental impacts of the project alternatives when considered in addition to other past, present and reasonably foreseeable future actions on all federal and non-federal lands regardless of whom undertakes the action.

Timber harvest activities have occurred in the area for many years. Some remnant of those old harvest activities and also recreational activities remains on the land. These activities have created some detrimental soil conditions in locations, especially the older timber harvests. Increased sedimentation in areas that have high erosion potential can impact fisheries habitat, especially in key RGCT streams such as Rio de los Pinos and Wolf Creek.

Baseline conditions for aquatic habitats in the planning area have been influenced by various natural and human-caused disturbances since settlement in the late 1800's. Although not extensive, there has been a long history of timber harvest within some portions of the planning area. Timber sales have resulted in some surface disturbance, and necessitated the development of an extensive road system which opened many miles of native surface roads to motor vehicle traffic and recreation. Some existing roaded areas have altered the hydrologic cycle of the watersheds. There has also been a much longer history of livestock grazing, which is a primary activity affecting riparian areas and aquatic habitats in the planning area. Other activities affecting baseline conditions for aquatic systems include beaver removal, non-native fish introductions, and various recreational pursuits.

Camping, hiking, horseback riding, hunting, and firewood collection are on-going practices which have some effect in the analysis area. Cattle grazing has occurred and will continue to occur in the area. Riparian and open areas will see the most use by cattle. Usually, these uses have minor influences on riparian zones and stream health. However, concentrated use areas involving these activities do contribute to impacts to riparian vegetation, soil compaction and stream bank degradation in some areas.

Forest and range management activities can also contribute to the impact and spread of diseases and invasive species by conducting activities within and near stream zones that increase the potential for stream sediment. Sediment creates habitat for many hosts and vectors which can then be spread by direct transfer of spores/species in mud and water that may be on vehicles, equipment, and anglers gear that have crossed or have been used in infected waters.

Through state stocking programs, viable self-sustaining nonnative trout populations occur throughout the perennial streams within the analysis area. These stocking contribute recreational value for human uses but can also impact native trout populations where emphasized. Brook trout currently can be found co-existing with RGCT in Jim, Torsido, and Wolf creeks. These nonnative salmonids pose a threat to RGCT existence due to competition for space and food. Fish stockings and angling can also increase the risk of introduction of various fish diseases (whirling disease, bacterial kidney disease, etc.) and invasive species (e.g., zebra mussels), particularly when combined with the incremental impacts of sedimentation facilitated by activities associated with the CPDWS project.

Currently, most impacts within the analysis area are considered to be localized to individual stream sections with most streams and riparian areas exhibiting stable banks and that are in fair to good condition. However, sedimentation from native surface roads are a primary issue affecting aquatic habitats in the planning area, and some existing RGCT populations are decreasing and/or suppressed due to these potential impacts. The action alternatives associated with the CPDWS have the potential to contribute short-term additional incremental impacts to aquatic habitats, particularly in relationship to surface disturbances involving roads and road use. Under the action alternatives, re-opening and use of closed and (closed) temporary road prisms and construction of temporary roads may involve approximately 63.1 miles (Proposed Action Alt. 2) to 45.8 miles (Alternative 3). These roads would be in addition to the use of the existing open road system.

Project design criteria have been established that are intended to eliminate and/or minimize any additional impacts to stream areas. However, extensive monitoring of activities and quick corrective responses will be required to ensure potential impacts remain within or decrease from existing baseline conditions. Post-activity conditions on federal lands are expected to decrease potential impacts over time. Long-term impacts are expected to be minimalized by following Forest Plan standards and guidelines, project design criteria and Watershed Conservation Practices Handbook practices, in conjunction with focused project administration and monitoring.

3.6 Threatened, Endangered and Sensitive Plant Species

Scope of Analysis

This analysis is a summary of the biological evaluation prepared for the proposed CP District-wide Salvage Project EIS and complies with Forest Service Manual (FSM) 2600-2016-1 direction. The objectives of a biological evaluation are 1) to ensure that Forest Service actions do not contribute to loss of viability of threatened, endangered, proposed, or sensitive plant and animal species, or contribute to loss of viability of threatened, endangered, proposed, or sensitive plant and animal species, or contribute to a trend towards Federal listing under the Endangered Species Act, and, 2) to incorporate concerns for sensitive species throughout the planning process, identifying opportunities for enhancement and reducing any potential negative impacts.

The species addressed in this document are from the August 23, 2016 Rocky Mountain Region Sensitive Plant list signed by the Regional Forester and include only those species known or suspected to occur on the Rio Grande National Forest. The threatened, endangered and proposed species considered in this document were confirmed through the U.S. Fish and Wildlife Service (http://ecos.fws.gov/ecp/). There are no threatened, endangered or proposed (TES) species known or suspected to occur on the Forest so the preparation of a biological assessment was not necessary for this project.

The project area is approximately 332,000 acres and is the specific boundary evaluated for direct, indirect and cumulative effects for TES plant species.

Assumptions

- Use of project design features will minimize or reduce direct and indirect impacts to resources.
- Fens and wetlands will be avoided during project activities and no proposed actions will occur in these delicate, unique habitats.

Existing Condition

Threatened and Endangered plants are determined and listed by the USDI Fish and Wildlife Service (50 CFR §17). A review of the current FWS list confirmed that there are no reported records or suspected occurrences of threatened or endangered plants on the Rio Grande National Forest. Threatened and endangered plants in Colorado have unique habitats or ranges that do not occur on this Forest. There are also no plants proposed for listing or candidates for listing that occur on the Forest.

Documented occurrences of sensitive plants on the Forest came from Forest files, Forest Service personnel, pertinent literature and records from the Colorado Natural Heritage Program (CNHP 2017). An evaluation was conducted on the remaining species on the current Regional sensitive species list to judge the likelihood of occurrence on the Forest. Local forest data and GIS data from the Colorado Natural Heritage Program (CNHP 2017) were analyzed to determine known populations of sensitive species within the project area. Some field surveys were conducted for this project; however, the entire project area has not been surveyed for sensitive plants.

There are twenty-three sensitive plant species known to occur or with the potential to occur on the Rio Grande National Forest (Table 42). Of those, there are documented occurrences of three sensitive species (CNHP 2017) and sixteen species were determined to have habitat that would fall within the elevational and distributional ranges of the project area.

Table 42. Region 2 sensitive plant species known or suspected to occur on the Rio Grande National Forest.

Species	Habitat	Known to Occur on the RGNF	Potential Habitat in the Project Area
Stonecrop gilia *Aliciella sedifolia*	gravelly, talus alpine slopes >11,700 feet	Yes	Yes
Rydberg's golden columbine *Aquilegia chrysantha* var. *rydbergii*	shady and moist canyons near riparian areas <8,500 feet		Yes
Missouri milkvetch *Astragalus missouriensis* var. *humistratus*	Gambel oak communities on shale soils <8,600 feet		No
Aztec milkvetch *Astragalus proximus*	Gambel oak communities on shale soils <7,500 feet		No
Ripley's milkvetch ***Astragalus ripleyi***	**open ponderosa pine/ Arizona fescue <9,540 feet**	**Yes**	**Yes**
Winding mariposa lily *Calochortus flexuosus*	desert flats <7,300 feet		No
Lesser panicled sedge *Carex diandra*	calcareous wetlands < 9,600 feet		Yes
Yellow lady's slipper *Cypripedium parviflorum*	aspen/ponderosa pine/Douglas-fir forests 7,400-9,800 feet		Yes
Gray's draba *Draba grayana*	gravelly alpine slopes and fellfields 11,500-14,000’	Yes	Yes
Smith's draba *Draba smithii*	rock crevices and talus slopes 8,000-11,000 feet	Yes	Yes
Brandegee's buckwheat *Eriogonum brandegeei*	Volcanic soils containing bentonite clay, Elev. 5800 – 9600’		Yes
Chamisso's cottongrass *Eriophorum chamissonis*	peaty wetlands 10,500-12,500 feet		Yes
Slender cottongrass *Eriophorum gracile*	fens, wetlands, & pond edges 8,000-12,000 feet		Yes
Colorado tansyaster ***Machaeranthera coloradoensis***	**gravelly grassland slopes 8,500-12,500 feet**	**Yes**	**Yes**
Bill's neoparrya *Neoparrya lithophila*	rocky cliffs and rock outcrops <9,200 feet	Yes	Yes
Degener's beardtongue *Penstemon degeneri*	pinyon-juniper woodlands and grasslands 6,000-9,500 feet		Yes
Ice cold buttercup *Ranunculus karelinii*	exposed alpine rock and scree slopes 12,000-14,000 feet		Yes
Arizona willow ***Salix arizonica***	**streamside meadows 10,300-10,700 feet**	**Yes**	**Yes**

Species	Habitat	Known to Occur on the RGNF	Potential Habitat in the Project Area
Sageleaf willow *Salix candida*	nutrient-rich birch (*Betula glandulosa*) fens and pond/river edges 8,900-10,040 feet		No
Autumn willow *Salix serissima*	wetlands 7,800-9,720 feet		Yes
Fine Bog-moss *Sphagnum angustifolium*	iron fens (pH < 5.8) 9,600 – 11,483 feet	Yes	Yes
Baltic Bog-moss *Sphagnum balticum*	iron fens (pH < 5.8) around 10,200 feet		Yes
Lesser bladderwort *Utricularia minor*	fens, shallow ponds, lakes, and slow streams usually below 10,000 feet and often alkaline		Yes

Direct and Indirect Effects

The entire project area was considered as the spatial context for this analysis. Both action alternatives are analyzed collectively as the proposed activities for each of these alternatives propose the same effects on sensitive plants and only differ in spatial area and extent in which they may occur. Some species will be dropped from further effects analysis because their specific habitat requirements are not found within the project area nor is the species or its habitat suspected to occur near roads or proposed temporary roads for the action alternatives.

Project design criteria and the project-specific checklist process is integral to the effects analysis and determination for sensitive plants. The design criteria and checklist development were formed with an emphasis on reducing, if not eliminating, adverse effects to sensitive plant species and their habitat.

The following project design criteria will be employed for both action alternatives:

> *Surveys for TES species will occur prior to design of a project; Results of surveys will be incorporated into the project design and/or implementation per applicable Forest Plan Standards. Known occurrences of sensitive species will be flagged with a buffer for avoidance from salvage harvest and fuels reduction activities.*

Alternative 1 – No Action

Under the No Action Alternative, there would be no new impacts to sensitive plant species based on proposed activities. Therefore, under Alternative 1, there is a "*no impact*" determination for Region 2 sensitive plant species.

Alternative 2 – Proposed Action and Alternative 3 – Vegetation Management – Limited Action

Though they have never been found in the project area, there is overlap in the project area with potential habitat for the following species:

Aliciella sedifolia

Aquilegia chrysantha var. rydbergii

Carex diandra

Cypripedium parviflorum

Draba grayana

Draba smithii

Eriogonum brandegeei
Eriophorum chamissonis
Eriophorum gracile
Neoparrya lithophila
Penstemon degeneri
Ranunculus karelinii (R. gelidus ssp. grayi)
Salix serissima
Sphagnum angustifolium
Sphagnum balticum
Utricularia minor

Direct effects could occur from proposed salvage activities causing plants to be burned in piles, uprooted, crushed/trampled or skidded off by logs. Indirect effects could arise from changes in nearby canopy cover of associated forest vegetation from tree removal or changes in litter and duff layers from tree-removal, pile-burning or movement of machinery. Indirect effects could also be caused by compaction of soil and the reduction in plant cover, which can lead to the introduction of invasive plant species and an increase in erosion.

Most of these plants occur within specific and unique habitats (fens and wetlands, open, shale-based meadows, mesic, rocky crevasses) and not in spruce-dominated forests. Because activities associated with the action alternatives will not occur in these areas (see project design criteria), the determination for the aforementioned sixteen sensitive species is "*may adversely impact individuals, but not likely to result in a loss of viability on the Planning Area, nor cause a trend to federal listing*". With the implementation of the project design criteria and the pre-implementation checklist, effects to sensitive plant species are expected to be minor and of short duration.

Three sensitive species are known to occur within the project area: *Astragalus ripleyi, Machaeranthera coloradoensis* and *Salix arizonica*. Direct effects could occur from proposed salvage activities causing plants to be burned in piles, uprooted, crushed/trampled or skidded off by logs. However, during the pre-implementation field review and checklist process, if it is determined that there could be direct impacts to these populations due to proposed activities, maps of these areas will be provided with the appropriate mitigation. That mitigation could include buffered areas flagged for avoidance of activities particularly vehicle or machinery operations, temporary road building or locations of skid trails and landings.

Indirect effects could arise from changes in nearby canopy cover of associated forest vegetation or changes in litter and duff layers from tree-removal, pile-burning or movement of machinery. Indirect effects could also be caused by compaction of soil and the reduction in plant cover, which can lead to the introduction of invasive plant species and an increase in erosion. Indirect effects may be monitored throughout the implementation process in the vicinity of these populations.

With the employment of the project design criteria and project implementation checklist with associated mitigation (as necessary), the determination for *Astragalus ripleyi, Machaeranthera coloradoensis* and *Salix arizonica* is "*may adversely impact individuals, but not likely to result in a loss of viability on the Planning Area, nor cause a trend to federal listing".*

Per forest plan and FSM 2670 direction, site-specific evaluations and surveys for sensitive plant species will be conducted as project spatial data becomes available. The results of project specific analysis may trigger additional mitigation during the pre-implementation process based on the results of the field review.

Cumulative Effects

The relevant past, present, and foreseeable future activities for consideration in cumulative effects analysis for this specific project area includes consideration of past timber harvesting/thinning and wood gathering, wildlife herbivory, grazing, recreation, roads and trails and fire suppression and use.

There has been past timber cutting and wood gathering in the project area and there are current and foreseeable future plans for both of these activities neither of which specifically target sensitive species habitat. The spruce beetle outbreak in the Engelmann spruce is currently causing extensive spruce mortality and the subsequent opening of the forest might have a positive effect on early-seral sensitive species. Effects on sensitive plants from past big game grazing are not clear and they are not documented. Palatable, sensitive plants have likely evolved with wildlife over time, and there is no information to suggest that past, current, and foreseeable wildlife populations would be expected to have any appreciable effects on sensitive plants or their habitat. Additionally, livestock grazing has occurred in this area since the late 1800s and continues today. Effects on sensitive plants from past livestock grazing, if any, are not documented and are not well understood.

Roads and trails as well as dispersed recreation impact localized areas in potential sensitive species habitat. However, no new roads and trails are proposed in the project area and dispersed recreation use is mostly confined to designated routes (i.e., existing disturbance) and disturbance areas tend to be reused and are extremely small (i.e., camp sites, fire rings, etc.).

In the past, there has been widespread fire suppression activity, especially at the lower elevations and particularly in the last 50 years or so. Effects on sensitive plants from past fire suppression, if any, are not documented or well understood. Currently, and in the foreseeable future, there may be more use of prescribed fire to mimic natural fire regimes. This management action could open the canopy and increase crown base heights and have a potential positive effect on early seral sensitive plant species.

3.7 Hydrology and Watershed

Scope of Analysis

The spatial extent of this analysis is the approximately 332,000 acre project area.

Assumptions

During the completion of project implementation checklists and associated field work, critical areas such as wetlands, streams, and riparian areas will be identified and protected through a variety of measures and project design criteria will be employed to reduce effects to wetland resources.

Existing Condition

The project area is positioned immediately to the east of the continental divide and exhibits a hydrologic cycle that is dominated by mountain snowpack, which results in streamflow runoff patterns that have a pronounced snowmelt-driven spring peak with a recession to base flows by late summer. Monsoonal storms have potential to generate high, localized discharges from basins receiving precipitation. Additionally, early fall snowpack that is subsequently subjected to rainfall has the potential to generate discharges similar in magnitude to spring peak flows. Precipitation trends across the analysis area show a strong west to east trend, which closely follows elevation gradients. In the west, along the continental divide, mean annual precipitation can exceed 50 inches, while lower elevation areas in the eastern portion of the analysis area receive less than 20 inches. Most of the proposed salvage areas are in mid to upper elevations (9,500 ft. to 11,500 ft.) and receive approximately 35 to 45 inches per year of mean annual precipitation, the majority of which comes as snowfall.

The project area contains all, or substantial portions of 27 6th level watersheds (12 Digit Hydrologic Unit Code), shown in Table 29. However, of these 27 watersheds, only 16 have salvage activities within their boundaries under either the proposed or Alternative 3 actions. The remainder of this analysis will focus on the attributes of, and potential impacts to, the resources of these 16 watersheds.

The density of ephemeral, intermittent, and perennial streams identified in the National Hydrography (NHD) dataset ranges from a high of 9.0 miles per square mile in the upper northwestern corner of the project area (Wrightman Fork) to a low of 2.3 miles per square miles in the Saddle Creek watershed. Stream density generally follows the same trend as precipitation with the northwest corner of the project area have the highest stream densities, while the southeastern watersheds tend to be drier. Stream densities for all watersheds are shown in Table 29.

Due to a variety of factors associated with soils, climate, and topography, the distribution of riparian vegetation across the project area does not necessarily follow the same trends as stream density. In general, riparian vegetation in the project area occurs along valley bottoms next to perennial streams, or in large open wet meadows, particularly in the higher and wetter portions of project area. Based on Region 2 FSVeg data, riparian vegetation comprises between 2.8% (Bighorn Creek) and 10.9% (Wrightman Fork) of watershed area, for those watersheds where salvage activities will occur (Table 29). In addition to stream and riparian areas, the project area also hosts a wide variety of seeps, springs, and wetlands that are sustained via both ground and surface waters. Owing the difficulty of mapping wetlands, particularly fens, at a large scale, the National Wetland Inventory data for the project area substantially under represents the actual occurrence of wetlands in the project area and is not included in this discussion. During the completion of project implementation checklists for individual projects, field inventories of streams, wetlands, and riparian areas will be undertaken so as to inform project area boundaries and Existing Conditions.

The Forest Service utilizes the Watershed Condition Framework (WCF) to asses and characterize the health and condition of watersheds at the 6th level hydrologic unit code (HUC). Of the 16 6th level watersheds that have salvage harvest or fuels treatments in the action alternatives, 4 are rated as Class 1, and 12 are rated as Class 2. Class 1 or Good condition watersheds are functioning properly because they exhibit high geomorphic, hydrologic, and biotic integrity relative to their natural potential condition. Class 2 or Fair condition watersheds are functioning at-risk because they exhibit moderate geomorphic, hydrologic, and biotic integrity relative to their natural potential condition. Class 3 or Poor condition watersheds are at impaired function because they exhibit low geomorphic, hydrologic, and biotic integrity relative to their natural potential condition. There are no Class 3 rated watersheds in the area of any proposed salvage harvest or fuels treatments.

Table 43. Riparian and stream data for 6th level watersheds with proposed treatment activities.

	General HUC Data				Riparian Analysis		NHD Stream Analysis	
Watershed Name	Hydrologic Unit Code	Acres within the Analysis Area	Total HUC Area	% within the Analysis Area	Acres of R2FSVeg Riparian	Riparian % of HUC	Miles of NHD Streams	Stream Density (miles/sq. mile)
Bighorn Creek	130100050404	7854	11,289	69.6%	223	2.8%	57	4.6
Elk Creek	130100050402	27568	27,585	100.0%	2,917	10.6%	124	2.9
Fox Creek	130100050403	12664	21,175	59.8%	715	5.6%	58	2.9
French Creek-Alamosa River	130100020304	18302	23,160	79.0%	765	4.2%	146	5.1
Headwaters Alamosa River	130100020302	24161	24,193	100.0%	1,877	7.8%	268	7.1
Headwaters Rio de Los Pinos	130100050201	16356	16,362	100.0%	1,480	9.0%	96	3.8
Jasper Creek-Alamosa River	130100020303	11252	11,288	100.0%	237	2.1%	155	8.8
Lake Fork	130100050104	6222	6,224	100.0%	372	6.0%	31	3.1

Platoro Reservoir-Conejos River	130100050103	6695	6,697	100.0%	280	4.2%	41	3.9
Rough Creek-Conejos River	130100050401	17888	17,898	100.0%	2,107	11.8%	89	3.2
Saddle Creek	130100050105	4742	4,743	100.0%	116	2.4%	17	2.3
Sheep Creek-Conejos River	130100050405	27386	28,595	95.8%	1,471	5.4%	105	2.5
Toltec Creek-Rio de Los Pinos	130100050203	18055	32,784	55.1%	1,063	5.9%	110	3.9
Trail Creek-Conejos River	130100050109	21187	21,195	100.0%	1,483	7.0%	138	4.2
Wolf Creek	130201020203	4824	18,012	26.8%	154	3.2%	40	5.3
Wightman Fork	130100020301	10124	10,239	100.0%	1,098	10.9%	143	9.0

The most common causes of watersheds being downgraded from Class 1 to Class 2 include poor riparian conditions, invasive aquatic species, and reduced flows due to diversions on public lands. Additionally, several watersheds received reduced scores due to poor water quality in the Alamosa River downstream of the Summitville Mine Site. However, water quality within the project area is generally good, with one waterbody listed as impaired on the State of Colorado's 303(d) monitoring and evaluation list (Table 30).

Table 44. State of Colorado 303d listed waterbodies in the project area.

WBID	Segment Description	Portion	Clean Water Act Section 303(d) Impairment	303(d) Priority
CORGAL03d	Alamosa River, from Ranger Creek to Terrace Res.	all	Al	High

Direct and Indirect Effects

Impacts to watershed resources from the activities analyzed in this document generally fall into three broad categories: 1) impacts from canopy removal, 2) impacts from roads, skid trails, and landings 3) impacts to riparian and wetland areas. This disclosure of potential environmental impacts will first discuss each of these categories, followed by a discussion of ways to mitigate these impacts; finally, the various alternatives will be compared.

Alternative 1 – No Action

In the no action alternative, no new ground disturbing activities would occur and, therefore, there would be no impacts to riparian or wetlands based on proposed salvage harvest activities.

Alternative 2 – Proposed Action and Alternative 3 – Vegetation Management – Limited Action

Effects of Salvage Harvest

Major reductions in the forest canopy can increase water yield in high-elevation forested watersheds such as spruce-fir forests or cool moist mixed conifer forests. These increases can be large in some regions. However, in the hydro-climatic regime of the project area, annual climate variations are typically much more important than alterations from timber harvest. If observed, flow increases occur mostly during spring runoff and during the summer; and are not measurable until about 25% of the live basal area of a forested watershed is cut (USFS 1980). Given that the majority of the trees to be removed under this analysis are already dead, it

is likely that many of the impacts that would typically be associated with harvest have already been observed. Namely, the trees have stopped transpiration, and other impacts such as canopy interception and shading have been altered from the green state. The removal of these dead trees and the subsequent creation of large openings can enhance or create localized areas of snow scour that can reduce site moisture and water yield (USFS 2006a).

Based on the relatively limited portions of each watershed that have the potential for salvage harvest (0.5% to 38.6%, mean of 9.2%) detectable changes in water yield would generally, not be of concern. In general, fuels treatments are not expected to result in measurable impacts to water yield because such treatments (including mechanical treatments and prescribed burns) primarily target the understory and small-diameter trees; therefore, they may not measurably alter basal area, and do not impact appreciable portions of any individual watershed (Table 31).

Table 45. Comparison of salvage harvest and treatment activities for 6th level watersheds.

	Alternative 2 - Proposed Action				Alternative 3 - Alternative Action			
Watershed Name	Acres of Salvage Harvest	Salvage Harvest % of HUC	Acres of Fuels Treatment	Fuels Treatment % of HUC	Acres of Salvage Harvest	Salvage Harvest % of HUC	Acres of Fuels Treatment	Fuels Treatment % of HUC
Bighorn Creek	1	0.0%	0	0.0%	1	0.0%	0	0.0%
Elk Creek	1,126	4.1%	0	0.0%	560	2.0%	0	0.0%
Fox Creek	601	4.7%	0	0.0%	198	1.6%	0	0.0%
French Creek-Alamosa River	2,106	11.5%	160	0.9%	1,028	5.6%	160	0.9%
Headwaters Alamosa River	2,041	8.4%	147	0.6%	1,274	5.3%	147	0.6%
Headwaters Rio de Los Pinos	1,189	7.3%	31	0.2%	1,057	6.5%	31	0.2%
Jasper Creek-Alamosa River	529	4.7%	104	0.9%	397	3.5%	104	0.9%
Lake Fork	2,400	38.6%	27	0.4%	851	13.7%	27	0.4%
Platoro Reservoir-Conejos River	817	12.2%	0	0.0%	251	3.7%	0	0.0%
Rough Creek-Conejos River	84	0.5%	0	0.0%	2	0.0%	0	0.0%
Saddle Creek	762	16.1%	0	0.0%	536	11.3%	0	0.0%
Sheep Creek-Conejos River	836	3.1%	11	0.0%	662	2.4%	11	0.0%
Toltec Creek-Rio de Los Pinos	929	5.1%	46	0.3%	183	1.0%	46	0.3%
Trail Creek-Conejos River	2,174	10.3%	295	1.4%	1,387	6.5%	295	1.4%
Wolf Creek	176	3.6%	74	1.5%	110	2.3%	74	1.5%
Wightman Fork	1,728	17.1%	0	0.0%	825	8.1%	0	0.0%

Water Quality Impacts – Sediment is the primary pollutant associated with salvage harvest and fuels reduction activities. Surface disturbances and the removal of ground cover have the ability to generate erosion and subsequent sediment introduction into waterbodies and sensitive riparian and wetland areas. Additionally, there is the potential for spills of fuel and other chemicals that are frequently used harvest and fuel reduction operations.

Effects of Forest Roads, Skid Trails, and Landings

The construction and maintenance of roads, skid trails, and landings has long been recognized as a potential and major source of sediment in forested watersheds (Meaghan and Kidd 1972; Reid and Dunne 1984). This infrastructure can change natural runoff patterns by increasing the amount of impervious surface in a

watershed, and/or by intercepting overland flow or shallow subsurface runoff. The network of road drainages often routes this water, and the associated sediment, directly into streams (MacDonald and Stednick 2003). Sediment is the major pollutant associated with roads on public lands. Sedimentation in streams impacts water quality, which can, in turn, impact aquatic life. Sediment can also alter channel morphology, which can subsequently impact aquatic habitat. Road construction and maintenance activities can result in physical changes to streams, including floodplain and riparian habitat modifications, channel degradation, and fish passage reduction.

Poorly designed and maintained road/stream interactions can necessitate increased road stabilization and maintenance costs, and lead to rapid sedimentation and filling in of water storage reservoirs and ponds. Ecological impacts commonly associated with stream/road interactions include aquatic, riparian, and wetland habitat degradation (USFS 2005). The magnitude of impacts to watershed resources from roads, skid trails and landings will depend primarily on miles to be constructed or reconstructed, and the number of truck passages necessary to remove the timber products.

Under all action alternatives, portions of existing National Forest System Roads will be reconstructed to accommodate new or increased utilization from the analyzed activities. Additionally, both new temporary roads, as well as old, non-system road templates that are re-used, will be decommissioned when salvage or fuels activities are completed. Given this fact, and the long time scale of this project, the actual increase in road construction and utilization at any given time is anticipated to be somewhat limited. This means that watershed impacts will be distributed, and mitigated, in both time and space as various salvage projects move forward across the project area.

Effects on Riparian and Wetland Areas

Salvage harvest and fuels treatments within riparian and wetland ecosystems are generally prohibited or constrained sufficiently such that these activities will not remove riparian vegetation or cause direct manipulation of wetlands. The primary exception to this practice is the placement and construction of roads necessary to complete timber harvest and vegetation management activities. Roads directly alter riparian vegetation when, by necessity, they cross the riparian corridors associated with streams. These alterations come by means of both riparian vegetation removal at the site of the stream crossing, and via alteration of surface and subsurface flow patterns, which can subsequently alter riparian vegetation communities. Roads are not permitted within wetland ecosystems, but do have the potential to alter surface and subsurface flow patterns near these areas. Other impacts include the alteration of the hydrologic cycle in the immediate vicinity of the harvest, which may modify the timing and magnitude of runoff, and change the amount of water available to riparian and wetland areas.

The impacts on riparian and wetland ecosystems from salvage harvest will depend primarily on miles and layout of Maintenance Level-1 and temporary roads employed during salvage harvest and fuels treatment.

Management Actions to Reduce Impacts to Watershed Resources

All salvage harvests and fuels treatments on National Forest System lands are subject to conditions and restrictions that are employed to mitigate impacts to watershed resources from authorized activities. These measures are variously referred to as Standards and Guidelines (1996 Forest Plan Revision), Best Management Practices (BMPs, FS990-A), and Management Measures (FSH2509.25). Actions taken under all alternatives will comply with the requirements of these documents, as a minimum, to provide adequate protection for watershed resources. Additionally, action alternatives are subject to the pertinent project design criteria (Table 7) that have been set forth in this document to provide unique mitigations specific to the physical characteristics of the project area. The management actions set forth in this document and mentioned previously in this paragraph have proven effective in mitigating watershed impacts and reducing the introduction of sediment into waterbodies. The effectiveness of these measures, particularly the BMPs,

will be monitored as part of an ongoing effort to improve salvage harvest and fuels treatments (Section 2.5, FS990-A).

Comparison of Alternatives

Alternative 1 would result in the fewest impacts to watershed resources due to the fact that no ground disturbing activities would occur. There would be no impacts to riparian and wetland areas, and erosion or sedimentation issues associated with salvage harvest activities would not occur. Of the action alternatives, Alternative 2 would have the greatest impacts to watershed resources due to having the highest number of acres available for salvage harvest, and the greatest number road miles to be constructed/reconstructed and subsequently decommissioned. Alternative 2 would result in a large percentage (36.8%) of the Lake Fork watershed (HUC 130100050104) undergoing salvage harvest, depending on the timing and exact layout of these salvage operations, significant watershed impacts could occur. Under Alternative 3, the percentage of Lake Fork harvested is reduced to 13.7%, which would reduce potential watershed impacts. Under both action alternatives, the remainder of watersheds have between 0.5% and 16.9% of watershed area available for salvage, these relatively low percentages, combined with effective monitoring and consistent implementation of standards, guidelines, BMPs, and mitigation measures, would maintain long term watershed health and function. All alternatives would comply with applicable laws, such as the Clean Water Act.

Cumulative Effects

Cumulative effects are the effects on the environment, which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. The most influential past actions in the analysis area that have impacted watershed resources include grazing, mining, vegetation management, travel management, and recreation. These activities have resulted in localized areas of riparian, wetland, and stream degradation, frequently resulting from grazing and road maintenance or construction practices. All past activities can reasonably be assumed to carry forward into the future, with the potentially exception of mining. These activities, when combined with any of the alternatives would be unlikely to combine to create new significant impacts.

3.8 Soils

Scope of Analysis

The scope of the analysis on forest soils is the approximately 332,000 acre project area.

Existing Conditions

There are 36 different soil resource inventory (SRI) units present within stands identified as potential for harvest (USDA 1996). SRI 151 accounts for the largest single soils unit at approximately 2,593 acres or ~15% of the acres and range down to SRI 166, which accounts for less than an acre. There are also approximately 6 acres of surface water mapped within the designated stands. Table 46 summarized the SRI units present and their relative amounts.

Table 46. Summary of soil resource inventory units for the project area.

SRI	% Range	Cumulative %
127, 137, 151, 167	10 +	50
149, 150, *160*	5 – 9	20
108, *124*, 125, 135, 140, 141, *161*, 168, 170	1 – 4	24
107, *110, 111, 112*, *121, 126*, *128, 129*, 139, *145*, 152, *153*,	1	6

154, 157, 158, *159*, 162, 165, 166, *169*, W		
Numbers in italics represent SRIs that are assigned Range Ecological sites and do not traditionally have large timber stands. The majority of these inclusions are due to GIS error because of scale at which soil layers are drawn and possibly changes in tree extent or projection differences.		

Erosion is potentially an issue from land management actions. Soil units are given an erosion hazard rating of low, moderate, high or N/A for miscellaneous units such as rock outcrops or talus slopes, etc. Inclusive of approximately 17,000 acres identified for possible management activities 92.5 percent are rate as having a moderate erosion potential hazard (see Table 32), with six percent having high potential, and the other 1.5 percent in the n/a and low hazard range. Soil mass movement potential is more evenly distributed across the different ratings. Approximately 83 % of the area will be of little concern for mass movement. The remaining 17 % that is listed as high potential risk, is primarily located in the La Manga/Cumbres Pass area, which according to the soil survey (USDA, 1996), allow timber harvest in the area due to local conditions such as level terrain. Care will need to be taken to ensure that soils sensitive to mass movement are identified within a project area and appropriate BMPs and project design criteria are applied to protect these areas from adverse effects.

Table 47. Erosion and mass movement potential in the project area.

	Erosion Potential Hazard (% of total acres)		Mass Movement Potential (% of total Acres
low	0.5	very low	23
moderate	92.5	low	34
high	6	moderate	26
n/a	1	high	17

Soil interpretations important for timber harvest beyond land stability (erosion and mass movement) are related to soil productivity. They are the reforestation potential and the limitations for total tree harvest. Approximately 74% of the acres fall in the good or fair ratings with 12% in the poor rating. Limitations of total tree harvest show approximately 38% in the slight to moderate and 23% in the severe with 40% in the N/A category (see Table 34).

Table 48. Reforest potential and total free harvest within the project area.

	Reforestation Potential (% of total acres)		Total Tree Harvest (% Total Acres)
Good	54	Slight	10
Fair	20	Moderate	28
Poor	12	Severe	23
n/a	13	n/a	40
@ acres are rounded to the nearest whole number so may not add up to 100% exactly			

As discussed in the context of soil resource inventory (SRI) units, many of these units are assigned Range Ecological sites. If a unit is assigned a range ecological site then it would not be assigned a rating for limitations for total tree harvest. This most likely accounts for the relatively high N/A rating of 40% for limitations for total tree harvest.

Areas where hazardous fuels treatments may occur covers approximately 943 acres. Of these areas about 84 % fall within the moderate or N/A erosion potential hazard, while about 87 % of soils are in the very low, low and moderate mass movement potential hazard.

Generally, soil condition across the district is in acceptable to good condition. Some areas, especially around high use recreation areas, and riparian areas impacted through grazing, have detrimental impacts associated with them but these areas are not the normal condition across the forest.

Direct and Indirect Effects

Alternative 1 – No Action

Natural processes will continue at a natural rate. Compacted soils will continue to improve slowly over time. No additional soil disturbing activities will occur beyond current permitted activities previously described. Indirect effects will be related to existing conditions not mitigated by activities like reforestation and temporary road and skid trail closures and decommissioning, which were foregone by the No Action Alternative. They also include a more natural recovery process which may take longer, but would not add disturbance due to harvest activities.

Alternative 2 – Proposed Action

Soils analysis of the different activities are generally analyzed by activity unit (e.g. timber cutting unit, hazardous fuels treatment area, etc.). The specific units are not yet known, but would be located within the areas identified on the alternative map. As conditions change due to bark beetle mortality or if a wildfire occurs the units can be adjusted and objectives adjusted or changed to meet the new conditions on the ground. As a result, only a discussion of general effects can be made at this time. As project units are delineated and finalized, site specific soil analysis will occur to confirm soil type and current disturbance levels as needed. Project design criteria will be finalized at that time which will prevent further detrimental disturbance or require mitigation or restoration activities which will protect, maintain or improve soil resources.

Treatment activity descriptions can be found described in detail with in chapter 2 of the NEPA document, which also include potential acres for these activities, however in brief they are as follows:

Activities associated with salvage harvest:

1. Commercial Logging and log hauling operations
2. National Forest System Road maintenance and reconstruction
3. Re-use of old, non-system road templates, and new temporary road construction
4. Decommissioning of non-system and temporary roads
5. Identification and establishment of areas for public and commercial firewood gathering
6. Reforestation activities (generally performed by hand)
7. Possibility of closure of system roads, with possible decommissioning activities as appropriate and where funding and workforce are available in relation to project units

Activities associated with Hazardous fuels treatments:

1. Establishment of shaded fuel breaks by hand thinning or removal of hazard trees (chainsaw) with in 400 ft. of public boundary and 200 ft. of administrative site
2. Pruning of residual tress within the fuel break to lift crown base height
3. Piling and burning or removal of activity generated fuels within timber sale area and fuel break thinning area.

The typical soil disturbance activities associated with harvest are temporary roads, skid trails, landings and mechanical harvester operation. Temporary roads, skid trails and landings can create large areas of disturbance. Top soils are removed in leveling, soils are compacted in the creation of roads, skid trails and landings, and exposed soils are subject to accelerated erosion. Mechanical harvester operations can compact soils by driving over them, and can disturb and remove top soil where they turn. This is especially true on steep hill slopes.

Up to 34 miles of non-system roads could be maintained or improved within the scope of this project, as well as up to 29 miles of new temporary roads could be created during this project life span. Since the life of this analysis is 10 to 15 years, not all segments of new temporary or non-system roads will be opened at the

same time. Standard BMPs and PDCs require decommissioning of temporary roads at the completion of use. As a result, only a small portion of the temporary or non-system roads opened will be open at the same time. This will limit impacts to streams and erosion, and spread the effects across the landscape and over several years. Initial reopening and maintenance can lead to a short term increase in erosion, and sedimentation into streams, this is due to ground disturbance as well as removal of vegetation which may be growing on the road prism. The best management practices (BMPs) associated with road construction and maintenance, which are applied to this activity will mitigate and reduce erosion. In addition, road maintenance may improve road drainage and help to improve current conditions.

Project Design Criteria (PDC) will require the use of old skid trails whenever possible to help reduce additional disturbance, especially compaction. Recommended skid trail spacing and placement of fine woody debris on skid trails, if needed, will help limit compaction throughout the unit and will also help reduce and prevent erosion, as well as maintaining soil nutrients. Soil nutrients will be maintained in a large degree due to the fact that most of the spruce trees will lose their needles and thus returning nutrients back to the soil.

Landings are similar to skid trails. The amount of new compaction and disturbance is limited by reusing existing landings, treating landings when finished, water barring skid trails, and spreading fine slash, to prevent erosion when finished, as needed.

Mechanical harvesting equipment can potentially cause damage to soil. Current PDCs and BMPs help to mitigate and protect the soil resource. Limitations of slope steepness and operational conditions (i.e. soil moisture level, frozen or snow covered soil), protect the soil resource from conditions where operation of harvesters would cause unacceptable levels of soil disturbance.

Fuels reduction along private and administrative boundaries outside of Colorado Roadless Areas will occur as part of this project. Thinning activities done by hand (chainsaws) have very low potential to disturb soils. WUI is largely a public safety and infrastructure protection issue. It is not anticipated that the soil will be detrimentally influenced by fuel reduction activities.

Burning of piles from fuels reduction and from salvage harvest operations are planned. Burning piles has the potential to detrimentally disturb soils. When conditions are such that high intensity fires and/or long residence times exist within the fire, soil heating can occur which creates adverse conditions in the soil leading to loss of nutrients .Physical changes also occur, which lead to hydrophobicity and accelerated erosion. Localized affects are common after a pile is burned. In some instances associated with harvest activities piles become large enough that when burned detrimental soil effects are present. Effects are localized and limited in the area of impact. Best management practices (BMPs) and project design criteria (PDCs) dictate that piles are not burned within a riparian area, but away from water. Overall detrimental disturbance after harvest and burning are still expected to remain below 15% of the unit. Impacts from burning piles is usually an insignificant part of the overall disturbance and is not expected to create a significant soil resource impact.

As discussed above, there are large areas of overlap between timber stands mapped layers and SRI layers. Meadows and riparian areas could be impacted due to this overlap; however, BMPs and PDCs are established to protect riparian zones and meadows. The activities are not planned for meadows and riparian zones and will be largely restricted to timber stands. As a result these activities are not anticipated to cause significant detrimental disturbance to the soil resource.

Roads can be one of the largest contributors to erosion and sedimentation in a watershed. Soils disturbed at construction or during maintenance, can erode and contribute sediment to waterways. Unmaintained and user created roads can contribute large amounts of sediment delivery to streams throughout the life of the road. Standard practices prescribed primarily through FSH 2509 and BMPs serve to protect water and soils

from significant impacts during these activities and can be monitored through the use of the National BMP monitoring program (USDA 2012).

Soils with high erosion hazards are of greater concern for detrimental soil disturbance due to erosive traits. These traits could be due to slope or due to soil characteristics. These are generally addressed by implementation of BMPs which mitigate this issue, for example spreading fine slash on skid trails helps to prevent erosion. Approximately 1,000 acres or ~ 6 percent of the area proposed for salvage harvest activities falls under the 'high' erosion hazard potential. The majority of soils are rated as 'moderate' or 92.5%. These soils are rated as high erosion potential due primarily to slopes, meaning as slope increase the potential for erosion increases. Project design does not allow mechanical treatments to take place on slopes steeper than 40%.

Table 49. Soil Resource Inventory (SRI) units with mass movement potential rating of high and associated acres and percent of the proposed activity areas.

SRI unit	Acres	% Acres
151	2,593	15.5
162	128	0.7
129, 139, 145	67	0.4
Total	**2,788**	**16.6**

All but 1.1 percent of the soils rated as high are in SRI 151. Of the remaining 1.1 percent, 0.7 percent is in SRI 162 which is a non-vegetate rock outcrop and rubble land unit. The Soil Resource and Ecological Inventory (USDA 1996) indicates that SRI 151 is unsuitable for timber production activities except in the Cumbres Pass area. This is mostly due to the relatively level slope and depth of soil to under lying Mancos shale deposits. Standard BMPs and PDCs will work to prevent situations that may increase the risk of mass movement, in addition to site-specific investigation that will be verified through the implementation checklists developed under this alternative. Timber harvest has occurred in the Cumbres area over the years with appropriate measures it can be done in such a way as not to impact soil resource values.

Treatment types generally cover a number of soil types, where each soil has a different erosion hazard rating. Treatments have different types of hazards associated with them. Salvage and other tree harvest activities generally have a higher risk of detrimental disturbance than pile burning or hand thinning. As discussed previously the majority of erosion concern comes from slope. Since harvest activities do not occur on slopes greater than 40% the erosion hazard is mitigated. In addition project design criteria (PDCs) are set forth to mitigate other activities such as skid trails which may also contribute to detrimental soil disturbance.

Non-treatment areas can be considered the same as a no action alterative. No activities will occur in these areas so no further analysis is needed. For further discussion see Alternative 1 the no action alternative.

Erosion is used in part as a surrogate for other soil characteristics which may be problematic; however, erosion potential hazard is the most far reaching of those characteristics and PDCs are designed to account for all foreseeable soil disturbance characteristics.

As specific activity units are delineated, a review will be conducted to determine extent of site-specific evaluation needed for each activity unit.

Best Management Practices (BMPs) are also used to protect resources and at times are monitored to track effectiveness. BMPs have been shown to be very effective when implemented (Cristan 2016). Monitoring of project design criteria can be done through the National BMP monitoring program (USDA 2012).

Alternative 3 – Vegetation Management – Limited Action

Impacts on individual activity units will be the same as described in alterantive 2, though overall impact will be less. Alternative 2 has 17,000 acres of potential salvage harvest, while Alternative 3 only proposes 8,500

acres. This reduction in acres, will lead to less ground impacted overall along with potentially less temp roads constructed or old road templates re-opened. Alternative 3 will be less impactful to the soil resource than Alternative 2, since only about half of the acres are proposed for harvest; however, establishd BMPs and project design criteria will protect soil and water resources and mitigate potential impacts from harvest activities in both alternatives.

Cumulative Effects

Past Actions

Timber harvest activities have occurred in the area for many years. Practices have become 'lighter' on the soil resource over the years. Some remnant of those old harvest activities and also recreational activities remains on the land. These activities have created some detrimental soil conditions in locations, especially the older timber harvests. Current PDCs, practices and equipment make it possible that harvest can occur with minimal increases in detrimental soils effects.

On-going present actions

Recreation, including camping, hiking, horseback riding, hunting, and firewood collection are on-going practices which have some effect in the analysis area. Cattle grazing has occurred and will continue to occur as the in the area. Riparian and open areas will see the most use by cattle.

Future Actions

Grazing will continue into the foreseeable future. Adjustments may be made to improve forage use and stream/riparian protection. As trees die and are cleared it may increase forage and grazing area on a temporary basis which may reduce grazing pressure in other areas. In the long run it is expected that the grazing program will remain the same into the future with similar effects.

Timber harvest activities are likely to increase and result in increased soil disturbance overall in the short term; however into the future timber activities are likely to slow and shift out of the spruce zone for an extended period, perhaps as long as 100 to 150 years. This will affect the timber program and related activities within the analysis area into the future.

3.9 Rangeland

Scope of Analysis

This analysis considers the effects to rangeland and rangeland management from the proposed vegetation management activities. Because there will be no effect to range management in areas where there are no activities proposed, this analysis will only focus on those rangeland management allotments where activities are proposed to occur.

Existing Conditions

Proposed treatment areas are located within thirteen range allotments: seven sheep and goat allotments and six horse and cattle allotments. Of the thirteen allotments, eleven are active and two are vacant (both sheep allotments). An active allotment is currently managed under a grazing permit and regular livestock use occurs. Vacant allotments have no current permitted grazing but they are open for consideration to future permitted grazing through a term (up to 10 years) or temporary (short-term) grazing permit.

Range management is analyzed through a separate NEPA analysis. Most of the allotments within the project area have current and active NEPA. The Alamosa allotment is part of a current rangeland management NEPA

effort (CPRD current). There are no range decisions associated with this analysis. Acres currently classified as unsuitable or incapable for grazing are not being proposed for conversion to suitable or capable.

Overall, current conditions of rangeland resources within the project area are healthy and vigorous. There are areas of concern due to activities associated with permitted livestock grazing. These areas are vulnerable due to livestock use, existence of invasive and noxious weeds or lack of an effective grazing rotation. However, these areas exist primarily in rangeland and open meadows and will be minimally or not at all affected by the proposed action.

There are a variety of range improvements in the project treatment areas, including pasture and allotment boundary fences, corrals and water developments including spring developments, pipelines, ponds and stock tanks. These improvements will be considered and, in most cases, protected during project-level analysis and layout.

Direct and Indirect Effects

Alternative 1 – No Action

No timber salvage or tree planting activities would occur under the No Action Alternative. There would also be no hazardous fuels mitigation. Multiple-use activities such as firewood gathering, recreational travel, dispersed recreation and wildlife use would continue. These activities serve as vectors for the introduction and spread of nonnative, invasive plant species, which can impact the quality and quantity of forage. Current invasive species management would continue to be implemented. Under the No Action Alternative, there would be no additional opportunity for release of desirable forage species based on the immediate canopy opening caused by timber removal.

Alternative 2 – Proposed Action

Mechanical treatments and pile burning may reduce forage in the short-term due to soil disturbance and removal of vegetation during timber removal operations. Selection of either action alternatives would likely have beneficial results for rangeland management in that increasing the penetration of light to the forest floor and available precipitation from canopy removal would likely release desirable forage species and provide for an increase in movement corridors for domestic livestock to access secondary range areas that were inaccessible prior to implementation.

Some resource conflicts may occur in areas where natural barriers no long keep livestock out of regenerating stands and temporary fencing, salting and additional herding is needed to protect these stands. Project Design Criteria is considered adequate for successfully managing this conflict. Another direct effect could occur if range improvements (fences, cattle guards, corrals, water developments, pipelines, troughs, stock driveways, etc.) are inadvertently damaged during project implementation. Permitted livestock could be displaced during proposed treatment activities and affect permittee operations in the short-term. Additionally, short-term impacts to grazing operations could occur in the following ways: shorter grazing seasons, fewer permitted livestock, alterations in grazing rotation, timing, season of use, total deferment of pastures, increased riding and salting (i.e. work) for the permittee and riders and increased range improvement maintenance.

These actions may be needed and could be implemented in order to allow for unimpeded and safe salvage harvest operations and/or vegetation recovery following treatments.

Alternative 3 – Vegetation Management – Limited Action

The proposed treatment activities for this alternative are the same as in the proposed action they only differ in spatial area and extent. The effects would be similar to those discussed for Alternative 2.

Cumulative Effects

Proposed activities, in combination with other foreseeable vegetation management could change forage conditions and can concentrate livestock use or affect livestock distribution patterns. Ongoing and increased recreation use and visitor travel can influence the distribution of wildlife and domestic livestock on the landscape.

Management actions that facilitate the introduction and spread of invasive and noxious plants cumulatively impact the quality and quantity of forage for grazing animals. Climate change is likely to alter plant communities and precipitation patterns in a way that affects plant growth, herbaceous canopy cover, distribution of species and vegetation types, and annual productivity (Finch et al. 2012). Anticipated change in temperature and precipitation will likely result in a shift of species distribution and the potential reorganization of rangeland communities in the long-term.

3.10 Invasive Species and Noxious Weeds

Scope of Analysis

This analysis focuses on the effects to noxious and invasive weeds from the proposed activities within the project area boundary though the existing conditions expand to the entire Conejos Peak Ranger District boundary.

Existing Conditions

The Rio Grande National Forest utilizes the Colorado state noxious weed list to guide management on invasive plants. The State of Colorado Department of Agriculture ranks invasive plants species by their priority for treatment as List A, B and C (CWMA 2015). List A species are designated and managed for eradication whereas the management for List B species focuses on containment of known populations. List C species management focuses on an integrated approach to manage populations.

The Forest Invasive Species Action Plan (2016) provides strategy and direction for control, prevention and management of invasive species. The Plan's strategy and direction tiers to previous guidance and decisions including:

- Forest Service National Strategic Framework for Invasive Species Management, August 2013
- Forest Service Handbook and Manual direction contained in 2900-Invasive Species
- Rocky Mountain Region Invasive Species Management Strategy (FY 2005-2010), March 2005
- Revised Land and Resource Management Plan for the Rio Grande National Forest (as amended), November 1996
- Environmental Assessment for the Management and Control of Noxious Plants on the San Juan/Rio Grande National Forest, July 1996
- Management and Control of Noxious Plants on the San Juan/Rio Grande NFs – Sufficiency Determination and Supplemental Information Report, July 17, 2012

When discussing the risk of spread of invasive and noxious weeds there is a relative level of uncertainty given the number of factors that influence densities and distribution of weeds. Discussion of effects on invasive and noxious weeds is qualitative based on current knowledge of the primary weed species of concern within the project area.

Existing populations of noxious and invasive weeds on the Conejos Peak Ranger District were compiled from the most current GIS data derived from treatment and inventory files collected in the field. Table 36 shows the results of a compilation of this data for the district. See Appendix K for a map of known occurrences of invasive plant species within the project area.

Table 50. Species list and acreage of known Colorado designated noxious weeds.

State Designation	Species common & scientific name	Acres*
List A	Orange hawkweed *Hieracium aurantiacum*	<1
List B	Canada thistle *Cirsium arvense*	883
	Hoary cress *Cardaria draba*	1
	Musk thistle *Carduus nutans*	3
	Oxeye daisy *Leucanthemum vulgare*	515
	Perennial pepperweed *Lepidium latifolium*	3
	Russian knapweed *Acroptilon repens*	6
	Scotch thistle *Onopordum acanthium*	<1
	Yellow toadflax *Linaria vulgaris*	10
List C	Downy brome/cheatgrass *Bromus tectorum*	17
	Field bindweed *Convolvulus arvensis*	3
Total		**1,441**

*Number of acres are approximate and derived from forest GIS noxious weed inventory files collected in the field.

The intent of invasive and noxious weed management within the project area consists of the following:

- Restrict the possibility of invasive plant propagules entering the project area;
- Pre-treat known populations within the treatment areas to reduce the potential for spread of these species through project activities;
- Apply project design criteria to reduce the potential for noxious weeds to establish or spread within recently disturbed areas;
- Monitor recently disturbed areas for new invasive plant establishment so immediate action can be employed to eradicate or control new infestations;
- If new infestations are discovered, they are added to annual treatment plans and inventory maps.

Direct and Indirect Effects

Alternative 1 – No Action

The No Action Alternative is used to compare the Proposed Action to other alternatives. Under Alternative 1 there would be no direct effect to invasive and noxious weed populations from project activities. Weeds would continue to be introduced and spread by common vectors such as wildlife, permitted livestock, and recreational travel and use. Efforts to eradicate and control noxious weed species would continue through the implementation of the Invasive Species Action Plan (RGNF 2016). Effects of introduction, establishment and spread of invasive plant species within the project area include:

- Negative changes to native plant abundance, density and species richness due to the invasiveness of noxious weeds to establish and aggressively compete for resources;
- Displacement of native plants and animals;
- Reduction in forage capability for wildlife and domestic livestock;
- Potential increase in soil erosion due to the decrease in potential canopy cover and to the shallow rootstock of some invasive plants;

- Increased cost of mitigation and treatment of invasive and noxious weeds.

Alternative 2 – Proposed Action

Under the proposed action, the direct effects of introduction, establishment and spread of invasive plant species within the project area are the same as in Alternative 1. Direct effects from project implementation, specifically timber salvage activities, could include an increase in the spread of noxious weed populations caused by the movement of propagules on machinery, vehicles and equipment into, between, and within the treatment units. Disturbances such as skidding logs, building temporary roads, road maintenance and driving cross-country, increase bare soil and remove competitive native plant cover creating more suitable habitat for invasive plant species (Birdsall et al. 2012). Areas at highest risk for the spread and increase of invasive plants are those with known populations in or near treatment units, roads and proposed temporary roads. Additional ground disturbance in these areas could cause an increase in pre-existing populations due to the germination of noxious weed seeds or the stimulation of roots and suckers.

Disturbance, soil exposure and the removal of litter and duff reduce a plant community's resistance to invasion (D'Antonio et al. 2001). Variability in canopy cover and, more specifically, the reduction of canopy cover increases the opportunity for invasive plant cover to increase (Kelley and McGinnis 2007, Merriam et al. 2006, Gibson 2002). The overstory in the proposed project area has already been reduced by beetle activity and subsequent tree mortality. Though the impact wouldn't be as great on salvage removal as it would if the activities were proposed in green-tree stands, there is still a subsequent reduction to canopy cover when dead stems are removed. This increases the availability of light and nutrients to understory plants including invasive species. Pile burning activities associated with hazardous fuels mitigation can remove native vegetation therefore creating bare soil and opportunity for invasive plants (Keeley 2006). Fire, depending on intensity and duration, can also reduce native seed banks.

A review of literature found that most vegetation treatment activities would in fact result in increases in nonnative plant species (Thysall and Carey 2001, McGlone et al. 2009). However, it is likely with pre and post-treatment of known populations that some of these populations would remain stable or decrease, particularly in the long-term. Additionally, with the adherence to forest plan standard and guidelines, project design criteria (Table 7), the pre-implementation checklist process and control methods outlined in the Invasive Species Action Plan, there should be no net gain in nonnative invasive plant populations in the project area in the long-term.

Alternative 3 – Vegetation Management – Limited Action

The effects to invasive and noxious weeds from selecting this alternative would be the same as the effects described for the Alternative 2; however, the effects would be on a smaller scale since the acreage proposed for treatment under this alternative is less than in Alternative 2.

Cumulative Effects

Studies conclude that the increase in invasion of exotic plants includes a frequent disturbance regime. Areas of multiple or prolonged disturbance have an increased susceptibility to invasive plants (MacDougall 2005). Multiple-use activities associated with but not limited to silviculture and timber harvest, recreation, permitted grazing, wildlife use and visitor travel continue to serve as potential vectors for the spread of invasive and noxious weed species on the Forest.

Over time, the combination of proposed salvage treatments including revegetation activities should increase the overall plant species diversity in affected stands. A proportion of the species diversity could be composed of invasive plants but it is likely the majority of plant diversity would be composed of native species present on-site prior to treatment (Griffis 2001, Fule et al. 2005). Another study describing an increase in invasive species following controlled mechanical and prescribed fire treatments indicates that the ecological impacts of these species may not be severe. In this study, natives outnumbered non-native invasive plants following

treatment by an almost thirteen to one ratio (Dodson 2004). In the long-term, as areas revegetated with native understory cover species, there would be fewer available areas of light and growing space where invasive plant species would establish.

3.11 Air Quality

Scope of the Analysis

This section describes the effects to air quality in the vicinity of the CP District-wide project area including nearby private land and the South San Juan Wilderness Area, a Class I airshed. The nearest town is the Village of Chama, New Mexico, which is about 12 miles south.

Past Actions that have Affected Existing Condition

Current land ownership patterns, wilderness designations, relatively low population, and lack of industrial development have minimized the sources of sustained air pollutants. Pulses of emissions that do occur are generally small, localized, and short-lived and therefore seldom overlap in time and space.

Existing Condition

Current conditions of air quality in Colorado are detailed in the Colorado Air Quality Control Commission: Report to the Public 2015-2016 (CAQCC 2015). The project area is located in the Colorado's Central Mountains Air Quality Region which includes many of the mountains and mountain valleys areas of the state. Skiing, tourism, ranching, mining, and correctional facilities are the primary industries in this region. All of the area complies with federal air quality standards (Colorado Dept. of Public Health 2011).

Information on air quality within the United States is available through the Visibility Information Exchange Web System (VIEWS") website (http://views.cira.colostate.edu/web/Default.aspx), an on-line database for air quality information and analysis. There are no air quality monitoring stations in the vicinity of the project area.

Direct and Indirect Effects

Alternative 1 - No Action

No logging operations or pile burning would occur, so no additional emissions would occur.

Alternatives 2 and 3 – Proposed Action and Vegetation Management - Limited Action

Proposed project activities in the action alternatives that could directly affect air quality would include the combustion of fuel from equipment use in cutting, transporting, and hauling logs, burning slash piles at landings following harvest completion, and, if used, burning handpiles as part of hazardous fuel reduction treatments.

Vehicle emissions from harvest operations would occur. Emissions would be a short-term, but would occur on an intermittent basis for several years. Depending on the season of logging (winter vs. summer), some amount of dust could be generated during harvest activities, which could be more visible than vehicle emissions.

The two action alternatives identify pile burning as a likely way to dispose of slash generated by both the WUI fuel treatments adjacent to private property and the large slash piles at landing areas. Pile burning usually occurs after the slash has cured for at least one season and is in the red-needled stage; piles are typically burned in the winter with adequate snow cover (minimum of 2 inches of continuous snow) to prevent the fire from spreading.

Due to the seasonal nature of most residency within and adjacent to the project area, as well as the dispersed nature of the landing and pile burning (both in space and time), the minor amounts of smoke generated would be unlikely to impact any residences. Due to prevailing wind direction, the limited scale of winter burning operations would be unlikely to impact nearby summer residences or the Village of Chama.

Qualitatively, Alternative 3 would generate less vehicle emissions and dust, since fewer acres would be harvested and fewer landing slash piles would be burned, but neither alternative would be expected to have a measurable impact on local air quality.

All pile burning operations would also require smoke permits issued by the Colorado Air Pollution Control Division (CAPCD). Prescribed burn permits include specific parameters that must be met to limit short term air quality impacts from smoke. Prescribed burns also require burn plans that consider smoke dispersal and impacts to local residences and visitors to the area to ensure that adverse effects are minimized.

Cumulative Effects

Emissions generated by implementing an action alternative would contribute somewhat to local pollution, especially if activities overlapped in time with other logging activities in the vicinity, but all affects would be short-term and limited. Once project activities are completed in a particular area, any additional dust or smoke impacts would cease and have no further overlap in time or space with other pollution sources. As a result, the CP District-wide project area is expected to remain classified as in attainment for National Ambient Air Quality Standards throughout all alternatives and would meet the national goal of preventing any future impairment of visibility in mandatory federal Class I airsheds.

All alternatives, therefore, would comply with the Clean Air Act. This conclusion is additionally supported by the Forest Plan FEIS (USDA Forest Service 1996a), pages 3-151 through 3-154 that air quality on the Forest is good for all air pollutants and all Forest Plan approved activities would meet National Ambient Air Quality Standards.

3.12 Fire and Fuels

Scope of Analysis

The scope of the fire and fuels analysis is the approximately 332,000 acre project area.

Existing Condition

The Conejos Peak District-wide analysis area would be generally categorized as Fire Regime V or infrequent fire occurrence (200+ years) and stand replacement in nature. The area is dominated by Engelmann spruce (*Picea engelmannii*) and subalpine fir (*Abies lasciocarpa*) with a very minor component of aspen (*Populus tremuloides*) in portions of the analysis area. Climate and weather conditions generally play a greater role in large fire development than fuel loading in this type of fire regime. However increased surface fuel accumulation increases the fire's resistance to control and increases soil heating impacts.

Direct and Indirect Effects

Alternative 1 – No Action

The extensive spruce beetle mortality within the Conejos Peak District-wide analysis area will increase surface fuel accumulation over time as the dead trees fall over. Recently modeled stand data show stands in the project area currently have an average fuel loading of 18.4 tons per acre in dead surface fuel larger than 3 inches in diameter. These larger fuels have a direct effect on fire residence time and soil heating impacts if a

wildfire occurs. Using Forest Vegetation Simulation (FVS) modeling over a thirty year timeframe the majority of the standing dead trees will have fallen and increased the dead surface fuels load (3"+) to an average of 44.9 tons per acre. Over a fifty year timeframe the dead surface fuel load (3"+) is projected to still be 43.6 tons per acre. These larger diameter fuels will persist on the landscape for a long period of time due to the slow decomposition rate of these large logs. The smaller diameter fuels (0-3") will increase in the first 20 years as the dead trees lose their fine branch wood, but will start to decrease over time as these smaller fuels decompose.

Indirect Effects

Alternative 1- No Action

As the large diameter surface fuels accumulate the potential for more intense, longer duration fires and associated soil impacts also increase.

Table 51. Summary of fuel loads within the project area for the No Action Alternative.

No Action Alternative- Year	Fuel Load 0-3" (tons/acre)	Fuel Load 3-6" (tons/acre)	Fuel Load 6-12" (tons/acre)	Fuel Load 12"+ (tons/acre)	Total Surface Fuel Load 3"+ (tons/acre)
2016	4	8.5	9.1	0.8	18.4
2026	10.6	9.4	14.9	6.1	30.4
2036	8	10	20.1	10.9	41
2046	6.4	9.9	21.1	13.9	44.9
2056	5.8	9.5	20.1	14.4	44
2066	5.8	9.2	19.4	15	43.6

Under this alternative no shaded fuel break thinning treatments would be done along private property or around existing infrastructure. As a result the canopy base height or canopy bulk density adjacent to these areas would not be altered. The following measures of fire spread potential are expected under this alternative.

- The torching index is the 20 ft. wind speed which would increase surface fire intensity to the level at which individual tree torching could occur. Under this alternative the torching index would vary between 10.9 and 26 mph over the next fifty years.
- The crowning index is the 20 ft. wind speed at which active crown fire is possible for the specified fire environment. Under this alternative the crowning index would vary between 21.3 and 30.8 mph over the next fifty years.
- Canopy base height is the lowest height above the ground at which there is a sufficient amount of canopy fuel to propagate fire vertically into the canopy. Canopy base height is an effective value that incorporates ladder fuels such as shrubs and understory trees. The higher the canopy base height the lower the probability of tree torching. Under this alternative the canopy base height would vary from 5.5 ft. to 7.6 ft. over the next fifty years.
- Canopy bulk density is the weight of available canopy fuel per unit volume of canopy space (kg/m3). It is the bulk property of the stand, not of an individual tree. The higher the canopy bulk density the more easily crown fires will spread. Under this alternative the canopy bulk density varies from 0.1045 to 0.1838 kg/m3 over a fifty year time period.

Table 52. Summary of key fuels and fire characteristics for the No Action Alternative.

No Action Alternative - Year	Torching Index (mph)	Crowning Index (mph)	Canopy Base Height (ft.)	Canopy Bulk Density (kg/m3)
2016	21.7	25.1	5.9	0.1404

2026	18.6	30.8	5.8	0.1045
2036	10.9	26.4	5.5	0.1311
2046	12.4	23.8	5.7	0.1533
2056	18.5	22.2	6.7	0.1699
2066	26.0	21.3	7.6	0.1838

Alternative 2- Proposed Action

The proposed action would reduce the large diameter surface fuel accumulation in the harvested areas by removing the majority of the dead trees and lessen the potential risk of long duration, high intensity fires in the those areas. FVS modeling for this alternative over a thirty year timeframe show a surface fuels loading of 3" and larger material of 20.4 tons per acres which is 24.5 tons per acre less than the No Action Alternative. Over a fifty year timeframe FVS modeling show a surface fuel loading (3"+) of 18.8 tons per acre which is 24.8 tons per acre less than the No Action Alternative. In the future the estimated surface fuel loadings of 3 inch and larger diameter material, 20.4 tons/acre in 2046 and 18.8 tons/acre in 2066, are much closer to the desired Forest Plan down wood requirements of 10-15 ton per acre than the No Action Alternative. A project design feature requires treatment of the slash so that surface fuel build up can be minimized. In the harvest units, tree limbs and other woody slash that remain would be lopped to less than 2 feet in length and scattered to assist with the decomposition process. Until this slash less than 3" in diameter has decomposed there could be an increase in the potential rates of spread if a fire did occur within the harvest units (as modeled in Behave Plus using fuel model SB1).

Indirect effects

Alternative 2- Proposed Action

Changes in species composition, age classes, and structure stages over the long term would create a patchier mosaic of fuels across the analysis area, which should help to limit large fire spread and severity.

Table 53. Summary of fuel loads within the project area proposed for salvage for Alternative 2.

Proposed Action Alternative-Year	Fuel Load 0-3" (tons/acre)	Fuel Load 3-6" (tons/acre)	Fuel Load 6-12" (tons/acre)	Fuel Load 12"+ (tons/acre)	Total Surface Fuel Load 3"+ (tons/acre)
2016	4	8.5	9.1	0.8	18.4
2026	9.8	8.7	10.4	2.6	21.7
2036	6.7	8.6	10.2	2.7	21.5
2046	5.4	8.1	9.7	2.6	20.4
2056	4.8	7.7	9.2	2.6	19.5
2066	4.8	7.4	8.8	2.6	18.8

Under this alternative shaded fuel break thinning treatments would be done along private property and around existing infrastructure to increase canopy spacing, reduce stand density, and increase canopy base height. The following measures of fire spread potential are expected in shaded fuel break areas under this alternative:

- The torching index in 2036 would be raised from 10.9 mph under the No Action Alternative to 42.7 mph under this alternative. In 2066 the difference would be 26 mph under the no action alternative versus 58.7 mph under this alternative.
- The crowning index in 2036 would be raised from 26.4 mph under the No Action Alternative to 31.5 mph under this alternative. In 2066 the difference would be 21.3 mph under the No Action alternative versus 28.1 mph under this alternative.

- The canopy base height in 2036 would be raised from 5.5 feet under the No Action Alternative to 14.3 feet under this alternative. In 2066 the difference would be 7.6 feet under the No Action Alternative versus 18.1 feet under this alternative.
- The canopy bulk density in 2036 would be reduced from 0.1311 kg/m3 under the No Action Alternative to 0.0745 kg/m3 under this alternative. In 2066 the difference would be 0.1838 kg/m3 under the No Action Alternative versus 0.0969 kg/m3 under this alternative.

Table 54. Summary of key fuels and fire characteristics for the areas proposed for shaded fuel breaks in Alternative 2.

Proposed Action Alternative – Year	Torching Index (mph)	Crowning Index (mph)	Canopy Base Height (ft.)	Canopy Bulk Density (kg/m3)
2016	18.9	23.5	5.6	0.1435
2026	34.1	38.1	12.3	0.0661
2036	42.7	34.3	14.3	0.0745
2046	48.3	31.5	15.9	0.0828
2056	52.2	29.4	17.1	0.0905
2066	58.7	28.1	18.1	0.0969

Alternative 3 – Vegetation Management – Limited Action

This alternative would achieve similar surface fuel reductions to Alternative 2 over a smaller footprint area. There are some slight variations in the projected fuel loads between this alternative and Alternative 2 due to the differences in the number of stands modeled and their individual stand data.

Indirect effects

Alternative 3

Similar changes in species composition, age classes, and structure stages over the long term would create a patchier mosaic of fuels across the analysis area, which should help to limit large fire spread and severity over a smaller treated area than Alternative 2.

Table 55. Summary of fuel loads within the project area proposed for salvage for Alternative 3.

Limited Action Alternative- Year	Fuel Load 0-3" (tons/acre)	Fuel Load 3-6" (tons/acre)	Fuel Load 6-12" (tons/acre)	Fuel Load 12"+ (tons/acre)	Total Surface Fuel Load 3"+ (tons/acre)
2016	4	8.4	9.1	0.8	22.3
2026	10	8.5	10.1	2.3	21.6
2036	6.7	8.3	10.3	2.8	21.2
2046	5	7.8	9.6	2.8	20.2
2056	4.2	7.4	9.1	2.7	19.2
2066	3.8	7	8.7	2.7	18.4

This alternative would allow for the same shaded fuel break thinning treatments as Alternative 2 and have similar effects the torching and crowning indices, canopy base height and crown bulk density.

Table 56. Summary of key fuels and fire characteristics for the areas proposed for shaded fuel breaks in Alternative 3.

Limited Action Alternative – Year	Torching Index (mph)	Crowning Index (mph)	Canopy Base Height (ft.)	Canopy Bulk Density (kg/m3)

2016	18.9	23.5	5.6	0.1435
2026	34.1	38.1	12.3	0.0661
2036	42.7	34.3	14.3	0.0745
2046	48.3	31.5	15.9	0.0828
2056	52.2	29.4	17.1	0.0905
2066	58.7	28.1	18.1	0.0969

Cumulative Effects

Alternative 1- No Action

The project area is broken by many natural barriers to surface fire spread such as open grass meadows, rock scree fields and cliff bands. However much of the fire spread potential in spruce/ fir ecosystems comes from short- and long-range spotting. The timber stands within the analysis area and the surrounding area have seen extensive vegetation management over the past several decades. Much of the area was treated with some type of timber harvest or timber stand improvement thinning in previous decades. These treatments reduced stand density in many areas which has help reduce crown fire spread potential, but the recent spruce beetle mortality has increased surface fuel accumulation from the dead spruce falling. FVS modeling show that this snag fall will continue over the next 20-50 years and will peak with a surface fuel accumulation of almost 45 tons per acre by 2046. These increased surface fuel loads would support long duration, high intensity surface fires which could have detrimental soil heating effects and could potentially cause more short and long-range spotting.

Alternative 2- Proposed Action

Past harvest treatments within and/or adjacent to the analysis area have reduced stand density in many areas which has help reduce crown fire spread potential. Further harvest of standing dead will further help lower crown fire potential, surface fire intensity, and spotting potential.

Alternative 3

This alternative would have similar cumulative effect to Alternative 2, but would not treat as many acres.

3.13 Socio-Economics

Scope of Analysis

Cost efficiency is a measure of how well inputs (activities) are used in a production process to produce a fixed set of outputs. It is only a partial measure because not all benefits and costs to society can be readily quantified. Costs to implement defined activities such as hazardous fuels reduction projects have been assigned dollar values based on known costs and are quantifiable. Other resources values such as watershed or riparian health, wildlife habitat and diversity, social benefits, and scenic resources cannot easily be assigned dollar values. This economic efficiency analysis does not consider ecosystem services or non-market goods that are not required at the project level by the National Forest Management Act (NFMA). Ecosystem services and non-market goods are addressed in the Forest Plan (refer to pages 3-445 through 3-469 of the Final Environmental Impact Statement 1996). Alternatives that meet the requirements and intents of the Forest Plan, achieve net public benefits as stated in NFMA.

The analysis area includes portions of three counties: Conejos (84 percent), Rio Grande County (9 percent), and Archuleta (7 percent). No activities are proposed in Archuleta County since the portion of project area in this county is mostly in designated wilderness or roadless areas. Therefore, Archuleta County is not included in the discussion.

The social effects discussion includes Conejos County, Rio Grande County, Colorado and Rio Arriba County, New Mexico. These counties are all primarily rural with relatively small communities and populations. Communities within the analysis area include Jasper and Platoro; nearby communities include Antonito and La Jara to the east, Del Norte to the north and Chama, New Mexico to the south. The social aspect of the report briefly describes potential qualitative effects based on known local social habits and uses of the Forest in or near the analysis area. These uses and trends were also described in Forest Plan Revision in Assessments 6, 7, 8, and 8.1 available on the revision webpage at: https://www.fs.usda.gov/detail/riogrande/landmanagement/projects/?cid=stelprd3819044. This information helps to consider the project in the local context.

The economic analysis focuses on the financial efficiency associated with commercial timber harvest and fuels reduction treatments proposed with the Conejos Peak District-wide Salvage project. The purpose of this analysis is not to determine exact costs associated with a project or determine if alternatives are above or below cost, but rather to compare the relative differences in financial efficiency between the alternatives.

Assumptions were made in the financial efficiency analysis concerning the timing of activities. For each action alternative, all proposed commercial timber harvest acres and hazardous fuels treatment acres were assumed to be divided into equal annual increments with timber sales being sold and acres being contracted for thinning over the course of ten years. Timber sale contract administration, tree planting, or pile burning activities could continue for an additional five years. These assumptions may not be reflective of how project units would actually be divided or implemented, but provides a reasonable, comparative estimate of expected costs and benefits for each alternative. Specific costs and benefits used in the economic analysis were based on recent, local experience and specialist input.

Existing Condition

Culturally, the rural analysis area counties continue to represent a mix of Anglo, Hispanic, and Native American cultures. What is now Southern Colorado has been utilized and inhabited to varying extents by all these cultures over hundreds of years and new migrants continue to add to the local cultural identity. The Forest lands in the analysis area are used by local populations and visitors for hunting, fishing, hiking, livestock grazing, firewood cutting, scenery and wildlife viewing, water sources, spiritual reasons, and other personal and commercial ventures related to natural resources. Firewood is an important source of household heating in Conejos and Rio Arriba Counties (US Department of Commerce 2013e, as cited in Assessment 6, pgs. 28-30) and is a resource potential to be directly affected by proposed activities.

Socially and culturally, residents of Conejos and Rio Grande Counties each identify farming, fishing, and forestry occupations as their industry of employment for about 13.5% of their local populations, which is higher than the average of 7.7% for the non-metro portion of Colorado; Rio Arriba County is less with about 2.1% employed in these industries. Much of the saw-timber cut on the Forest is processed in the San Luis Valley mills located in La Jara, Del Norte, and Saguache (Forest Stewardship Concepts Ltd 2014). Some additional saw timber from the Forest is also processed in Chama, New Mexico. Since the 2015 EPS (Economic Profile System) data was compiled, additional wood process/milling employers have become established near La Jara and Blanca (in Costilla County east of the analysis area) and may also provide some additional opportunities for future employment. All three counties have over 20 percent (21.1 to 25.3%) of their populations employed in the Education/Health/Social Assistance occupations. Retail trade and construction are also important occupations in these counties.

Based on EPS Demographics data (2015), poverty levels for individuals are identified at 18.3, 19.2, and 23.7 percent for Conejos, Rio Grande, and Rio Arriba Counties, respectively. All of these percentages are substantially higher than the 9.7 percent average for individuals in Colorado, outside of metro areas, but are only slightly higher than the 21.9 percent for individuals in non-metro areas in New Mexico. Percent of full time employment (greater than 35 hours/week, more than 50 weeks/year) ranges from about 45 to 58 percent, with Rio Grande county seeming to have the highest full time employment.

Direct and Indirect Effects

Alternative 1 – No Action

Under Alternative 1, firewood for personal use would continue to be abundant and accessible in the spruce-fir vegetation type, since additional areas would not be sold to commercial timber companies. This alternative would avoid any potential negative short-term social effects such noise, dust, or traffic concerns that may affect uses of the area. However, this alternative would not modify fuels adjacent to private properties or near infrastructure which would leave these structures at higher risk to damage from wildfires, should one occur, or at risk from falling dead trees in the spruce-fir forest type which could result in increased financial risks. The large numbers of standing or eventually down dead trees may also change uses of the spruce-fir forest due to safety or access concerns.

Alternative 1, the No Action Alternative, does not generate revenues through the sale of commercial forest products, nor does it provide for active forest management adjacent to private lands or infrastructure that would also result in non-quantified potential benefits. This alternative does not incrementally contribute to economic sustainability for local communities or the commercial forest products industry. Additionally, this alternative would not help facilitate reforestation in any non-stocked or understocked stands in the spruce-fir forest where the overstory has been killed by spruce beetles and that lack understory advance regeneration. It also would not assist with road maintenance or other identified road improvement needs. Because costs have been incurred to complete the Environmental Impact Statement and no revenues are derived from this alternative, the benefit to cost ratio is 0.00.

Alternative 2 – Proposed Action

Under Alternative 2, firewood availability for personal use in the spruce-fir forest type would likely be reduced over time compared to Alternative 1, since dead trees on up to 17,000 acres would be sold to commercial timber companies. This would reduce personal use firewood gathering in accessible areas as implementation proceeds, though since operations would occur over several years, the reduction in acres available may not be apparent for several years for most permit holders. Opportunities to cut firewood from slash piles would be increase in availability over several years, which would still supply the needed material, though it may not be a favored source of wood collection for some individuals. This alternative would likely have the highest levels of potential for noise, dust, traffic conflicts, or other social conflicts (see Recreation section). This alternative would have the most potential to reduce the numbers of standing or eventually down dead trees which may reduce safety concerns and improve or maintain access and usability of the spruce-fir forest. This alternative would also have the highest potential to assist with road maintenance or other identified road improvement needs.

Alternative 2 would generate a benefit-to-cost ratio of 1.21, which is the highest of the three alternatives analyzed. The net present value of this alternative is $414,257 which includes the cost of the hazardous fuel treatments, pre-implementation reviews, contract administration, timber sale preparation, timber sale administration and reforestation costs. Recent average bid rates for commercial timber values were included as the benefits. The present value of the benefits (forest products) being offered under this alternative and present value costs associated with this alternative are $(-1,969,296) and +$2,383,553 respectively, which would result in a positive net present value. Under this alternative, an estimated 340,337 CCF of wood fiber could be offered, and approximately 1,000 acres could be treated to reduce hazardous fuels adjacent to private land and/or to protect infrastructure, which could provide potential resource benefits that were not quantified.

Alternative 2 has the largest benefit-to-cost ratios of all the alternatives analyzed since it would offer the greatest volume of commercial sawtimber which provides the economic benefit. This alternative would likely have a positive incremental effect on local economic conditions including the forest products industry. It would also help accelerate forest regeneration, as needed, in understocked spruce stands to meet future objectives. Making resources available to local and regional industry has potential to help sustain or boost the

social structure of local counties which have some reliance on forestry and construction jobs which combined account for 22.6% of the employment in Conejos, 19.9 percent in Rio Grande, and about 10.5 percent in Rio Arriba Counties (EPS Demographics 2015).

Since sawtimber volume is offered under an existing Forest timber management program with a goal of selling a steady and sustainable volume of sawtimber, this alternative would likely have the most potential to contribute to a sustained economic impact over the next ten to fifteen years.

Alternative 3 – Vegetation Management – Limited Action

Under Alternative 3, firewood availability for personal use in the spruce-fir forest type would likely be reduced more than Alternative 1, but less than Alternative 2, since approximately 51 percent fewer acres would be sold to commercial timber companies for salvage harvest. As with Alternative 2, there may be some incremental effects on firewood gathering as project implementation proceeds, it may not be apparent for several years or until a timber sale effects an area that is favored by an individual. Firewood gathering opportunities from slash piles would be less than Alternative 2. Compared to Alternative 2, this alternative would likely have somewhat less potential for noise, dust, traffic conflicts or other social conflicts (see the Recreation section). This alternative would also reduce the numbers of standing or eventually down dead trees that would help address safety or access concerns, but on about half the number of acres. This alternative would have less potential to assist with road maintenance or other identified road improvement needs, compared to Alternative 2.

Alternative 3 generates a benefit-to-cost ratio of 0.95, which is lower than Alternative 2. The net present value (benefits minus costs) of Alternative 3 is $64,050, which includes the cost of the hazardous fuel treatments, pre-implementation reviews, timber sale preparation, and timber sale administration, and reforestation costs; recent rates for commercial timber values were included as the benefits. The present value of the forest products being offered under this alternative and present value costs associated with this alternative are $(-1,329,884) and $+1,393,934, respectively. This alternative has a lower commercial product value (benefits) and a lower present value cost of the two action alternatives, since fewer acres are proposed for salvage harvest. Net present value would be slightly negative compared to Alternative 2. This alternative could produce an estimated 189,906 CCF of sawtimber volume which would be about 56 percent less than Alternative 2. As with Alternative 2, approximately 1,000 acres could be treated to reduce hazardous fuels adjacent to private land and/or to protect infrastructure, which could provide potential resource benefits that were not quantified.

This alternative would also likely have a positive incremental effect on local economic conditions, including the forest products industry, though not as great as Alternative 2. It would also help accelerate forest regeneration in understocked spruce stands to meet future objectives, though reforestation would occur on about 49% fewer acres compared to Alternative 2.

This alternative would also contribute to the Forest goal of selling a steady and sustainable volume of sawtimber over the next ten to fifteen years, but at a lesser extent than Alternative 2.

Cumulative Effects

Past actions that have affected the existing condition in the Conejos Peak District-wide Salvage analysis area include a variety of management decisions and activities. Many of the stands in the analysis area have previously been harvested to some extent, while other stands have remained relatively unmanaged. Past activities and timber harvests have created access roads, which have improved the financial feasibility of proposed salvage activities.

There are other forest management activities ongoing and planned in the analysis area and on nearby private lands. These activities would also incrementally support the local economy and communities to some level over the next several years by contributing to the wood products and related industries and also supporting the local retail sales and service industries. Forest management activities that promote the long-term

sustainability of the forested landscape also help contribute to the sustainable use of the area for recreation, wildlife habitat, and meeting other future needs.

Comparison of Alternatives

Table 1 shows a comparison of the financial efficiency of the three alternatives considered in detail for this project. As indicated, Alternative 2 would have the highest benefit to cost ratio and Alternative 1 the least. Alternative 2 would also have the highest potential to benefit local communities with workers in the forestry employment sectors. Alternative 3 would provide more benefits than Alternative 1, but less than Alternative 2.

Table 57. Financial efficiency for each alternative using a 4% discount rate.

	PV – Benefits	PV – Costs	Benefit: Cost ratio	Net Present Value
Alternative 1	$0.00	$150,821	0.0	$(-150,821)
Alternative 2	$2,383,553	$1,969,296	1.21	$414,257
Alternative 3	$1,329,884	$1,393,934	0.95	$(-64,050)

Compliance with RGNF Land and Resource Management Plan and Other Relevant Laws, Regulations, Policies and Plans

Executive Order 12898 - Environmental Justice Act

Executive Order 12898 and for the Forest Service, USDA departmental regulations (1997), direct federal agencies to focus attention on human health and environmental conditions in minority and low income communities and evaluate the effects of federal actions on these populations. The purpose is to identify and address, as appropriate, disproportionately high adverse human health or environmental effects on minority, low income populations, or American Indian tribes.

The San Luis Valley is comprised of six local Colorado counties and is used as the geographic area of comparison for the counties considered in this analysis. The median household income in the San Luis Valley is $35,634 (U.S. Census Bureau, 2009-2013). The median household income in Conejos County is $36,652 with 13.9% of the families below the poverty level. In Rio Grande County the median household income is $39,672 with 15.3% of families below the poverty level. For Rio Arriba County the median household income is $36,098 with 17% of families below the poverty level. The median household income in the three counties considered are slightly higher than the San Luis Valley as a whole.

The population composition by racial affiliation of Conejos and Rio Grande Counties are similar to the entire San Luis Valley and do not likely have a distinctly different minority population. Rio Arriba County may have a distinctly different minority population compared to the other two counties and the San Luis Valley. Based on the information available, the local counties would not be considered low income, but do have minority populations, as defined by Executive Order 12898 (CEQ 1997; Romero et al. 2001).

Based on scoping and public involvement process (chapter 1), there are no indications that the proposed action or any of the alternatives would have a disproportionate adverse effect any low-income or minority populations or American Indian tribes. Based on information provided in the Social-Economics, Air Quality, Heritage, and other sections in this document, no adverse impacts are expected on any populations. No concerns have been identified by any minority populations.

Table 58. Population information for Conejos, Rio Arriba and Rio Grande Counties (2015).

Race or Ethnicity	Conejos County	Rio Grande County	Rio Arriba County	San Luis Valley
Hispanic or Latino	54.4%	44.2%	71.5%	50.1%

Race or Ethnicity	Conejos County	Rio Grande County	Rio Arriba County	San Luis Valley
White	43.3%	53.1%	13.1%	47.3%
Other races	0.7%	1.6%	1.4%	2.6%
American Indian	1.6%	1.1%	14.0%	<1%
Total population	**8,249**	**11,745**	**39,949**	**46,027**

Sources: EPS Demographics for each county. Produced by Economic Profile System (EPS) in June 2017. http://headwaterseconomics.org/tools/economic-profile-system; San Luis Valley Statistical Profile, April 2015. San Luis Valley Development Resources Group and San Luis Valley Council of Governments

The action alternatives would provide more potential for economic benefit and diversity that could benefit local populations in a variety of ways (Social-Economics, Recreation sections). The No Action Alternative might not provide direct or indirect benefits, but it would be unlikely to cause measurable harm. Notwithstanding, there may be additional financial risk for those that may have homes adjacent to the analysis area that could benefit from proposed fuels reduction treatments.

Cumulatively, the additional commercial forest products and continued availability of local firewood, both in the form of either standing dead snags or in slash piles created during salvage harvest in the analysis area would continue to help provide economic opportunities to area residents and provide low income individuals with an economical source of local wood for home heating, as needed.

3.14 Heritage

Scope of Analysis

The area of analysis encompasses 332,000 and is known to contain a low density of heritage resources that represent the entire spectrum of human occupation in the San Luis Valley; 12,000 Before Present (BP) to 50 BP. These include small ephemeral prehistoric camps, historic logging sites and historic grazing sites to name a few. The latter include cow camps, stock driveways, cairns and arborglyphs.

The Conejos Peak District-Wide Salvage Project has the potential to affect historic properties. Due to the scale of the project, the Rio Grande NF will sign a Record of Decision (ROD) without full assessment of project effects on potential historic properties. Instead, a Programmatic Agreement (PA) between the Rio Grande National Forest (FS) and the Colorado State Historic Preservation Office (SHPO) will be used to comply with the legal mandates of the NHPA that requires federal agencies to take into account the effects of their undertakings on historic properties. The PA outlines step-by-step procedures the FS will use to comply with the NHPA during project implementation through time. Key components of the PA are as follows:

1. The Rio Grande National Forest (Forest) became a signatory to the Colorado Bark Beetle PA in 2017 in order to phase in the NHPA's Section 106 process for large landscape-scale bark beetle salvage projects, which allows the ROD to be signed before cultural resource surveys are completed.
2. This agreement also (a) allows the Forest to implement undertakings in areas in which no cultural resource sites are located prior to sending the report to the State Historic Preservation Office (SHPO); (b) identifies specific activities having no potential to effect historic properties; (c) identifies areas of potential effect and survey strategies for specific undertakings having the potential to affect historic properties; and (d) allows for implementing off-site mitigation if conditions are too dangerous for heritage resource surveys.
3. The PA does not eliminate requirements to conduct heritage resource inventories and effects analysis prior to implementation.
4. Consultation with the SHPO will not be necessary for exempted undertakings listed in Appendix B of the PA.

5. A pre-implementation checklist will be employed to ensure the PA is followed through the life of the project (Appendix B).

The legal framework also requires that the agencies consider cultural resources as they relate to the Archeological Resources Protection Act (ARPA) of 1979, the American Indian Religious Freedom Act (1979) and the Native American Graves Protection and Repatriation Act (1992). In addition, the FS is a signatory to the San Luis Valley Intra-tribal and Intra-agency Memorandum of Understanding (MOU) that provides procedures for compliance with the Native American Graves and Repatriation Act of federal lands within the San Luis Valley of southern Colorado (GSRA 2008).

Existing Condition

A Class I literature review utilized the records of the Colorado State Historic Preservation Office, the heritage resource atlases of the Rio Grande National Forest and all relevant heritage resource inventory reports (Reiser 2017). This overview revealed that proposed treatment areas for Alternative 2 (proposed action) have a total of 8,147 acres previously surveyed (46%) for heritage resources. Proposed treatment areas for Alternative 3 have a total of 4,541 acres previously surveyed (48%) for heritage resources. Previous inventories have resulted in data that serve to inform the current project analysis in terms of site significance (*eligible* to the National Register of Historic Places or *not eligible*), the site types and site distribution across the landscape as well as high potential vs. low potential areas, based on a predictive model. However, some of the older surveys would require sampling in future heritage resource inventories, as they are not to current standards. The predictive model aids in identifying high site probability areas using criteria such as proximity to water, slope, vegetation and aspect. This, in addition to a summary of existing sites and surveys, goes far in helping archaeologists build research designs for each tiered undertaking and to understand the nature and scope of the potential for heritage resources across a large landscape. When project activity areas are identified for implementation, a Heritage Checklist will be employed that will guide how project activities will comply with the Colorado Bark Beetle PA.

Inventory data gathered within the analysis area since the mid-1970s suggests, not surprisingly, that most archaeological sites are organized around water. Outliers include a few prospect pits, tie-hack cutting areas, and aboriginal ‘chipping stations’ perched high on saddles or other promontories far from water. Low potential areas include the heavily timbered areas interior to the tree lines (which changes over time) and on slopes greater that 25%. It is also assumed that many heritage resources within the analysis have been impacted by historic logging events and/or have been collected upon and/or vandalized through time. However, it is also expected that some intact buried cultural deposits remain.

Within the proposed treatment units in Alternative 2, thirty-five heritage sites have been previously documented. Three are eligible to the National Register of Historic Places (NRHP), including Cumbres & Toltec Scenic Railroad; a National Historic Landmark. Ten sites remain unevaluated. Within the proposed treatment units in Alternative 3, sixteen sites have been previously documented. Two are eligible to the NRHP, including the Cumbres & Toltec Scenic Railroad**,** and six remain unevaluated. The literature search suggests variable degrees of site density across the analysis area depending especially on proximity to water. Previous inventories do suggest that heavily timbered areas (spruce-fir) exhibit very low potential for heritage resources while tree lines along watercourses exhibit moderate potential. The unevaluated sites represent ‘deferred maintenance’ for the Heritage Program that is mandated to evaluate as many sites for significance as possible through the life of this project.

Some heritage resources have likely been negatively impacted by historic and unmanaged livestock grazing, wild ungulate grazing, unmitigated soil erosion, illegal roads, and/or dispersed recreational activities for decades. In addition, some of the analysis area may have been subjected to intensive logging activities that occurred between the 1920s through the 1960s prior to the advent of the National Historic Preservation Act (NHPA) of 1966 or the National Environmental Policy Act (NEPA) of 1970.

Direct and Indirect Effects

Alternative 1 – No Action

Since this alternative includes no ground-disturbing activities, the potential for inadvertent discoveries of and damage and destruction to surficial and buried cultural deposits or aboriginal human remains would be negligible. This alternative would have no direct effect on significant heritage resources and no design criteria or monitoring activities would be necessary. However, the fuel loading that would continue to occur under the No Action Alternative could result in negative direct effects to significant fire sensitive heritage resources if large scale catastrophic wildfires sweep over the region. Fuel loadings would continue to increase as snags fall, increasing the potential for longer duration fires and negative soil-heating impacts that can negatively impact archaeological features and artifacts.

Alternative 2 – Proposed Action

Under this alternative, the potential for effects to heritage resources is highest of the action alternatives because it proposes the greatest number of acres to be potentially treated. However, the potential to effect heritage resources is low within areas proposed for commercial activities in higher elevation spruce-fir stands as they contain the lowest potential for heritage resources. If landings and skid trails are reused from past harvests, the potential of effect to heritage resources is reduced. If design criteria below, the Heritage Checklist and the stipulations outlined within the PA are followed, there should be no adverse effects to significant heritage resources.

Alternative 3 – Vegetation Management – Limited Action

Under this action alternative, the potential for effects to heritage resources is lowest of the action alternatives as there are fewer acres of treatments proposed. As with Alternative 2, proposed units are within low potential areas for heritage resources (high elevation spruce-fir). If landings and skid trails are reused from past harvests, the potential of effect to heritage resources is reduced. If the Colorado Bark Beetle PA, the Heritage Checklist and the design criteria outlined below are followed, there should be no adverse effects to significant historic properties.

Effects Common to All Action Alternatives

Sanitation/salvage, fuels reduction treatments (mechanical thinning), tree planting, landings, and new road construction all have the potential to directly affect heritage resources. Direct negative effects to heritage resources of certain commercial and non-commercial treatments could include the potential destruction and/or alteration of unidentified heritage resources through ground disturbance and inadvertent impacts to standing structures.

Indirect effects to cultural resources could include erosion potential from the removal of vegetation and increased resource visibility, which may make the resource vulnerable to vandalism. Conversely, vegetation removal can allow resources to be more easily inventoried and understood by researchers. Beneficial indirect effects from fuels reduction around fire sensitive heritage resources can result in greater protection from increasingly intense wildfires. Fuels reduction can therefore mitigate the potential negative effects to heritage resources from potential future suppression activities associated with a wildfire.

Activities such as road maintenance and the opening of old roads would not be expected to directly impact heritage resources if maintenance is relegated to the original road foot print. Temporary road construction has the potential to have negative direct effects on unidentified buried cultural deposits for all action alternatives. Indirect effects from project activities can include the erosion of buried cultural deposits precipitated by temporary road construction and the removal of trees. Potential indirect effects from vandalism to heritage resources perpetrated by individuals associated with project activities is possible under the action alternatives.

Finally, action alternatives have the potential to negatively affect stands of the ethnobotanically significant oshá plant (*Ligusticum porteri*) in the short term. However, salvage operations would likely have a positive effect on plant populations over the long term. Preliminary research suggests and visual observation confirms that oshá responds well to overstory removal, precipitated by fire, beetle kill, and salvage logging alike (Kindscher et al 2013). While locally abundant, the plant is reported to be disappearing at lower elevations and in popular collecting locations in the southwest region likely due to climate change and over-wildcrafting by harvesters. Therefore, salvage activities will likely have positive direct effects on wild oshá populations in the analysis area and the southwest region. This increase could continue to drive discussions and research toward the limited commercial harvest of the plant as an alternative forest product.

Cumulative Effects

The loss of heritage resources has happened in the past and will happen in the future. The cumulative effect is that over time fewer heritage resources will be available to learn about past human lifeways, to study changes in human behavior through time, and to interpret the past to the public. Heritage resource inventory, recording, evaluating and archiving basic information about each site for future reference serves to partially mitigate potential cumulative effects to heritage resources. In conjunction with the proposed project, previous logging activities, recreation activities such as hunting, and livestock grazing have the potential to cause ground disturbance (erosion) and lead to cumulative, long term, irreversible adverse effects to heritage resources.

Past Actions that have likely negatively affected heritage resources within the analysis area include historic and unmanaged livestock grazing, wild ungulate grazing, unmitigated soil erosion, illegal roads, and dispersed recreational activities. In addition, some of the analysis area may have been subjected to intensive logging activities that occurred between the 1920s and 1950s prior to the advent of the National Historic Preservation Act (NHPA) of 1966. As such, it is also possible that heritage resources have been previously impacted by past logging within the project area.

Unmanaged recreation still continues within the analysis area. Grazing is managed much better than in the 20th century, however the cumulative effects of domestic grazers along with wild ungulates can continue to negatively impact heritage resources, especially within or near riparian areas.

Grazing will continue into the foreseeable future. Adjustments may be made to improve forage use and stream/riparian protection. In the long run it is expected that the grazing program will remain the same into the future with similar effects unless continued drought demands changes in livestock numbers and seasons of use. Timber activities are likely to increase and perhaps increase soil disturbance overall in the short term; however into the future as the spruce die the timber activities are likely to slow and shift out of the spruce zone for an extended period, perhaps 100+ years. Recreation use is likely to remain constant or to increase. While there may be changes in the distribution of activities, due to dead trees, which may affect wildlife distribution and areas open for firewood cutting, it is anticipated that recreation levels will be largely unchanged into the future.

3.15 Recreation Use

Scope of Analysis

This section addresses recreational and travel management within the CP District-wide Salvage Project area as shown in Chapter 1.

The national recreational opportunity spectrum (ROS) and the Forest Plan are used to define and manage the expected recreation experience in this analysis. The Forest Plan provides the management framework for the recreation resource. The Forest Plan designated each part of the Forest into management area (MA) direction

(see Chapter 1, Section 1.5, and Table 2). These MA include standards and guidelines for managing recreation and other Forest resources. The ROS is an inventory tool used to describe the existing condition of recreation opportunities. The Forest Plan assigned a range of appropriate recreation settings using the ROS. These are used to guide management activities in order to maintain or attain a defined range of recreation opportunities. The ROS classes are defined in detail in Appendix J.

Existing Condition

Past Actions that have affected the Existing Condition

Recreation use on the Conejos Peak Ranger District has varied and fluctuated over time with changes in land use, federal land management, economic drivers and socio-cultural influences. In the early 1900's, livestock grazing was prevalent and consisted of thousands of sheep moving from the valley low lands following the receding snow up to the high mountains. Since the late 1900's, a more modern grazing rotation of shorter seasons and mostly cattle grazing has been utilized. Fire *prevention* programs have evolved into fire *management* programs that focus on integration of wildfire into natural forest processes. In the past, roadways were not planned but were user-created by primitive and later motorized vehicles. As management of this area advanced, user-created trails and two-tracks were replaced by engineered, graded roadways. Game management has progressed to provide new experiences in hunting and fishing by introducing and promoting a variety of animals to harvest and pursue. Advancements in technology (GPS, geo-locators, cell phones, etc.) and in transportation (ATV, UTV, high-clearance vehicles, etc.) have made it easier to access and navigate primitive areas that were once inaccessible except by foot or horseback.

Past activities that affect the existing conditions include livestock grazing, timber harvest, road construction, and various forms of dispersed recreation, all within the project area boundary.

Recreation

National Forest System (NFS) lands within the project area have been used for a diverse array of recreational activities for over 100 years. Recreation opportunities within the project area include but are not limited to: driving for pleasure, viewing scenery and wildlife, camping in campgrounds, backpacking, hiking, hunting, fishing, horseback riding, picnicking, firewood gathering, snow shoeing and cross-country skiing to a system of yurts, use of all-terrain-vehicles (ATV) on roads, and snowmobiling. There are several priority and temporary outfitters who are authorized to provide services to hunters and fishermen on NFS lands within the project area.

The project area includes nine developed campgrounds, one group area, sixteen trailheads, three cabin rentals and multiple dispersed camping areas.

Table 59. Recreation Site Development Scale and Total Capacity.

Number of Sites	*Development Scale*	*Total Capacity*
2	0	50
6	1	246
5	2	191
18	3	1799
3	4	24
34		**2310**

Trails and Travel Management

Forest travel regulations restrict motorized travel to designated roads and trails. Additionally, forest regulations allow vehicles to leave roads for a distance of 300 feet to access a suitable campsite or for gathering firewood, as long as no damage is caused to the resources. Game retrieval is allowed in some areas on the district during the big game hunting seasons. Game retrieval is allowed in the afternoons and only low tire pressure ATVs under 48 inches in width are permitted.

Roads and trails within the project area provide travel access and corridors for motorized and non-motorized uses (Figure 7). The majority of trails within the project area are single track trails, with trails 740.1 and 741 being the only ATV trails on the district. The district has a total of 283 miles of trails with approximately 71 miles designated as motorized and approximately 212 miles designated as Non-motorized within the project area.

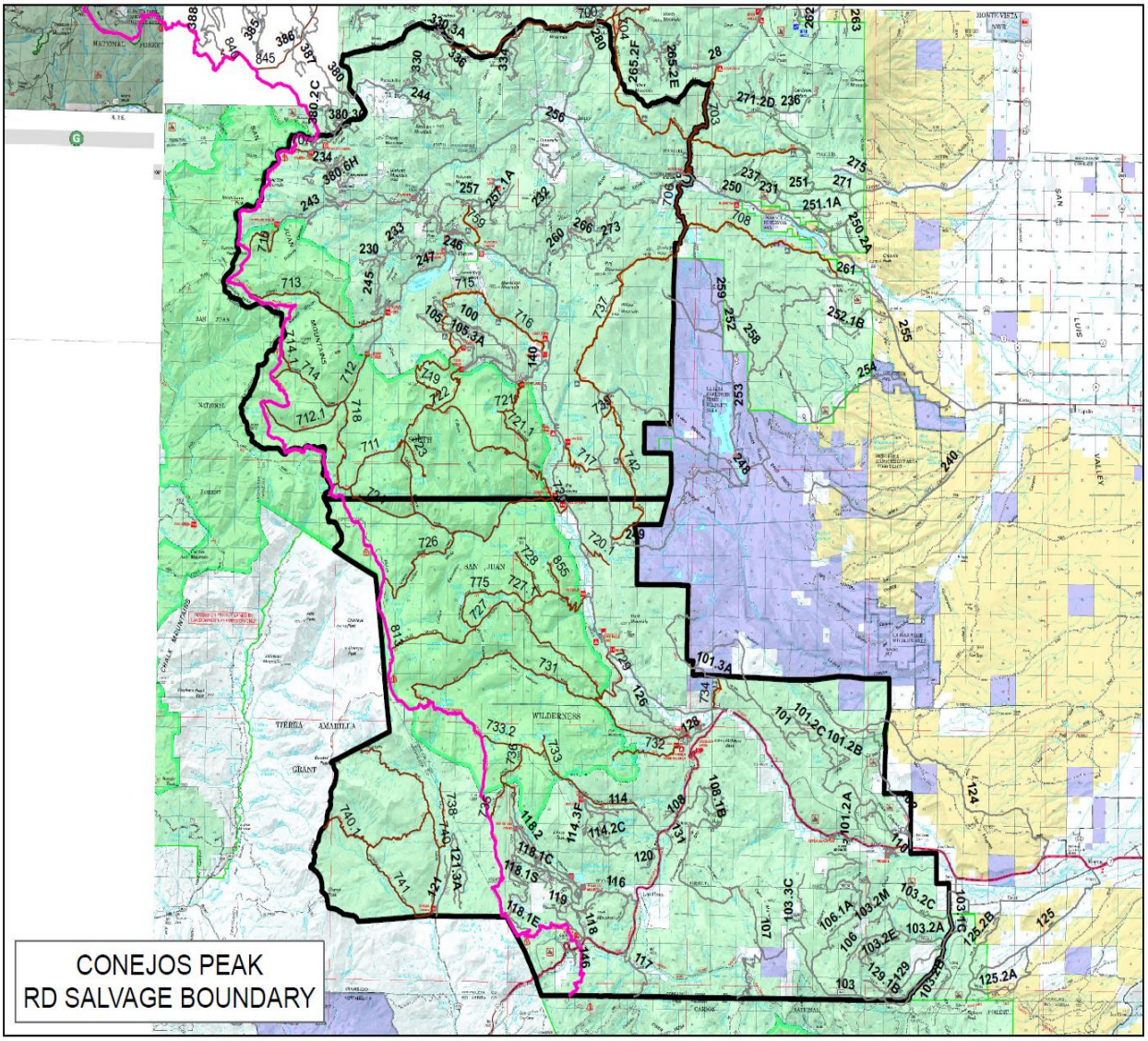

Figure 7. District map of roads and trails.

Continental Divide National Scenic Trail

Approximately 54 miles of the Continental Divide National Scenic Trail (CDNST) exists on the Conejos Peak Ranger District. The CDNST is a congressionally-authorized trail and has national management direction.

For this project, salvage harvest treatment is proposed near approximately 1.5 miles of the CDNST near Cumbres Pass and on the south side of approximately 0.8 of a mile of the CDNST near Elwood Pass.

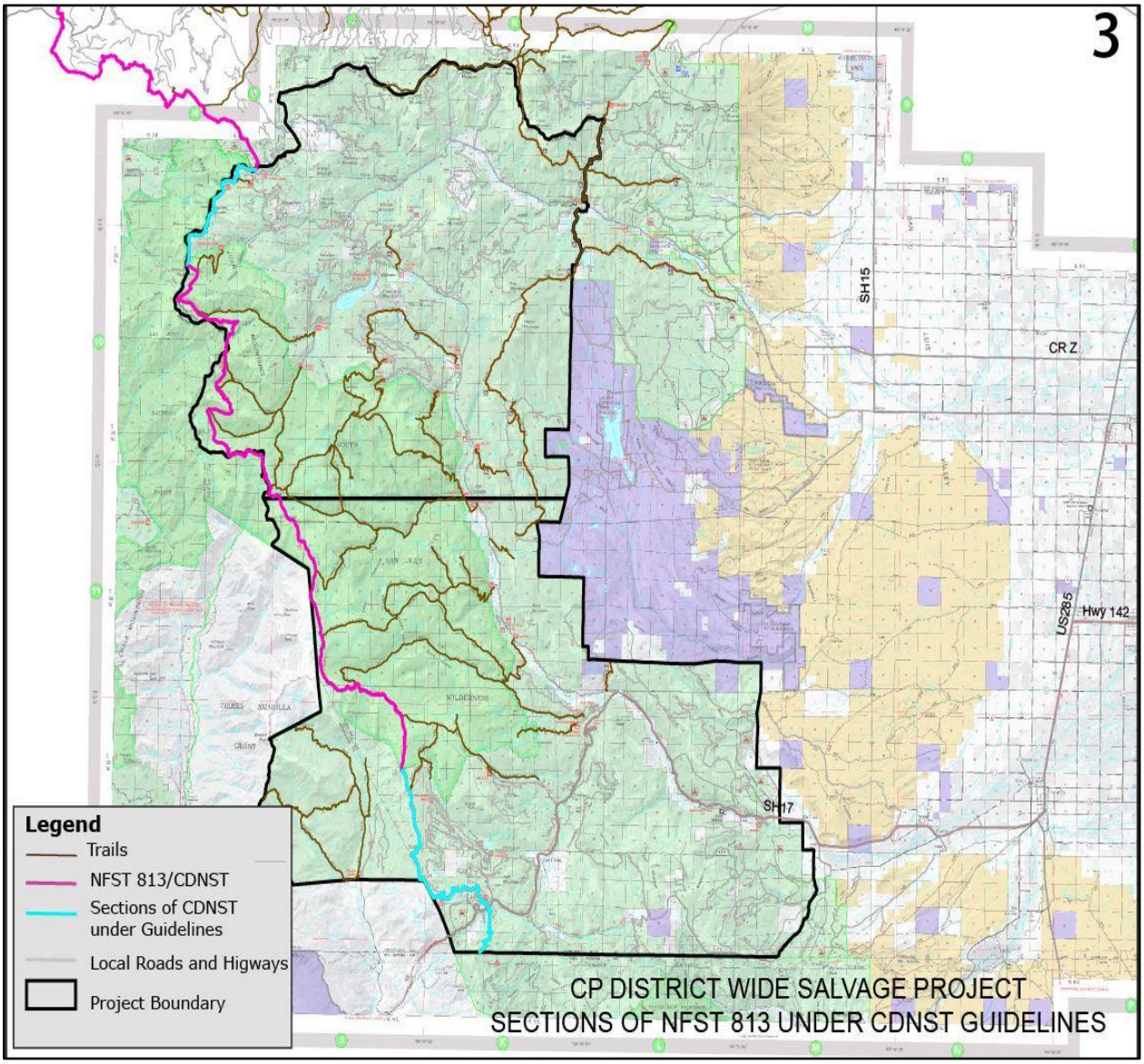

Figure 8. CDNST district location map.

Wilderness

Although the South San Juan Wilderness area falls within the project area boundaries, under any of the project alternatives harvest activities would not occur within congressionally designated wilderness areas. Therefore wilderness resources will not be discussed in further detail as part of the recreation analysis.

Recreation Special Uses

The district administers multiple recreation special use permits that fall within the project area. These special use permits consist of priority and temporary use permits, recreation residences, non-commercial and recreation events. These permits consist of activities such as hunting, fishing, camping, hiking, backpacking, horseback riding, weddings, reunions, and competitions. The district manages the following special use permits within the project area:

Table 60. Recreation special uses on the Conejos Peak District.

Number of Permits	Activity
9	Recreation Residences
7 Priority	Outfitter and Guides
2 Shelter	5 Yurt Rentals
Annually 4-12 Temporary	Outfitting and Guiding
Annually 4-8	Non-Commercial Group Uses
Annually 2-5	Recreation Events

Direct and Indirect Effects

Direct and indirect effects will be discussed in four sections specific to the recreation activity for the No Action Alternative and the action alternatives. Those activities are: Recreation (Developed and Dispersed), Trails and Travel Management, Continental Divide National Scenic Trail, and Recreation Special Uses (permitted use).

Alternative 1 – No Action

Recreation

Under the No Action Alternative, vegetation management could still occur as user safety and access are deemed necessary. Typical vegetation management activities such as force-account chainsaw crews, saw training classes, or site-specific hazard tree removal could continue in areas of concentrated forest use (administrative sites, campgrounds, roadways, etc.). This would not be a concerted effort as in the action alternatives and would likely not be completed in the proposed timeframe of 1-15 years. These activities would occur as-needed and as funding and priorities allowed. Most of the beetle killed hazard trees in developed sites have been managed or are currently being managed at a site-specific level due to safety concerns. Remaining dead trees would continue to fall potentially impacting the infrastructure in and around developed sites. This alternative would not be expected to have a large impact on developed recreation sites.

Dispersed camping and dispersed recreation could change with the No Action alternative. Sites used in the past could become increasingly hazardous. People may choose to use previously unused sites in order to avoid these hazards. This could result in new sites being created in previously undisturbed areas. Pristine areas and open grasslands (areas devoid of hazard trees) could be some of the only places to recreate due to their lack of dead or dying spruce.

Travel within forested areas could continue to be more difficult due to falling dead trees. Roads that would be improved or maintained under the action alternatives may be left unmanaged or blocked by downed trees impeding motorized and non-motorized recreational travel. This could result in user-created paths that could

cause increased erosion and resource damage. System trails could continue to be damaged or blocked by dead and downed trees and debris.

Cross-country foot and horseback travel within the project area could be more difficult and dangerous under the No Action alternative since dead trees could fall and likely not be removed. Additionally, more obstacles may be hidden under snow in winter therefore obstructing over-snow travel and potentially increasing accidents to winter recreationists.

Under the No Action alternative, calculated timber harvests and removal will not occur or be planned by timber managers. Hazards may need to be mitigated one tree at a time and trips to remote areas may be needed in order to ensure open, public access. These activities cause an increase in overall cost and impact to the District's recreation program. Additionally, common occurrences such as wind events and heavy snow that typically bring down a large number of trees at once would still likely occur at a higher rate causing potentially dangerous safety issues to forest users and emergency response personnel.

Trails and Travel Management

Due to an increase in dead, dying trees falling across roadways or to the increase in perceived hazards from dead trees, users may form new, unplanned routes of forest travel. Braiding, routes parallel to one another, may occur due to numerous people avoiding obstacles on the way to popular destinations. Trail braiding and new route creation typically leads to an increase in resource damage and erosion. Trails and roads are usually engineered to insure proper drainage in order to decrease erosion. It is directed in a way that its force does not take the road bed or trail bed away. Once travelers start using alternate routes, water tends to follow those routes. The erosion, itself, then becomes an obstacle in the form of ruts and gullies.

Combining the issues of unmanaged hazards, erosion, and path obstruction may lead to trail closures. Trail crews, if present, could have a hard time keeping up with the pace needed to keep trails safe. Decisions to close trails could be made if it is determined that the liability of keeping them open is too great.

It could be more difficult for people to enter system trails and roads. Roads and trails that lead to recreational opportunities could be blocked by down trees or hazards may discourage travel to and from forest destinations. As a result of fewer people in these areas, solitude experienced by some visitors would likely increase.

Continental Divide National Scenic Trail

Under the No Action alternative, there would be no effect to the CDNST from proposed treatments. Dead trees would continue to fall and greater funds to keep this trail open could be needed as more trees block the trail. Crews with specialized skills in removing large diameter trees are needed to clear the Continental Divide trail however, travel to the CDNST from the district office is long and difficult. This makes trail work and maintenance on the CDNST logistically difficult, which may decrease service to the public.

Recreation Special Uses

Under Alternative 1, trails and infrastructure outside of harvestable areas that are used by outfitters and guides would continue to experience large amounts of downed trees, hindering travel and causing an access and workload impact to the permittees.

The presence of dead, dying and falling trees could be costly to holders of special use permits. The fire danger to recreation residence owners may increase. If fires occur, their momentum may be greater if dry fuel is present and downed fuel gives a continuous path for the fire to travel. Temporary use proponents may be less likely to apply for special use days if the area is not easily accessible. And, current priority use outfitters may have expenses in clearing their paths into areas they are permitted to operate.

Wind events and heavy snow would continue to down trees on yurts, trails and snow routes. Dangerous conditions and hazards may create a situation where holding a special use permit is no longer economically feasible due to the risk and liability to customers.

Alternatives 2 and 3 – Vegetation Management - Proposed Action and Limited Action

It is assumed that the types of impacts that have the potential to affect recreation use are the same to both action alternatives. The effects could be dependent on the location where the treatments occur and to what spatial degree. Both action alternatives could likely reduce some of the recreation impacts compared to Alternative 1 but could create other impacts to Forest users.

Recreation

Under the action alternatives, hazard tree removal would be authorized and there would be positive safety effects on developed sites such as campgrounds, picnic areas, trailheads and access roads. Some treatment areas may be closed temporarily while proposed activities occur, causing negative impacts to users and the concessionaire authorized to manage the site. However, systematic closures for treatment would likely be rare and of shorter duration than if closures were to occur due to safety concerns where no treatments were scheduled. User experience in developed recreation sites would likely be more positive post-treatment due to enhanced safety and scenic quality of live, residual trees. The action alternatives would likely provide for safer and easier access to trails. Openness of trailheads and roads would be more consistent for users.

Infrastructure could be preserved and protected by the action alternatives. Controlling the paths in which trees fall could avoid toilets, signs, tables, and other recreation features. Professional timber harvest could prevent the random falling of trees as they dye. Shelter permits, such as the yurt rentals, could benefit by having these professionals keep trees in the surrounding areas from hitting their structures.

The action alternatives could have temporary impacts to recreation. Hazards in developed areas can be eliminated through harvest, instead of on a case by case basis. An example would be harvesting many of the trees in a campground over a summer, instead of using forest personnel or concessionaires to fall one tree at a time. Developed areas could be closed for these operations, preventing use for short periods of time.

Depending on their proximity to the treatment areas, dispersed recreation sites may be enhanced by clearing the dead and dying trees. Increasing user safety, access, and scenic quality may be a benefit. However, salvaging dead trees may also decrease the amount of cover and privacy in some dispersed sites. Timber harvest activities may temporarily degrade the user's experience due to noise. Additionally, sites, roads, trails and trailheads may be temporarily closed during implementation of the action alternatives.

Harvest and hazard fuels mitigation activities including chainsaw operations and temporary road-building may impede or close forest access in some locations. Harvest may affect typical animal movement and therefore hinder hunting. Snow trails for skiing and snowmobiling may be affected by winter operations.

Trails and Travel Management

Temporary closures could prevent people from accessing areas for the time it takes to remove hazards and dead and down trees. The roads could then offer safer and easier travel to all destinations within the analysis area. Safer and easier access to trails could allow contract and volunteer labor the ability to clear trails for both motorized and non-motorized users.

With improved access to the area may come higher visitor use. Trails even in non-motorized areas could be cleared more efficiently because crews may have easier access to trail heads. There could be more demand for permitted use. With the action alternatives, logging traffic may impact Forest users. Equipment and

logging trucks may affect user's experience with noise, dust and diesel exhaust. Because timber contracts require a higher level of road maintenance, road conditions may be better for all users.

Continental Divide National Scenic Trail

Under the action alternatives, approximately 1.7 miles of the CDNST could be affected by salvage harvest treatments. Where these treatment units exist, the project-level checklist would be the instrument to ensure compliance with the CDNST regulatory direction including the National Trail System Act, 2009 Comprehensive Plan and the applicable best management practices. Design features for project-level consideration near the CDNST could include the following:

1. SHAPE OF INDIVIDUAL UNITS
    - The goal is natural appearing opening(s) when viewed individually and a natural appearing mosaic when viewed within the broader landscape.
2. EDGES OF INDIVIDUAL UNITS
    - The goal is a natural appearing transition between treated and untreated vegetation.
3. PATTERN CREATED BY MULTIPLE UNITS
    - The goal is a natural appearing mosaic of vegetation across the landscape.
4. COMPOSITION OF VEGETATION
    - The goal is to maximize diversity of species and age class that are within the landscape's natural range of variation/Forest Plan Desired Condition.
5. ROAD, SKID TRAIL, and LANDING CONSTRUCTION
    - The goal is to minimize long-term visual impacts of access roads, skid trails, and landings.
6. SLASH TREATMENT
    - The goal is to minimize slash piles and residue that appears man-made.
7. SKYLINE TREATMENTS
    - The goal is to minimize the long term visual impacts of skyline operations.
8. UNIT MARKING
    - The goal is to minimize the visibility of tree markings post treatment.
9. RELATED RECREATION AND TRAIL MITIGATION
    - The goal is to minimize both short term and long term impacts to recreation infrastructure and use.

People traveling on our trails and roads could view a landscape that is impacted by both machinery and insects. Even with the implementation of the CDNST direction, views from the continental divide could be altered. Experiencing solitude could be more of a challenge in any area where salvage is occurring.

Where the CDNST is in close proximity to the salvage area, travelers may find altered conditions. Camping sites may be cleared of trees. Roads, machinery, and timber sale areas may be visible for a considerable distance along their trek. Safer travel routes could exist simply due to the removal of dead and dying trees. Dust, diesel exhaust, and noise may be present during the same time people are using the trail.

Recreation Special Uses

Salvage harvest and hazardous fuels reduction activities could temporarily affect organized camps and other facility-based special use permits during implementation. The effects could include closing areas permitted for use by shelter permits, as well as those used more traditional outfitters and guides. Outfitting and guiding as well as special events may be cancelled for safety reasons. Possibly to avoid logging traffic. An example could be a recreation event involving cyclists on a heavily traveled road. If not cancelled or postponed, these activities could be relocated to mitigate project implementation. The long-term impacts of continually falling trees and visual impact of dead and dying trees would likely be a greater impact to these users.

Cancellations, relocations, and special accommodations needed for the action alternatives could cause short-term financial losses to outfitters and guides as well as other special use permit holders. The need to alert customers of activities in the area could become necessary. The owners of these operations may likely share some of the financial burden of notifying people. Customers may only have certain times they are able to visit the area, and they may not be able to adjust to postponed seasons or times. Over-snow travel may need new routes defined. The yurt operators may need to place markers or signs in new locations to define these routes. This takes time, effort, and money that may not be readily available to these businesses.

Areas previously not accessible could become new areas of exploration for visitors. Trees that once blocked snowmobiles may be removed. This may allow for easier travel within the harvested area. Motorized game retrieval, allowed in the area, may be possible in areas that were forested prior to timber harvest. Hunters may choose areas for this reason alone.

Salvage areas could be marked for timber harvest. Selected areas, such as buffers to trails and scenic roads, could be left alone. Closed roads could be open. Temporary roads could be created. Timber harvest activities and machinery could be near trails, campgrounds and roads. New trees may be planted and new rules may follow in order to protect seedlings. Over-snow use could be limited to times when enough snow covers tree tops to allow for healthy growth.

The action alternatives could remove hazards within recreation residences, over-snow routes, and yurt locations. Reducing fuels through salvage may prevent fires from reaching these structures. Commercial harvest may lessen the burden, of hazard removal, on both the owners of recreation residences and yurt operators.

Customers may enjoy a safer stay knowing dead trees do not exist close to their shelters and some businesses may benefit by having new areas available for visitation. Snowmobiles may be able to reach areas they could not reach before. Direct routes to popular sites, like reservoirs, may allow for quicker trips for ice fishing.

Cumulative Effects

A combination of all of the proposed treatments could temporarily impact the user experience in localized areas of the district. However, these effects would be short-term (less than 15 years) and, over the landscape and over time, user safety, recreation and visual experience could be enhanced through the reduction of standing, dead stems, the continuity of localized forest access, release of residual regeneration and the planting of new trees. Vegetation treatments could alter big game foraging and movement, which could impact hunters though in the long-term salvage harvest treatments could create for favorable forest conditions and could increase animal forage and hunting opportunities. Implementing the outlined project design criteria and Forest-wide standards and guidelines should address these temporary impacts, and could provide for the continuation of accessible and safe recreational opportunities within the project area.

Irreversible and Irretrievable Commitment of the Resources

There would be no irreversible or irretrievable commitment of resources if the proposed action is implemented.

3.16 Scenic Resources

Scope of Analysis

The project area boundary is located on the west side of the San Luis Valley, from the northern end of the Conejos Peak District to the southern end of the Conejos Peak District and the New Mexico border.

Past Activities that have affected Existing Conditions

The Conejos Peak District has large areas of spruce beetle infestation with evidence of dead trees across the District covering many of the viewsheds seen by visitors. This includes areas of heavily used Forest Service roads, Scenic Byways, Scenic Railroads, and popular recreation destinations. The forest canopy has been changing over the last 15-20 years with many of the canopy changing from dark green to red to grey in color. Most visitors will notice large viewsheds that contain standing dead grey trees mixed with sparse green fir or aspen trees. Many of the locations proposed for harvest have had some previous harvesting activities or disturbance. However, this analysis includes areas that have not had previous harvesting.

RIS sites were identified in 1990 during Forest Planning that identified most of the Conejos Peak District in the Existing Visual Condition of Level I or II (which is defined as naturally appearing or nearly naturally appearing). Many viewsheds would still be considered natural appearing however, the large amount of beetle killed trees have changed the color and texture of this landscape from heavily forested and green to gray with missing canopy.

Recent Harvesting that affects the Scenic Resources

Trujillo Meadows Campground has recently been harvested due to beetle kill trees in the campground. This has reduced the canopy cover in the campground to approximately ½ of the original canopy cover.

Adjacent to the analysis boundary is the County Line/Wolf Timber Sale which has very little canopy due to a previous a Forest Service and private land timber sale and large scale blowdown event that left roughly 5-10 trees per acre. The County Line/Wolf Timber Sale also harvested around the Flat Mountain Yurt. The private land that sits on the west side of the Cumbres Vegetation analysis boundary was also harvested 15 years ago and left approximately 30-40 trees per acre.

Existing Conditions

All of these events have altered the Trujillo Meadows Viewshed and Landscape Character from forested to nearly non-forested. Viewers can expect to see harvesting activities from current harvesting and dead and dying trees in the remaining viewsheds. Many of these past activities as well as the current spruce mortality can be seen along the Los Caminos Antiguous Scenic and Historic Byway, the Cumbres and Toltec Scenic Railroad, the Sangre de Cristo National Heritage Area, Forest Development Road (FDR 250) and may recreation sites. District personnel determined that many of the roads including FDR 250 and FDR 118 is a Level 1 Road (viewers have a high concern for scenic resources) during Forest Plan Revision.

Most of the areas identified for harvesting within the analysis area is mapped as “High” which means all harvesting activities on the landscape must borrow from the form, line, color, texture, and landscape patterns so completely that viewers are not aware of landscape deviations. These deviations must not dominate the landscape and remain visually subordinate. However, the Rio Grande Forest Plan Forestwide Standards and Guidelines identify several categories which the Scenic Integrity Objective can be changed to the next lower objective.

III-30 Forestwide Standards and Guidelines

Scenic Resources Standards

1. The Scenic Integrity Level(s), based on current landscape character, are usually accepted as the Scenic Integrity Objective(s) unless highly unusual or special circumstances identify a need to change, and will be limited to:

*Treatment of small-diameter/suppressed lodgepole pine stands.

*Harvest as a result of a disturbance such as fire, windthrow, or insect and disease infestations.

Variations in the Scenic Integrity Objectives may dominate the valued landscape

Character, but must borrow from the valued attributes such as size, shape, edge Effect, and pattern of natural openings, and still meet the minimum requirements of the next lower Objective chosen."

The CP District-Wide Salvage management activities would then have to meet the "Moderate" landscape objective. When the objective is changed to "Moderate", the landscape will "appear slightly altered" after harvesting activities. "Moderate" is defined as landscapes where the valued landscape character "appears slightly altered". Noticeable deviations must remain visually subordinate to the landscape character being viewed.

It is important to note that landscape Scenic Integrity Objectives only apply to human activities on the ground and not natural conditions. Changes to the landscape character from forested to non-forested are considered natural and fall within the range of natural landscape variability.

Direct and Indirect Effects

Alternative 1-No Action

The No Action Alternative will have no to very little impacts to scenic resources as large scale bug events are considered part of the overall landscape dynamic. These events would only be considered a change in cover type or change to landscape character only. However, visitors' response to these dynamic and changing landscapes may be dramatic as most visitors are attached to static (unchanging environments) especially in locations where people participate in recreational activities. Visitors can expect to see more dead or dying trees with the canopy opening and exposing more of the ground plane. Eventually a portion of these trees will begin to fall. There will still be texture on the landscape with standing dead trees, however, if trees have not turned gray already, trees will begin to turn red and gray changing the overall color of the viewshed. As the canopy opens up, it is expected that visitors may be able to see more of the ground cover. Seedlings and saplings will provide color and texture on the ground but the landscape will still look dramatically different than it did over a decade ago. During the winter months even more of the ground will be visible in the background viewing distances as the canopy recedes. There would be changes to the overall scenery for the Los Caminos Antiguous Scenic and Historic Byway, the Cumbres and Toltec Scenic Railroad, and recreation sites. Viewers would see dead and dying trees similar to the characteristic landscape that has been changing over the last 15 years.

Because this project is a large landscape level analysis, the visuals are looked at on a larger picture. Viewsheds are expected to move toward a change in character from forested to non-forested in areas of dead and dying trees, however, standing dead trees under this alternative will provide texture on the landscape. Evidence of dead and dying trees are recognizable due to the gray color of the landscape during the summer and fall months. Over the last 15 years, more of the ground plane is visible due to the absence of canopy and the ground plane will be more visible in the winter months.

Alternative 2 – Proposed Action

If this alternative is implemented, visitors can expect to see changes to the surrounding landscape character as trees are harvested. Visitors will see evidence of stumps and harvest activities, but these activities will not dominate the landscape character. Visitors will notice changes to the landscape, however, relative to the large beetle killed trees with little or no foliage, visitors may not notice harvesting activities as much as if harvesting was completed in a green stand of trees. During the winter months the background becomes more pronounced as snow accentuates loss of canopy, however this would also be the case with areas of non-harvesting, as most of the canopy is already open due to the amount of dead trees. In the immediate foreground, the snow will cover most of the evidence of harvesting activities for winter visitors. It is expected that visitors on the heavily used Forest Road 250 will see activities related to harvesting, however, they are expected to be in the middleground to background and on the top of benches. The areas being

harvested around Platoro and the 3 Forks trailhead will be viewable in the foreground and middleground. Visitors traveling within the Silver Lakes area on the northeast portion of the District will view harvesting activities in the foreground and middleground. The area adjacent to the Summitville will be viewable by visitors along roads that get heavy to moderate use. Many of these areas have recreation areas and trails; however, it is expected that within areas of high recreation use, harvesting activities will be mitigated to minimize the evidence of harvesting activities and may include lower stump heights, angle cutting away from viewer's line of sight, and blending harvesting activities with natural openings.

Visitors would expect to see harvesting activities under both alternatives, however, they would be gradual as timber sales were implemented over the next 8 years.

Activities such as thinning and lifting canopy heights to prevent wildfire risks will have little impact on the overall landscape for Scenic resources unless these activities happen directly adjacent to a trail or recreation site (within the immediate foreground-100-200' feet). The overall scale of this activity (roughly 1000 acres) over the entire District (roughly 500,000 acres) minimizes the impact. The expected results of canopy lifting will be pile burning in various locations; however, these piles will be mitigated away from recreation sites or along heavily used trails and roads frequented by visitors.

There is expected to be road reconstruction that could impact scenic resources; however, most of the salvage areas will be accessed by existing roads, closed roads that will be opened, or connector roads that may have revegetated over time. Some of these roads will be seen by visitors, others will be obscured by topography and vegetation.

The majority of impacts are expected to be from commercial timber harvest through salvage activities as new road construction and thinning are expected to be small. This may leave large openings on the landscape with missing trees and reduced amounts of color and texture on the landscape. These activities can fit within the landscape character if handled on a viewshed basis-or on a large scale. Contiguous activities that are implemented across large viewsheds can have less impacts than small pockets of heavily managed harvest activities that can draw the observer's attention to it. However a combination of smaller and larger activities can be mitigated on the landscape to minimize visual impacts with careful planning and mitigation measures.

Alternative 3 – Vegetation Management – Limited Action

This alternative includes less acres of harvesting and therefore visitor may see less impacts from commercial timber harvesting activities. This alternative has roughly half the harvested acres of Alternative 2. This alternative would leave more texture on the landscape from standing dead trees. Visitors can expect to see less activities in the foreground, middleground and background from commercial timber harvesting. This would include less slash and fewer stumps. During the winter months the background would become more pronounced as snow accentuates loss of canopy, however this may be less in areas that are not harvested. However, visitors would still see more of the ground plane, as most of the canopy is already open due to the amount of dead trees. In the foreground, the snow will cover most of the evidence of harvesting activities in the immediate foreground for winter visitors. It is expected that visitors on the heavily used Forest Road 250 will see less activities related to harvesting in the middleground to background and on the top of benches. The areas being harvested around Platoro and the 3 Forks trailhead will be viewable in the foreground and middleground but to a lesser degree. Visitors traveling within the Silver Lakes area on the northeast portion of the project will view harvesting activities in the foreground and middleground. The area adjacent to the Summitville will be viewable by visitors along roads that get a heavy to moderate use. Many of these areas have recreation areas and trails; however, it is expected that within areas of high recreation use, harvesting activities will be less and the remainder will be mitigated to minimize the evidence of harvesting activities and may include lower stump heights, angle cutting away from viewer's line of sight, and blending harvesting activities with natural openings.

Visitors would expect to see harvesting activities under both alternatives, however, they would be gradual as timber sales were implemented over the next 4 years.

The activities such as thinning and lifting canopy heights to prevent wildfire risks will have little impact on the overall landscape for Scenic resources because these activities will be less under this alternative. The expected results of canopy lifting will be pile burning in various locations, however, these piles will be mitigated away from recreation sites or along heavily used trails and roads frequented by visitors.

There is expected to be less road reconstruction that could impact scenic resources, however, most of the salvage areas will be accessed by existing roads, closed roads that will be opened or connector roads that may have revegetated over time.

The impacts from this alternative will be less than Alternative 2. Depending upon how harvesting is achieved, smaller more intense harvesting can create more impacts, however, through mitigation, these impacts can be mitigated.

The majority of impacts are expected to be from commercial timber harvest through salvage activities as new road construction and thinning are expected to be small. This may leave large openings on the landscape with missing trees and reduced amounts of color and texture on the landscape. These activities can fit within the landscape character if handled on a viewshed basis-or on a large scale. Contiguous activities that are implemented across large viewsheds can have less impacts than small pockets of heavily managed harvest activities that can draw the observer's attention to it. However a combination of smaller and larger activities can be mitigated on the landscape to minimize visual impacts with careful planning and mitigation measures.

Effects Common to All Action Alternatives

It is expected that the entire landscape will have a more open canopy appearance regardless of the harvesting. Harvesting under a more open canopy will lessen the impacts of overall harvest rather than harvesting against a dark background canopy. This is due to the current open nature of the characteristic landscape. In many areas, there are a large number of seedlings and saplings that provide additional texture and color on the landscape where salvage activities will occur.

However, many of the areas identified for harvest are near areas of recreation activities, especially in the Platoro area and along Forest Development Road 250 which provides the major access for visitors into the Conejos Peak District.

Given past harvesting activities, there is a high probability that remaining trees may fall due to blowdown potential. The trees that remain may not have the appropriate wind firmness needed to withstand a high wind event. This would further reduce the trees per acre and reduce the amount of texture on the landscape.

Cumulative Effects

There is the potential for these proposed harvesting activities to actually rehabilitate the residual timber activities on the landscape. This is due to the fact that previous harvesting has occurred in the Silver Lakes area and near Summitville. New harvesting activities can add to the negative effects of human made activities on the landscape, but also mitigate them.

3.17 Transportation

Scope of Analysis

This analysis inventories and evaluates the existing National Forest System Roads (NFSRs) and evaluates roads managed by other entities within the 332,000 acre (519 sq. miles) project area. This

report focuses on road treatments within the CPDWSP area. Road maintenance needed to accomplish the proposed vegetation management activities will be discussed.

Existing Conditions

Geographic information systems tools were used to analyze road location and mileage within the project area. Mileages given in this report should be considered precise to approximately ±10% (unless otherwise specified) after accounting for the precision of available 2017 ArcGIS® roads layers. On-the-ground reconnaissance was completed on most project routes to observe current conditions and determine needs for short- and long-term treatments.

An extensive road network was built within the project area for many reasons, including, but not limited to: supporting past timber management activities, supporting recreation opportunities, and providing access to private in-holdings. These roads are categorized by maintenance level (ML) ranging from ML-1 to ML-5 (Table 61). The CPDWSP area contains 348.0 miles of existing National Forest System Roads (NFSR) under various maintenance levels (Table 62).

Table 61. Description of NFR maintenance levels.

Maintenance Level	Description
ML 1	Basic Custodial Care (Closed)
ML 2	High Clearance Vehicles
ML 3	Suitable for Passenger Cars
ML 4	Moderate Degree of User Comfort
ML 5	High Degree of User Comfort

Table 62. CP District-wide Salvage Project Area Road Mileage by Maintenance Level.

Maintenance Level	Miles in Project Area
ML 1	66.8
ML 2	71.7
ML 3	209.6
Total Miles in Project Area	**348.0***

*Discrepancy due to rounding

The following list of system roads describes their current conditions and an example of some of the unique maintenance needs that would affect the cost per mile.

Fox Creek (NFSR 101) is 19.2 miles in length. However, this road is maintained by multiple entities. The first 1.3 miles is a ML-3 road, which will require light maintenance. Mile post (MP) 1.3 to 18.2 is a ML-2 road with both crushed aggregate and native surface material. The remaining mile is a ML-1 road with a native surface. There are approximately 7.0 miles within the ML-2 section of this road that will require heavy blading and dozer work. A substantial amount of drainage features, including ditching, will be required.

Fox Creek Spur (NFSR 101.3A) is approximately 3.1 miles long. This is a ML-2 road with native surface material. This road is currently not suitable for log truck traffic due to its narrow construction. This road will need to be widened, which will require a sizeable amount of bulldozer and blade work. Furthermore, the road was built on bedrock, and has a few steep areas.

Osier Park Plantation (NFSR 103.3C) measures 2.7 miles in length. The first mile of this road is a ML-2 road with native surface material. MP 1.0 to 2.7 is included in the project area and is a ML-1 road with

native surface material. This road is located in a rather flat area, and has waterflows that create a boggy surface. Therefore, substantial ruts are found throughout the roadbed, and will require a corrugated metal pipe (CMP) to be installed. This will necessitate at least 30 cubic yards of pit run to be hauled up in order to build up the roadbed for installation. Furthermore, this road will need significant blade work, and moderate clearing and grubbing.

Pinorealosa (NFSR 107) measures approximately 9.0 miles. It is a ML-2 road with native surface material. The majority of the length of this road is in need of heavy maintenance. Beginning at the 108.1A intersection, the road is in rough condition, narrow, steep, and rocky in places. Extensive work will be required to allow access for log trucks.

Cumbres (NFSR 119.1D) is about 1.5 miles in length. It is a ML-1 road with native surface material. This road is narrow, with heavy vegetation throughout, which will require significant clearing and grubbing, and extensive construction efforts. This will include installing several drainage features, such as culverts, drainage dips, and ditches.

Other roads within the CPDWSP area, including, but not limited to: approximately MP 0.0 to 1.9 of NFSR 234, MP 0.0 to 4.6 of NFSR 244, and MP 0.0 to 4.1 of NFSR 280 were evaluated for similar needs. These roads will require at a minimum: clearing and grubbing, catch basin cleaning, and road reconditioning to improve drivability for all vehicles, equipment, and log trucks. Additionally, NFSR 234 will require the replacement of a deeply buried CMP, which is located at Prospect Creek.

Desired Conditions

According to 36 CFR 212.5, the desired minimum road system is that which is "needed for safe and efficient travel and for administration, utilization, and protection of National Forest System lands".

The RGNF Forest Plan (Rio Grande National Forest, 1996) states that the desired future condition is: *"The road system continues to serve as adequate access for the public to enjoy the Forest. Road construction is limited, and the amount of reconstruction has decreased. Road closure is emphasized in some areas to enhance wildlife habitat, soil, and water resources."*

The Rio Grande National Forest has created a Forest-wide Travel Analysis Process (TAP) report, which "is a set of science-based recommendations for the forest transportation system, and is intended to inform subsequent National Environmental Policy Act (NEPA) processes, allowing individual projects to be site-specific and focused, while addressing cumulative impacts." (USDA) Through this science-based process, the RGNF staff recommended a minimum road system and also identified unneeded roads, in accordance with 36 CFR 212.5 (US Government). Each road within the analysis area was recommended for either keep/maintain, storage, or decommissioning (see Appendix B for definitions).

Construction Activities for all Action Alternatives

All NFSRs identified to be used during vegetation management activities in the CPDWSP area will require maintenance completed in order to ensure the safe passage of all vehicles, equipment, and log trucks. Table 62 displays the typical work items that will be completed based on the road ML.

Table 63. Maintenance Levels and Associated Work Items.

Maintenance Level	Typical Work Item
1 - CLOSED	Pre-Haul: • Remove slumps and slides • Replace non-functional culverts • Clearing and grubbing • Clean catch basins

Maintenance Level	Typical Work Item
	• Scarify, re-shape, and grade surface • Compact surface Post Haul: • Out-slope road • Clean catch basins • Temporary turf establishment • Install or repair gate
2 - HIGH CLEARANCE VEHICLES	Pre-Haul: • Replace non-functional culverts • Clearing and grubbing • Clean catch basins • Scarify, re-shape, and grade surface Post Haul: • Clean catch basins
3 - SUITABLE FOR PASSENGER CARS	Pre-Haul: • Clearing and grubbing • Clean catch basins • Spot gravel • Scarify, re-shape, and grade surface Post Haul: • Clean catch basins

Road reconditioning costs have been estimated to be approximately $1,430 - $1,770 per mile; however, this amount can vary greatly depending on the condition of the road. This was calculated using the Cost Estimating Guide for Road Construction developed for the Forest Service (US Forest Service).

Direct and Indirect Effects

Colorado Forestry Best Management Practices Water Quality Protection Guidelines are followed for road maintenance and construction/reconstruction activities. All roads within the CPDWSP area will be designed using the Standard Specifications for Roads and Bridges on Federal Highway Projects (US Department of Transportation), and the Forest Service Supplemental Specifications (USDA Forest Service).

Alternative 1 - No Action

Under the No Action Alternative, no changes would be made to the existing transportation network in the project area. Closed roads in the project area will not be opened and will continue to be monitored for critical issues. Natural grass and forb establishment would continue to occur, which may help stabilize roads. Also, tree seedling establishment can make vehicle travel more difficult over time. System roads would have normally scheduled maintenance but no additional maintenance or improvements would be funded or authorized for project activities.

Alternative 2 - Proposed Action

Road treatments for vegetation treatment implementation under the proposed action alternative would include up to 281.2 miles of existing open (ML-2 & 3) and 66.8 miles of closed (ML-1) routes. Where necessary, ML-1 roads would have gates opened, berms removed, and would be brushed-out to provide personnel, vehicle, and equipment access to harvest units. During use, ML-1 roads will remain closed to public travel. The only exception would possibly be a short-term opening for public firewood gathering following harvest. After use, the closed roads would be returned to storage using an authorized closure

method, and seeding would occur. Figure 7-1 illustrates the road system being used for Alternative 2 in the CPDWSP.

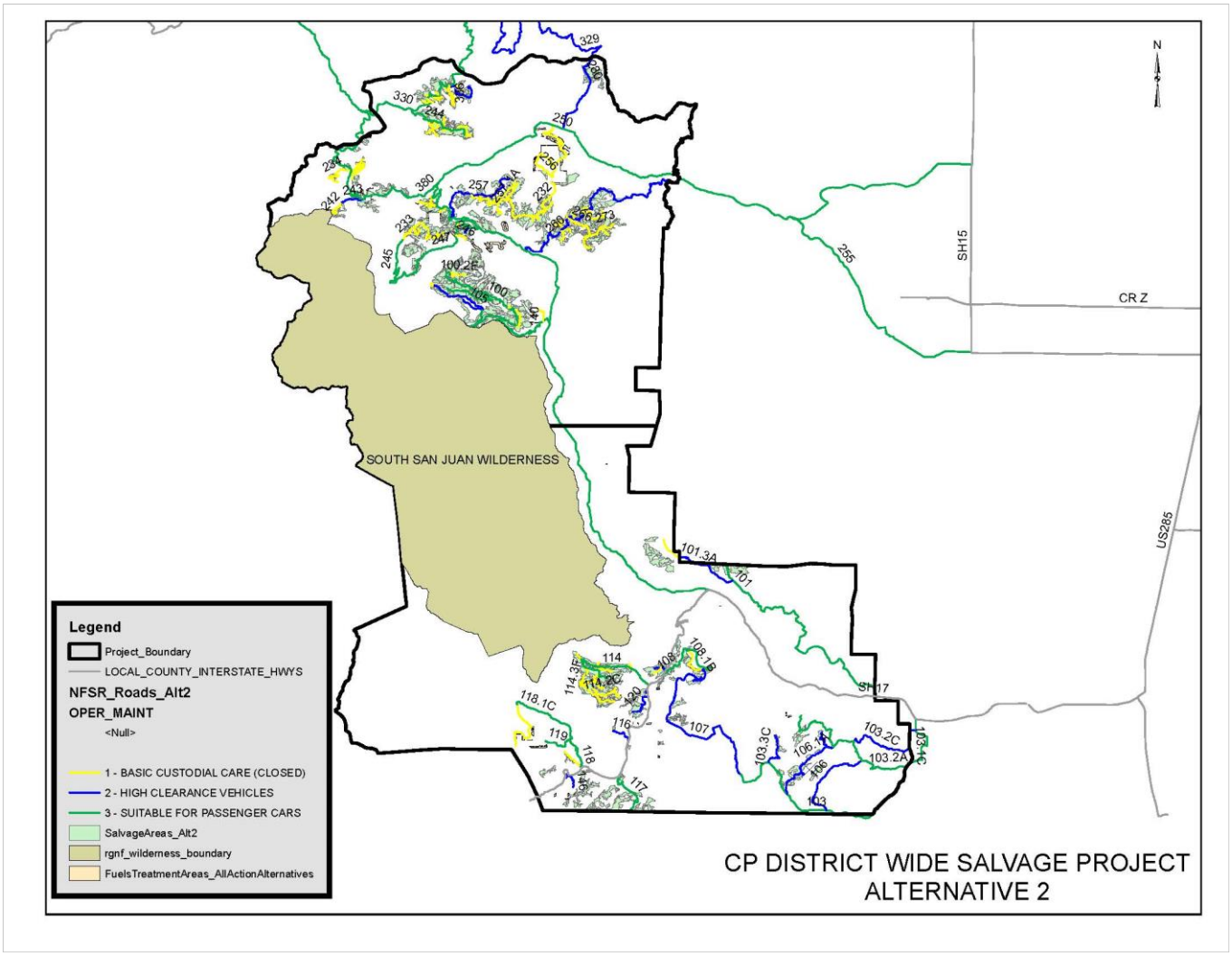

Figure 9. CP District-wide Salvage Project area Alternative 2 road map.

Alternative 3 - Vegetation Management - Limited Action

Road treatments for vegetation treatment implementation under the limited action alternative would include up to 280.0 miles of existing open (ML-2 & 3) and 61.2 miles of closed (ML-1) routes. Similarly to the proposed action alternative, ML-1 roads would have gates opened, berms removed, and would be brushed-out as necessary to provide personnel, vehicle, and equipment access to vegetation treatment units. During use, the closed roads will remain closed to public travel. The only exception would possibly be a short-term opening for public firewood gathering following harvest. After use, the closed roads would be returned to storage using an authorized closure method, and seeding would occur. Figure 9 illustrates the road system being used for Alternative 3 in the CPDWSP.

Effects Common to All Action Alternatives

Any construction of new temporary roads on previously undisturbed land would result in the irretrievable loss of virgin ground. The use and maintenance of existing system roads would have no effect since these corridors have been impacted by past activities and will return to current conditions after project activities are done.

The following direct and indirect effects apply to all action alternatives. All ML-1 roads, including those listed in the TAP, will be assessed on a road by road basis to determine their continued need following completion of all vegetation treatment activities. This will be accomplished by utilizing the project implementation checklists, which can be found in Appendix D of the EIS. A comprehensive evaluation of all Forest roads will occur after the Forest Plan Revision (FPR) concludes (RGNF in progress). The information gathered during this project will serve to inform travel management decisions in the future. No decisions that will change the Minimum Road System are proposed in this project. Table 64 was created using the TAP report's decommissioning recommendations in conjunction with the transportation network within the CPDWSP area.

Table 64. Travel Analysis process report recommendations for decommissioning.

TAP Recommendation	Road Numbers	Miles
System Roads recommended for Decommissioning	100.2F, 242, 250.6L, 260.1A, 280, 330.5A, 330.5B, 330.5C, 330.5D, 330.5E, 330.5F, 335.1A, 336.1A, 380.3C, 380.5A, 380.6A, 380.6C, 380.6D, 380.6E, 380.6F, 380.6G	14.7

The TAP's purpose is to provide recommendations and is not an official decision document. If any ML-1 roads are confirmed to be unneeded for management activities for the long-term timeframe they have the potential to be recommended for decommissioning following use and the completion of the FPR and subsequent processes. It was assumed that decommissioning would generally consist of all defined typical activities short of full obliteration and recontouring, though these more intensive operations may be used to meet specific resource objectives, if approved by the Responsible Official.

Roads used in this project needed for long-term access, but not in the immediate to near future, would be returned to storage (ML-1). Storage treatments would put these roads into an environmentally benign condition until future needs warrant reopening. Storage treatments could include a combination of obstructing or gating the entrance, installing water bars, and seeding.

Roads needed for long-term vehicular access would be maintained under this project to provide safe, efficient access, and to meet water quality BMP's. Maintenance activities would include surface grading, ditch reshaping, installation of drain dips and cross drains for surface erosion control, minor culvert cleaning or installation, roadside brushing, and seeding of disturbed areas.

Recurrent road maintenance is expected to continue annually for select NFSRs under an agreement between the Forest Service and Rio Grande and Conejos Counties. A list of these roads may be found in Table 65.

Table 65. Schedule A agreements within the CPDWSP Area.

County	Road Number
Conejos	101, 103, 105, 117, 118, 250, 255
Rio Grande	250, 329, 330 (CO 14), 380

All other NFSRs are maintained by the Forest Service on a 5 year cycle for the Conejos Peak District, and for other non-NFS routes by the applicable owner and users. As described under the action alternatives, additional road maintenance would occur on roads used for timber hauling operations. The needed work to allow safe passage of logging trucks is completed by the timber purchaser and the roads used are maintained by the purchaser for the period of use. This additional work does result in a general improvement in the condition of open roads and provides opportunities to fix some known problems, which can be beneficial to several resources. The benefit of additional maintenance is usually most apparent on the roads maintained

infrequently due to limited agency budgets. On roads maintained more frequently, the additional work may also help improve conditions to some extent and temporarily reduce maintenance costs for the Forest or County during the life of the timber sale(s). If a portion of the ML-1 roads are approved and decommissioned following use as part of the action alternatives, this would continue to reduce overall road miles on the Forest Service portion of the analysis area. Since these roads are currently closed to motorized travel, it would have no effect on public travel or road maintenance needs, but would move toward determining a minimum road system.

Cumulative Effects

Historically, the CPDWSP area was developed for mining and railroad building activities beginning in the 1880's. The main driver for the development of the southern area was the construction of the railroad, which still operates today as the Cumbres & Toltec Scenic Railroad. The construction of the railroad led to grazing activities in the area and extensive logging. Gold and silver were discovered in the late 1870's leading to mining activities in the Summitville area. The San Luis Valley continues to be an agricultural hub, and as such, grazing activities have continued in the area. Logging activities are also still occurring in the area along with hazardous fuel reduction. Moreover, many recreation activities such as hunting, fishing, camping, hiking, horseback riding, and off highway vehicle (OHV) use are currently occurring. These activities will likely continue on into the foreseeable future.

Road condition affects many activities in the CPDWSP area. Frequent road grading, ditch and culvert cleaning, spot gravel surfacing, and other road treatments allow safer and easier travel into forest areas. Lack of maintenance may lead to certain roads becoming less accessible and prohibit traffic with horse trailers, or other larger vehicles, which may lead to less visitors to these areas. Lack of maintenance can also lead to more sedimentation from the road water interaction. The amount of road maintenance activities will likely be substantial for a length of time during project activities and drop to a minimal level upon project completion.

Activities in the area, such as logging and recreation, affect the roads in direct proportion to the amount of use on the roads. Increased road use wears surfacing away, increases sediment /dust production, and develops ruts or mud holes during wet weather. Road maintenance is usually concentrated on arterial routes. However, collector and local routes are maintained as needed for resource protection, or as forest management activities direct. Typically, roads used for log hauling are maintained in accordance with the timber sale contract requirements commensurate to the use by the timber purchaser. Forest travel management activities will continue in order to provide for the useful need in the area.

3.18 Climate Change

Scope of Analysis

Evidence of human-caused climate change continues to grow, and is widely accepted throughout the scientific community. The fifth Intergovernmental Panel on Climate Change (IPCC) assessment recognizes both human and non-human contributions to climate change. Anthropogenic influences contributions have *likely* made substantial contributions to observed warming since the 1950s (IPCC, 2014). As stated:

> *Human influence on the climate system is clear, and recent anthropogenic emissions of greenhouse gases are the highest in history. Recent climate changes have had widespread impacts on human and natural systems (p. 2; IPCC).*

Carbon Dioxide (CO2), the most common greenhouse gas (GHG) accounts for approximately 76% of annual global emissions that are attributable to human activity. CO2 comes from a variety of anthropogenic and natural sources. Elevated concentrations of GHGs are largely attributable to human activities, such as fossil fuel combustion and land-use change.

The following analysis includes both qualitative and quantitative discussion that is commensurate with Council on Environmental Quality Climate Change and NEPA guidance (CEQ, 2014), as well as Climate Change Consideration in Project Level NEPA Analysis (USFS, 2009).

Existing Condition

Temperature Trends and Greenhouse Gases

Temperature and precipitation patterns continue to be impacted by climate change. Impacts are variable throughout the world, and the United States. In the lower 48 United States, 7 of the 10 warmest years have all occurred since 1998 (U.S. Forest Service, 2014) (Figure 1). The 10 warmest years globally, have all occurred since 1998. There is a close correlation between temperature rise and atmospheric concentrations of greenhouse gases.

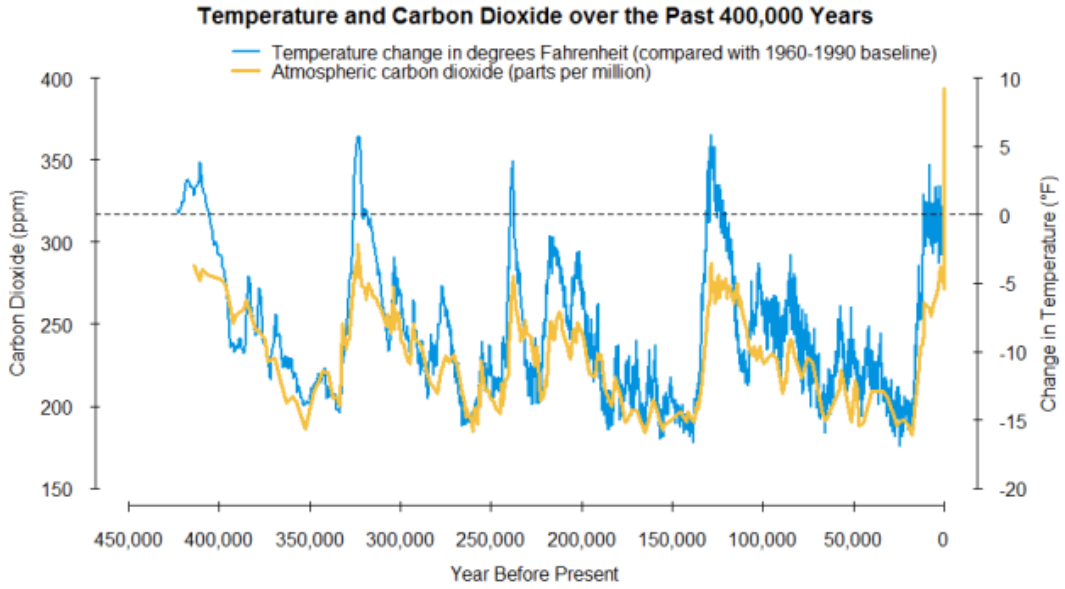

Figure 10. Data from NOAA National Climatic Data Center and the Mauna Loa Observatory, from U.S. Forest Service Climate Change Resource Center.

Climate researches use historical temperature and precipitation data, as well as models to predict trends into the future. Projection models vary based on many assumptions, including future concentrations of greenhouse gases (GHGs) in the atmosphere. Current concentrations of CO2 in 2017 are approximately 406 ppm (NOAA, 2017); pre-industrial era (late 1700s) concentrations were approximately 280 ppm. As concentrations of GHGs increase, temperature is expected to also increase.

Vegetation management activities associated with the action alternatives for this project will initially add to atmospheric concentrations. However, as trees re-establish and stands mature, carbon sequestration will reduce atmospheric concentrations of GHGs. Both processes are described qualitatively throughout this section. While the carbon cycle is considered here, the purpose of this project is more relevant to climate change adaptation, creating healthier stands more resilient to climate change impacts.

Climate Change Impacts

Climate change effects vary greatly depending on location and impact. For example, sea-level rise is a more direct threat to low-lying countries in the South Pacific, than to National Forests in Colorado. However, warmer temperatures and the proliferation of destructive insects are important management concerns to National Forests in Colorado.

The Colorado Climate Change Vulnerability Study (Gordon and Ojima, 2015) summarized observed and predicted impacts specific to Colorado including, but not limited to:

- Increased average annual temperatures by 2 degrees Fahrenheit over the past 30 years, projecting an additional increase of 2.5 to 5.5 degrees by mid-century;
- Peak runoff has shifted 1-4 weeks earlier over the past 30 years; projecting an additional 1-3 weeks earlier are expected by mid-century; and
- Observed and projected more frequent drought conditions

The report continues by assessing vulnerability in key sectors, including agriculture, transportation, outdoor recreation and tourism, and public health. Forest health and resiliency are important considerations on the Rio Grande National Forests and forested stands have become increasingly susceptible to insects and disease, exacerbated by climate change impacts. Smoke from wildfires affects public health; watershed conditions impact tourism and drinking water; and precipitation and snowpack affect water availability for downstream agriculture. Climate change, forest management, and human health and economy are all interrelated.

The U.S. Forest Service and other land management agencies are developing and implementing strategies to adapt to climate change. Land managers often respond to drought, floods, fire, and destructive insects; many climate change adaptation tactics are responses to these events. The proposed activities, described in detail in chapter 1 and the Silviculture, Forest Products, and Biodiversity Reports, promote forest health; and timber harvesting reduces hazardous fuels, reducing the risk of wildfire.

Adapting to Climate Change

The CPDWS project is largely in response to impacts, either caused, or worsened by climate change. The proposed activities are consistent with the Climate Project Screening Tool: An Aid for Climate Change Adaptation (Morelli et. al, 2012). Some of the forest types analyzed under CPDWS have been severely affected by insects or disease. While these insects are native to these forests, many have expanded to epidemic levels, as noted in the vegetation report of this analysis. Sudden Aspen Decline (SAD), for example, is likely attributable to drought conditions and higher summer temperatures. Droughts and temperature fluctuations are natural events, but are well-documented as being exacerbated by climate change.

The *purpose and need* of this project details objectives that promote forest health, diversity and resilience to insects, disease, and other stressors. It also recognizes that most of spruce-fir or spruce-mixed conifer forest across the district have already been heavily impacted and identified a need to salvage trees for timber production where there is still economic value. Both commercial timber sales and non-commercial treatments facilitate thinning, reforestation (both planting and natural regeneration), and increasing stand vigor, and better position individual trees to be less susceptible to insects, disease, and drought – all worsened by climate change - in the future.

Another aspect of the project focuses on reducing fuels around private land and administrative sites to increase defensible space for fire suppression efforts. These are also climate change adaptation techniques. Reducing stressors to watersheds facilitates landscape resilience and is also considered an adaptation strategy for climate change.

Carbon Sequestration and Greenhouse Gases

Forest carbon sequestration has recently been estimated for the Rio Grande National Forest and this information has been incorporated into this analysis (USDA Forest Service, 2015) on a baseline and cumulative analysis level. The Rio Grande National Forest carbon assessment is based on forest inventory and analysis (FIA) data and uses a 1990 – 2013 baseline, which does not completely reflect changes due to the current extent of spruce beetle mortality. At the national scales, uncertainty of carbon flux is between 20-30 percent. Therefore, at the forest-level, the uncertainty can be much higher.

Although uncertainty is high, ongoing research is focused on reducing these uncertainties over time. As time goes on, better carbon estimates for the Forest will be developed. Uncertainty around the carbon estimates should not prevent local managers from using this as a baseline and engaging the public around this non-market benefit of sequestered carbon. Carbon uptake by forests in the United States, offsets about 13 percent of our national CO2 emissions each year, including the approximately 75 teragrams (1 teragram equals one million metric tons) of carbon stored in the Forest (Figure 2). Carbon stored in U.S. forests is projected to peak between 2020 and 2040 and then decline through 2060, although the Rio Grande National Forest, and other western forests, may emit greater amounts of carbon dioxide if wildfire and insect disturbances increase as expected, due to climate change and other stressors.

Growth rates may increase in high-elevation forests during years with earlier spring snowmelt, abnormally warm annual temperatures, and longer growing seasons. These results suggest that projected changes in regional climate will likely result in increased productivity and carbon stocks of high-elevation forest, otherwise this project will likely have little effect on the overall carbon sequestration changes for the Forest overall.

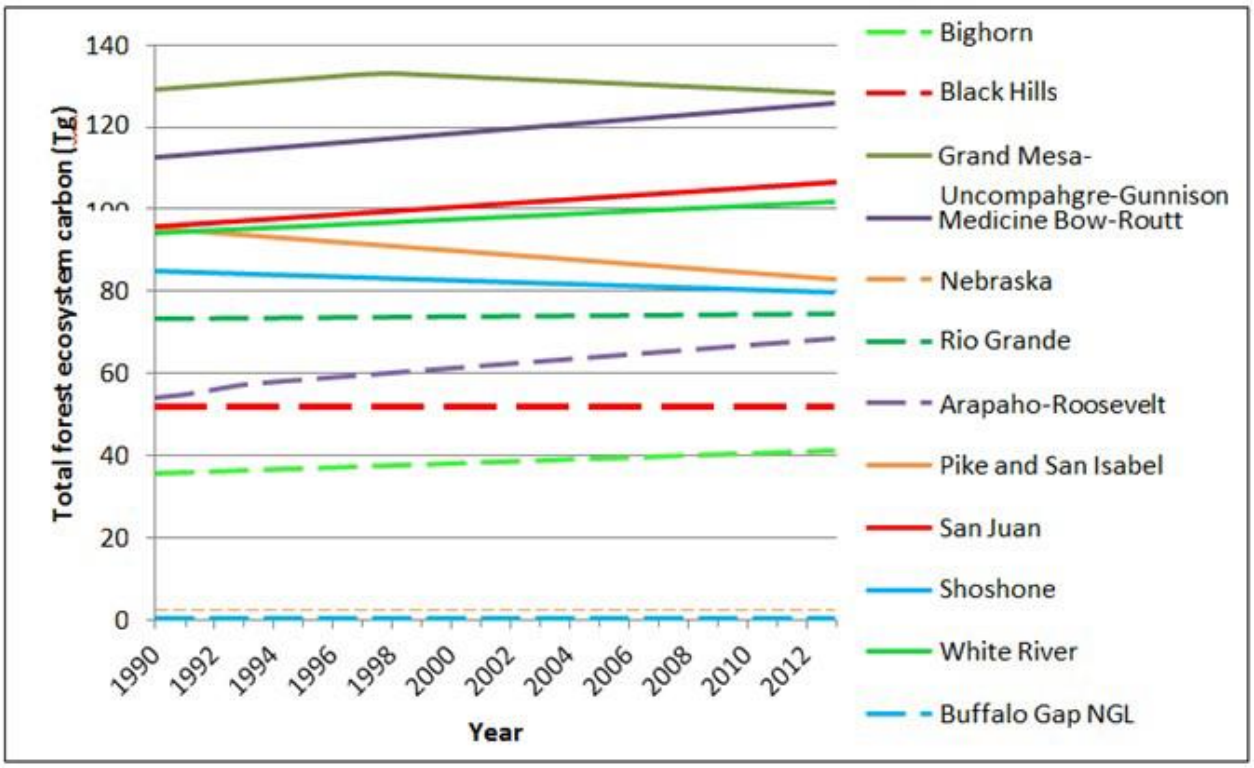

Figure 11. Forest Carbon summary within Rio Grande National Forest and other regional forests from the 2015 Rio Grande National Forest Carbon Assessment.

Alternative 1 (No Action)

Climate change is part of the environmental baseline and will continue to happen in the absence of this project.

Under the No Action Alternative, forest health conditions would continue to deteriorate, limiting the adaptive capacity of these forest types. Carbon dioxide would gradually be released through decomposition and decay of dead and dying trees. Without management, stands will likely be at higher risk to wildfire. In the case of wildfire, stands would burn causing an immediate release of stored carbon. As stands re-establish post-wildfire, carbon sequestration would increase as trees grow. Some intense wildfires result in damaged soil

conditions that severely limit reforestation. While highly speculative, the potential for carbon sequestration would be very limited.

Direct and Indirect and Cumulative Effects

Alternative 1 – No Action

Apart from ongoing road maintenance and firewood collection, there would be no direct effects of GHG emissions associated with the No Action alternative. However, indirect effects would continue to occur as stands emit CO2 and sequester carbon through the succession and stand development. Emissions from fire are speculative, but are also worth mentioning as a possible indirect effect. Both emissions and sequestration have a cumulative effect on atmospheric concentrations of GHGs.

Effects Common to Both Action Alternatives

Forest management activities for CPDWS are intended to increase resiliency over the long term. Although there will be short term increase in GHG emissions, as summarized below, these will be buffered by longer term carbon sequestration. Increased stand resiliency correlates with an ability to better withstand climate change impacts and sequester carbon.

Timber harvesting, slash piling and burning, and reforestation all change the amount of carbon sequestered in forest vegetation and soil. Timber harvests result in reduced carbon in forests as biomass is removed. This reduction may come from either living biomass carbon pool, or standing dead carbon pool. Some of the carbon will continue to be stored in wood products (Nunery and Keeton, 2010), or may be used as a source of energy that could range from wood pellets, to firewood. Both forms have the potential to offset energy from traditional fossil fuels.

Many of the lower elevation stands analyzed for treatment under CPDWS are at risk for uncharacteristically large or intense wildfires that could release large amounts of CO2. In 2008 wildfire on 931,000 hectares resulted in approximately 143 million metric tons (mmT) of CO2, as compared to prescribed fire on 783,000 hectares that resulted in about 20 mmT (Heath, et. al, 2010). This large discrepancy is not surprising because prescribed fires – including pile burning and the prescribed broadcast burns – are controlled and usually result in lower emissions on a per area basis.

Continued road maintenance and firewood collection would continue under all alternatives and are included for comparison. Emissions from harvesting activities considered under the action alternatives are qualitatively considered in the context from potential emissions from uncontrolled wildfire and quantitatively considered by estimating GHG emissions by alternative (Table 1).

Alternative 2 - Proposed Action

The proposed action analyzes treatment up to 17,000 acres of commercial harvest and 1,000 acres of fuels treatments. Both commercial and fuels treatments will result in the initial loss of stored carbon through vegetation loss, soil disturbance, and emissions associated with equipment and machinery. However, as stands re-establish and grow, both as a result of thinning or planting, carbon will be sequestered as part of the typical terrestrial carbon cycle. These stands could burn and trees will still die, or decompose and release carbon in the future.

The capacity to adapt to stressors associated with climate change is central to the purpose and need for this project. This can be accomplished through commercial and non-commercial activities. Adaptation would be maximized under this alternative. While this decision does not compel action on all acres of the CPDWS Project, it allows management that will facilitate resiliency and increase stand vigor, while still allowing commercial harvest of trees with economic value.

Greenhouse gas emissions, including CO2, would occur directly from tree cutting, soil disturbance, and machinery associated with mechanical treatments and harvest operations including needed road work. These direct emissions would be greater than Alternatives 3. Indirectly, more carbon would be retained in wood products or biomass, than under alternatives with few acres for commercial operations. Wood products would continue sequestering carbon for the life of the product and biomass could displace emissions from other fuel sources. All GHG emissions would cumulatively add to atmospheric concentrations. However, as trees re-establish and thinned stands continue to grow, carbon would be sequestered, reducing atmospheric concentrations.

Alternative 3 – Vegetation Management – Limited Action

The alternative analyzes treatment up to 8,500 acres of commercial harvest and 1,000 acres of fuels treatments. Both commercial and fuels treatments would result in the initial loss of stored carbon through vegetation loss, soil disturbance, and emissions associated with equipment and machinery. Fewer commercial harvest acres would also result in few emissions from machinery, skid trails, and other activities associated with a commercial timber harvest operation.

While this decision does not compel action on all acres, it allows forest management that will facilitate resiliency and increase stand vigor, while still allowing commercial harvest of trees with economic value.

Greenhouse gas emissions, including CO2, would occur directly from tree cutting, soil disturbance, and machinery associated with mechanical treatments and harvesting, although less than Alternative 2. Indirectly, more carbon would be retained in wood products or biomass, than under alternatives with few acres for commercial operations, but probably less than Alternative 2, which maximizes the commercial aspects of harvesting. Wood products would continue sequestering carbon for the life of the product and biomass could displace emissions from other fuel sources. All GHG emissions would cumulatively add to atmospheric concentrations. However, as trees re-establish and thinned stands continue to grow, carbon would be sequestered, reducing atmospheric concentrations.

Comparison of alternatives for GHG emissions

Site specific GHG emission factors and fuel consumption was estimated using values from several sources within the San Luis Valley, and within and outside Colorado (Dubinsky and Karunanithi, 2016; TSS Consultants, 2001; USDA-Forest Service, 2005) and incorporated into the Forest Service CarbonPlus Calculator (USDA-Forest Service 2016). Of all alternatives, Alternative 2 represents the highest estimate of total GHG emissions (50,628 CO2e Metric Tons), relative to the increased acres proposed for treatment over the life of the project. The amount of GHG for the No Action Alternative (1,335 CO2e Metric Tons) represents ongoing road maintenance and some level of harvest for firewood collections.

Table 66. **Summary of gallons of fuel used and metric tons of GHG emissions by alternative.**

		Alt1	Alt2	Alt3
Road maintenance	maintain roads	556	696	696
	New temp road construction	0	128,000	128,000
Forest management	Commercial (salvage/thinning)	0	3,934,296	2,195,313
	Fuels thinning/WUI	0	231,429	231,429
	Firewood Collection	115,715	115,715	115,715
Total gallons of fuel		**116,271**	**4,410,135**	**2,671,153**
Total GHG CO2e Metric Tons (Mg) emissions		**1,335**	**50,628**	**30,665**
Economic Cost in $		**$30,433**	**$1,154,326**	**$699,158**

Chapter 4. Preparers, Contributors, Distribution Contacts

4.1 Interdisciplinary Team Members

Table 67. Core ID Team members with credentials and EIS roles.

Core ID Team	Education	Years Professional Experience	Position Title ***Team Role***
M. Beth Davis	MS Forestry, Southern Illinois University BS Botany, Eastern Illinois University	17	Rangeland Management Specialist/Botanist *TES Plants, Invasive Species, IDT Leader*
Armando De La Cruz	MS Civil Engineering, New Mexico State University BS Civil Engineering, New Mexico State University	5	Civil Engineer/Transportation Specialist *Transportation*
Kelly Garcia	BS Environmental Science/Biology, Adams State College	27	Rangeland Management Specialist *Rangelands*
Ivan Geroy	MS Civil Engineering, Boise State University BS Fisheries & Wildlife Management, Oregon State University	7	Hydrologist *Hydrology & Watershed*
Sid Hall	Technical Fuels Management, Applied Science-Animal Health, Adams State College	16	Fuels Management Specialist *Fire & Fuels*
Angie Krall	MA Applied Anthropology, Northern Arizona State University BA Anthropology, Colorado College	24	Heritage Program Leader/Archaeologist *Heritage*
Antonio Lucero	BA Biology, Adams State College	16	Natural Resource Specialist *Recreation Use*
Diana McGinn	BS Range-Forest Management	31	Silviculturist

	BS Wildlife Biology, Colorado State University		*Biodiversity, Socio-Economics*
Kelly Ortiz	BA Literature, Syracuse University MLA Landscape Architecture, State University N.Y.	22	Landscape Architect *Scenic Resources*
Jason Remshardt	BS Wildlife and Fisheries Ecology MS Fisheries Ecology, Oklahoma State University	24	Forest Fisheries Biologist *Aquatics & Fisheries, Climate Change*
Vaughn Thacker	MS Soil Fertility and Plant Nutrition and Ag System Technology, Utah State University BS Environmental Soil and Water Science, Utah State University	11	Soil Scientist *Soils, Air Quality*
Michael Tooley	BS Forestry, Oklahoma State University	20	Forester *Silviculture, Forest Products*
David Topolewski	B.S. Wildlife Management and Zoology, Humboldt State University M.S. Biology, *in progress* University of Nebraska, Kearney	7	Wildlife Biologist *Wildlife*

4.2 Agencies and Tribes Consulted

Table 68. List of Agencies and Tribes consulted for the CP District-wide Salvage Project.

Colorado Parks and Wildlife
Environmental Protection Agency
US Fish and Wildlife Service
Colorado State Historic Preservation Office
Conejos County Commissioners
Southern Ute Indian Tribe
The Hopi Tribe
Ute Mountain Ute Tribe
Uintah & Ouray/Northern Ute Tribe
Pueblo of Nambe
Jicarilla Apache Nation

Navajo Nation
Pueblo of Santa Ana
Santa Clara Pueblo
Taos Pueblo
Pueblo of Santo Domingo
Pueblo de Cochiti
San Ildefonso Pueblo
Pueblo of Picuris
Ohkay Owingeh
Pueblo of Zuni
Pueblo of Laguna
Pueblo of Acoma
Comanche Nation

4.3 Distribution of the Draft Environmental Impact Statement

Notification of the availability of the draft environmental impact statement has been sent to the following individuals, Federal agencies, federally recognized Tribes (see above), State and local governments, elected officials, and organizations representing a wide range of views.

Table 69. Draft environmental impact statement notice of availability contacts.

Contact	Format	Contact	Format
Allpine Lumber & Log Home Co.	Email	David Kenvin, CO Trout Unlimited	Email
Antonito Chamber of Commerce	Email	Jim Kessler	
Dick Artley	Email	Page Lewis, Nature Conservancy	Email
Jerry Babbitt, Silver Lakes Trout Club	Letter	Neal Lummus	Email
Rick Basagoita, Colorado Parks and Wildlife	Email	Lauren McCain, Defenders of Wildlife	Email
Cathy Bear, Chama Valley Outdoor Club	Email	Doug MacLennan, Southwest Nordic Center	Email
Joanie Berde	Email	Roz McClellan, Rocky Mountain Recreation Initiative	Email
Norm Birtcher, Montrose Forest Products	Email	John Mellgren, Western Environmental Law Center	Email
Kristie Borchers, RWEACT	Email	Adam Moore, Colorado State Forest Service	Email
Kurt Broderdorp, USFWS	Email	Molly Pitts, Pitts Resource Consulting, LLC	Email
Bonnie Brown, Colorado Wool Growers Association	Email	Office of Honorable Michael Bennett	Letter
Jimbo Buickrood, San Juan Citizens Alliance	Email	Office of Honorable Larry Crowder	Letter
Robyn Cascade, Great Old Broads for Wilderness	Email	Office of Honorable Cory Gardner	Letter
Chama City Hall	Letter	Office of Honorable Scott Tipton	Letter
Chama Valley Chamber of Commerce	Email	Office of Honorable Edward Vigil	Letter
Conejos County Commissioners	Letter	Matt Reed, High Country Conservation Advocates	Email
Nathan Coombs, Conejos Water Conservation District	Email	Rio Grande County Commissioners	Email
Costilla County Commissioners	Email	Brian and Ann Rue	Email
Ralph Curtis, Rio Grande Water Conservation District	Letter	Lynn Rutland, San Juan Mountain Church	Email
Mary Ann Deboer, Cumbres Nordic Adventure	Email	Rod Ruybalid, Colorado Parks and Wildlife	Letter
Monique DiGiorgio, Chama Peak Land Alliance	Email	Matthew Sandler, Rocky Mountain Wild	Email
Heather Dutton, SLV Water Conservancy District	Email	San Luis Valley Cattlemen's Association	Email
Greg Dyson, WildEarth Guardians	Email	San Luis Valley Ecosystem Council	Email
Chris Furr, Tres Piedras Ranger District	Email	Rocky Smith	Email
Bill Getz		Tom Sobal, Quiet Use Coalition	Email
Mike Gibson, Rio Grande Basin Roundtable	Email	Kevin Terry, CO Trout Unlimited	Email
Garrett Hanks, Trout Unlimited	Letter	Tom Troxel, Intermountain Forest Association	Email
Bentley Henderson, Archuleta County Administrator	Letter	Jim Webb	Email
Marty Jones, SLV Trout Unlimited	Email		

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Appendices

Appendix A – Commonly Used Terms and Definitions

A.1 - Acronyms and Abbreviations

AMP – allotment management plan	**GIS** – geographical information system
AMZ – aquatic management zone	**HRV** – historical range of variability
AOI – annual operating instructions	**HUC** – hydrologic unit code
BA – basal area	**IDT** – interdisciplinary team
BpS – Biophysical Setting	**IRA** – inventoried roadless area
BMPs – best management practices	**LTA** – landtype association
CCF – hundreds of cubic feet	**LAU** – lynx analysis unit
CEQ – Council on Environmental Quality	**MAP** – forest service management area prescription
CFR – Code of Federal Regulations	**MBF** – thousand board feet
CPW – Colorado Parks and Wildlife	**MIS** – management indicator species
CRA – Colorado Roadless Area	**MMBF** – million board feet
CWD- coarse woody debris	**NEPA** – National Environmental Policy Act
CWPP – Community Wildfire Protection Plan	**NFMA** – National Forest Management Act
DAU – data analysis unit (big game)	**NFSR** – National Forest System Road
DBH – diameter at breast height	**PDC** – project design criteria
DSD – detrimental soil disturbance	**PFC** – properly functioning condition
DEIS – draft environmental impact statement	**RGNF** – Rio Grande National Forest
DHC – dense horizontal cover	**ROD** – record of decision
DSD – detrimental soil disturbance	**ROS** – recreation opportunity spectrum
EIS – environmental impact statement	**SHPO** – State Historic Preservation Office
FEIS – final environmental impact statement	**SISS –**stand initiation structural stage
FS - Forest Service	**SRLA** – Southern Rockies Lynx Amendment
FSDMP – forest soil disturbance monitoring	**TES** – threatened, endangered, and sensitive species
FSH – Forest Service handbook	**WIZ** – water influence zone
FVS – forest vegetation simulator	**WUI** – wildland urban interface

A.2 – Terms and Definitions

Term	Definition
Aquatic Management Zone (AMZ)	The land next to water bodies where vegetation plays a major role in sustaining long-term integrity of aquatic systems. It includes the geomorphic floodplain, riparian ecosystem, and inner gorge. Its minimum horizontal width (from top of each bank) is 100 feet or the mean height of the mature dominant vegetation, whichever is most.
Artificial Regeneration	A group or stand of young trees created by direct seeding or by planting seedlings or cuttings
Basal area (BA)	Cross-sectional area, in square feet, of a tree measured at dbh, diameter at breast height (4.5 feet above ground).
Board Foot (BF)	Measure of an amount of timber equivalent to a piece of lumber 12 inch by 12 inch by 1 inch.
Coarse Woody Debris (CWD):	Woody materials greater than 3 inches in diameter.
Commercial Forest Products	Sawlogs, small roundwood, biomass, and other forest products removed in the process of harvesting or cutting trees from NFS lands.
Cover Type	A taxonomic unit of vegetation classification referencing existing vegetation. Cover type is a broad taxon based on existing plant species that dominate, usually within the tallest layer.
Desired Conditions	A set of ideal conditions established for a Management Area Prescription within the Forest Plan. These conditions are the goals for the Management Area and the

Term	Definition
	intended end results for all actions taken within it. Desired Conditions for each specific Management Area Prescription are outlined in Chapter IV of the Revised Land and Resource Management Plan of the Rio Grande National Forest.
Endangered plant:	A plant that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.
Even-aged management	The application of a combination of actions that results in the creation of stands in which trees of essentially the same age grow together. The difference in age between trees forming the main canopy level of a stand usually does not exceed 20 percent of the age of the stand at harvest rotation age. Regeneration in a particular stand is obtained during a short period at or near the time that a stand has reached the desired age or size for regeneration and is harvested.
Existing Scenic Integrity	Represents the status of the landscape and the degree to which it has been altered. This is a baseline measurement for Scenic Resources. The following is a list of the Scenic Integrity Levels: • **Type I** (Natural Appearing Landscapes)-areas in which on ecological change has taken place except for trails needed for access. They appear untouched by human activities. This included wilderness and primitive areas. • **Type II** (Slightly Altered Appearing Landscapes)-areas where some human activity has occurred. Usually these areas can be described as near natural appearing or slightly altered. • **Type III** (Altered Appearing)-areas where human modification has occurred and is obvious. Usually these areas are described as altered.
Fine Slash	Branches, leaves and limbs less than 3 inches diameter.
Fire Behavior	The manner in which a fire reacts to the variables of fuel, weather, and topography
Fuel Break	A wide strip or block of land on which the fuels have been modified so that fire burning into it can be more readily contained.
Fire Intensity	The rate of energy or heat release per unit time, per unit length of fire front, regardless of its depth.
Fuel Loading	The amount of fuel on site expressed in Tons per Acre.
Fuel Profile	The representation of various fuel characteristics (size class, loading, volatility, density, etc.) in terms of vertical and horizontal arrangement, amount, and continuity.
Fire Regimes	The nature of fires occurring over extended period of time. Fire Regimes reflect the fire environment, and influence the type and abundance of fuel, thereby affecting fire behavior and fire effects through time.
Fire Severity	A qualitative indicator of the effects of fire on an ecosystem, whether it affects the forest floor, canopy, or some other part of the system.
Fuels	Available vegetation, both live and dead that is capable of combustion and can contribute to fire spread.
Group Selection Harvest	An uneven-aged harvest system in which trees are removed and new age classes are established in small groups, rather than evenly-spaced individual trees. Natural regeneration is thereby established in pockets, but still under the protection of a partial forest canopy.
Hazard Tree	A standing tree with the potential to fall which would cause injury or damage to people or property due to conditions that affect the integrity and/or stability of the tree. These conditions include but are not limited to deterioration or physical damage to the roots system, trunk, stem, or limbs, and/or the direction and lean of the tree
Heritage Resources	Are sites, features, and values having scientific, historical, educational, and/or cultural significance. They include concentrations of artifacts, structures, landscapes, or settings of for prehistoric or historic events.
Heritage Resource Inventory	A systematic on-the-ground search designed to identify the locations of heritage resources. Heritage resources identified in such inventories are recorded on State of

Term	Definition
	Colorado cultural resource site forms which includes determination of the significance of individual sites.
Historical Range of Variability	A method to understand the dynamic nature of ecosystems; the processes that sustain and change ecosystems; the current state of the ecosystem in relationship to the past; and the possible ranges of conditions that are feasible to maintain.
Indicator	A measurement of a resource quantity or quality, which is linked to a cause-and-effect relationship and responsive to a key issue. Indicators are used to compare the effects among alternatives, and are most generally quantitative, rather than qualitative, in measure.
Intermediate Shelterwood Harvest	One intermediate step of the shelterwood harvest system in which the canopy cover is opened up through the removal of mature trees to promote natural regeneration and stand vigor. This step is prior to final harvest.
Key Issue	A concern expressed over the potential effects of a proposed action on the human environment, due to the geographic extent, duration, or intensity of interest or resource conflict. Key issues are used to develop and compare alternatives, prescribe mitigation measures, and analyze the environmental effects. For an issue to be considered Key, it must be relevant to the specific project and appropriately addressed at that level
Ladder Fuels	Intermediate height fuels
Landtype Association	An ecological mapping unit based on similarities in geology, soils, and plant associations. Repeatable patterns of soil complexes and plant communities are useful in delineating map units. LTAs are an appropriate ecological unit to use in Forest- or area-wide planning and watershed analysis. On the RGNF, soil mapping units were aggregated into 13 distinct LTAs.
Long-Butt	A section cut from the bottom log of a tree and culled because of rot or other defect.
Natural Regeneration	The establishment of a plant or a plant age class from natural seeding, sprouting, suckering, or layering.
National Forest System road ~	A forest road other than a road which has been authorized by a legally documented right-of-way held by a State, county or other local public road authority.
Non-system Road	Also termed “Unclassified Roads.” Roads on National Forest System lands that are not managed as part of the forest transportation system, such as unplanned roads, abandoned travelways, and off-road vehicle tracks that have not been designated and managed as a trail; and those roads that were once under permit or other authorization and were not decommissioned upon the termination of the authorization (36 CFR 212.1).
Noxious Weeds	A plant specified by law as being especially undesirable, troublesome, and difficult to control.
Operational maintenance level	The maintenance level currently assigned to a road considering today’s needs, road condition, budget constraints, and environmental concerns. It defines the level to which the road is currently being maintained (FSH 7709.59, 62.3). **Maintenance levels** ~ Defines the level of service provided by, and maintenance required for, a specific road, consistent with road management objectives and maintenance criteria. **Level 1.** Closed roads that have been placed in storage between intermittent uses. The period of storage must exceed 1 year. Basic custodial maintenance is performed to prevent damage to adjacent resources and to perpetuate the road for future resource management needs. These roads are not shown on motor vehicle use maps. **Level 2.** Roads open for use by high clearance vehicles. Passenger car traffic, user comfort, and user convenience are not considerations. Motorists should have no

Term	Definition
	expectations of being alerted to potential hazards while driving these roads. Traffic is normally minor. **Level 3.** Maintained for travel by a prudent driver in a standard passenger car. User comfort and convenience are not considered priorities. Warning signs and traffic control devices are provided to alert motorists of situations that may violate expectations.
Prescribed fire	Planned ignitions, implemented in accordance with approved burn plans that are designed to meet specific objectives.
Preparatory cut	An optional type of cut that enhances conditions for seed production and establishment applied under the shelterwood regeneration methods.
Reforestation	The re-establishment of forest cover, either naturally or artificially. This process usually maintains the same forest type and is done promptly after the previous stand or forest was removed.
Regeneration method	Cutting procedure by which a new age class is created. The major methods are clearcutting, seed-tree, shelterwood, selection, and coppice. Regeneration methods are grouped into: coppice, even-aged, two-aged, and uneven-aged.
Road decommissioning	Activities that result in the stabilization and restoration of unneeded roads to a more natural state." (36 CFR 212.1, FSM 7705- Transportation System) The Forest Service Manual (7712.11- Exhibit 01) identifies five levels of treatments for road decommissioning which can achieve the intent of the definition. These include the following: 1) Block entrance; 2) Revegetation and waterbarring; 3) Remove fills and culverts; 4) Establish drainageways and remove unstable road shoulders; 5) Full obliteration recontouring and restoring natural slopes.
Equivalent Road Disturbance	During Forest planning, Disturbance Area Factors (DAF) or values were established for different types of surface disturbances that may occur in watersheds (i.e. road building, livestock grazing, clearcuts, partial timber harvests, pipelines, railroads, impoundments, etc.) in order to evaluated the percent disturbance for each watershed. Each type of disturbance was given a relational DAF value that compared the disturbance to roads, generating an “equivalent road disturbance” factor. Since roads were considered the most impacting disturbance due to the elimination of vegetation and compaction they were given a DAF of 1.0 along with other similar impact disturbances such as ditches, railroads, milling sites, impoundment, etc. Clearcuts were given a factor of 0.3 and partial timber harvests were given a factor of 0.19. When all disturbance acreage is multiplied by the appropriate DAF and added together to give a total road equivalent disturbance acreage for each watershed.
Road Maintenance	The ongoing upkeep of a road necessary to retain or restore the road to the approved road management objective (FSM 7712.3).
Road Construction (New)	Activity that results in the addition of forest classified or temporary road miles (36 CFR 212.1).
Road Reconstruction	Activity that results in improvement or realignment of an existing classified road a) **Road Improvement.** Activity that results in an increase of an existing road’s traffic service level, expands its capacity, or changes its original design function. b) **Road Realignment**. Activity that results in a new location of an existing road, or portions of an existing road, and treatment of the old roadway (36 CFR 212.1).

Term	Definition
Road Spot Reconstruction	Road reconstruction activities on very short sections of road. Generally involve activities such as culvert replacement and surface rock replacement
Salvage	Removal of dead trees or trees being damaged or dying due to injurious agents other than competition, to recover value that would otherwise be lost.
Sanitation	Removal of trees to improve stand health by stopping or reducing actual or anticipated spread of insects and disease.
Seral	The stage of succession of a plant or animal community that is transitional. If left alone, the seral stage will give way to another plant or animal community that represents a further stage of succession.
Shelterwood Harvest	The removal of a stand in a series of usually three cuts over a period of time. Regeneration of the new stand occurs under the cover of a partial forest canopy. A final harvest cut removes the shelterwood and permits the new stand to develop in the open as an even-aged stand.
Silvicultural system	A planned series of treatments for tending, harvesting, and re-establishing a stand. The system name is based on the number of age classes (i.e. even-aged, two-aged, uneven-aged) or regeneration method (i.e. clearcutting, seed tree, shelterwood) used.
Soil Compaction	Soil that has a 15% increase in bulk density over natural undisturbed conditions.
Soil Erosion Hazard	A rating of a soils potential to erode.
Stand	A community of trees or other vegetation sufficiently uniform in composition, constitution, age, spatial arrangement, or condition to be distinguishable from adjacent communities and so form a silvicultural or management entity.
Stand Initiation Structural Stage	Vegetation stage that develops after a stand-replacing disturbance by fire, insects, or regeneration timber harvest. A new single-story layer of shrubs, tree seedlings, and saplings develop and occupy the site.
Stocking	The degree to which trees occupy the land, measured by basal area or number of trees by size and spacing, compared with a stocking standard such as the basal area or number of trees required for full utilization of the land's growth potential
Structure Class	A classification of forested cover types which aggregates Habitat Structural Stage into broader categories.
Succession	The process of vegetative and ecological development whereby an area becomes successively occupied by different plant communities.
System Roads	Also termed "Classified Roads." Roads wholly or partially within or adjacent to National Forest System lands that are determined to be needed for long-term motor vehicle access, including State roads, county roads, privately owned roads, National Forest System roads, and other roads authorized by the Forest Service (36 CFR 212.1).
Temporary Road	A road necessary for emergency operations or authorized by contract, permit, lease, or other written authorization that is not a forest road or a forest trail and that is not included in a forest transportation atlas.
Threatened plant	A plant that is in danger of extinction throughout all or a significant portion of its range.
Uneven-aged stand	A stand of trees of three or more distinct age classes, either intimately mixed or in groups.
Trap Tree	A log or tree felled or treated in a manner to invite insect infestation, particularly bark beetles.
Weeding	The removal of competing vegetation from a stand that is still in sapling stage in order to increase tree survival and vigor.
Wildfire	A fire that burns uncontrollably in a natural setting (e.g., a forest, or grassland).

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Appendix C – Project Implementation Checklists

CP District-wide Salvage Project
Implementation Checklist #1 of 2
Analysis at Project Initiation

This stage of analysis is tiered to the CP District-wide Salvage Project. Refer to the project Final Environment Impact Statement and Record of Decision, available at the Conejos Peak Ranger District office or online at http://www.fs.usda.gov/projects/riogrande/landmanagement/projects, for discussions and analysis permitting this action.

Implementation Project Name: _____
Implementation Project Location: _____
Proposed activities: _____
Proposed treatment area (acres): _____

1. Forest Plan Compliance
This project falls within the following Management Area Prescriptions (MAPs) or geographic areas (attach map): _____

☐ 1a. Current law, policy and plans have been considered for new information pertaining to these activities. Effects are within the context considered in the FEIS.*
☐ 1b. The treatment activities are allowed within these area prescriptions per current Forest Plan direction.
☐ 1c. Standards, guidelines, and handbook direction specific to this activity, which are not already addressed by project design criteria (PDC), are listed below. These are to be included in the project design:

MAP	Specify standard, guideline, direction, or NA

** If effects are determined to be outside the scope and range of effects considered in the FEIS, the responsible official will determine the type of additional analysis that is necessary prior to additional implementation.*

Analysis completed by _____ Date _____
Signature

2. Colorado Roadless Rule Compliance
☐ 2a. No timber sale units fall within a CRA.
☐ 2b. No hazardous fuel treatments fall within an upper tier CRA.
☐ 2c. Hazardous fuel treatments within a CRA (non-upper tier) are within ½ mile from the boundary of an at-risk community. Name of community, or NA: _____

☐ 2d. Hazardous fuel treatments within a CRA (non-upper tier) are within 1½ miles from the boundary of an at-risk community having a Community Wildfire Protection Plan. Name of CWPP & community, or NA: _____

☐ 2e. Hazardous fuel treatments are not otherwise prohibited (by law or Forest Plan prescription).

Analysis completed by _____Date _____
Signature

3. Project FEIS/ROD Compliance

☐ 3a. This project falls within the CP District-wide Project Boundary and the proposed activities were allowed by the Decision.

☐ 3b. This project does not treat areas which were excluded from treatment by the Decision.

☐ 3c. Total number of salvage acres previously treated under this decision _____. Additional proposed salvage acres to be treated with this project _____. Summed acres do not exceed Decision treatment area for salvage harvest.

☐ 3c. Total number of hazardous fuels treatment acres previously treated under this decision _____. Additional proposed acres to be treated with this project _____. Summed acres do not exceed Decision treatment area for hazardous fuel treatment.

☐ 3d. Total number of miles of temporary road (new & old combined) previously opened under this decision _____. Additional proposed miles of temporary road (new & old combined) proposed with this project _____. Summed miles of temporary road do not exceed Decision for temporary road.

☐ 3e. This project was considered for public firewood gathering. Areas were designated as appropriate.

☐ 3e. Specialist survey and required consultation has been completed. Note remarks under (3f).

Resource	Specialist Initial & Date	Resource	Specialist Initial & Date
Fisheries		Watershed	
Wildlife		Heritage	
Scenic		Silviculture	
Soils		Old Growth	
Recreation		Range	
Fuels		Hydrology	
Botany & Rare Plant			

☐ 3f. The following actions must be added to the project design (in addition to PDC and 1b above) to meet statutory, regulatory, and Forest Plan requirements.

Provision	Citation of requirement being met

4. Lynx Conservation Compliance (Southern Rockies Lynx Amendment or superseding agreement)

This project falls within the following LAUs (attach map): _____

☐ 4a. Standards VEG S1, VEG S2, VEG S5, & VEG S6 (or equivalent) are met or are not applicable to the treatments proposed.

☐ 4b. Guidelines VEG G1, VEG G4, VEG G5, VEG G10, & VEG G11 (or equivalent) are met or are not applicable to the treatments proposed.

☐ 4c. Impacts to lynx habitat baselines resulting from this project have been recorded in the tracking spreadsheet (see attached) and reported to the USFWS.

☐ 4d. The project is in compliance with the terms of the BO.

Analysis completed by _____Date _____
Signature

5. Heritage Resources

☐ 5a. Section 106 compliance has been met on this project.

Analysis completed by _____Date _____
Signature

6. District Ranger Certification

I have reviewed Implementation Checklist #1 for this project and agree that the analysis herein meets all project planning requirements and that the actions fall within the scope of the CP District-wide Salvage Project Record of Decision. Implementation Checklist #2 will be completed after sale preparation.

_____ Date _____
Signature

CP District-wide Salvage Project
Implementation Checklist #2 of 2
Analysis prior to Contract Solicitation

This stage of analysis is tiered to the CP District-wide Salvage Project. Refer to the project Final Environment Impact Statement, available at the Conejos Peak Ranger District office or online at http://www.fs.usda.gov/projects/riogrande/landmanagement/projects, for discussions and analysis permitting this action.

Implementation Project Name: _____
Implementation Project Location: _____
Proposed treatment activities: _____
Proposed treatment area (acres): _____

1. Management Area Compliance

☐ 1a. All standards, guidelines, and handbook direction identified in Checklist #1, Section 1, have been implemented in the project & addressed in the Timber Sale Report (for timber sales) or Silviculture prescription (for Hazardous Fuels management projects), along with the PDC.

2. Project FEIS/ROD Compliance

☐ 2a. All stipulations identified in Checklist #1, Section 3, have been implemented in the project & addressed in the Timber Sale Report (for timber sales) or Silviculture prescription (for Hazardous Fuels management projects), along with the PDC.

☐ 2b. Public notification has occurred per the Decision direction.

Analysis completed by _____ Date _____
Signature

3. Public Notification

☐ 3a. Checklist #1 and all supporting documentation has been placed on the Forest website.

4. District Ranger Certification

I have reviewed Implementation Checklist #2 for this project and agree that the analysis herein meets all project planning requirements and that the actions fall within the scope of the CP District-wide Salvage Project Record of Decision. Project implementation may begin immediately.

_____ Date _____
Signature

Appendix D - Silviculture and Hazardous Fuels Guidelines for Project Implementation

Note: Actual use of these guidelines and acres of management will depend on the selected alternative. The following table includes the full range of potential activities as described in chapter 3.

Vegetation Zone/ Type	Desired Condition	Lynx habitat status[5]	Silvicultural Treatment(s) Options – mechanical	
Engelmann spruce – subalpine fir Spruce-mixed conifer	Short- midterm: A healthy mix of mostly young conifers, aspen regeneration, and residual live trees[6] Snags and CWD levels meet resource needs Long term: More closed canopy; two or more canopy layers with dense understory cover to provide winter snowshoe hare habitat Maintain 5 to 15 percent seral aspen component on the landscape Moderate future fuel loading to reduce future fire severity		***Silvicultural Rx:*** *Salvage dead and dying spruce to recover economic value and reduce long-term fuel accumulation. Depending on the level of stand mortality, salvage harvest may be recorded as a regeneration harvest activity since the residual stand will be at an early seral stage with a causal agent of bark beetles. Perform stocking surveys following harvest completion; Allow stands or portions of stands to convert to aspen or plant Engelmann spruce or other suitable native conifer seedlings in understocked stands following harvest to speed forest recovery & meet desired stocking levels.*	
			Stand Condition Description	**Action(s)**
		Multi-storied stand with DHC	Stand is multi-storied (≥2 live layers), mature or late successional (≥40% live canopy closure), and contains Dense Horizontal Cover (DHC; i.e., ≥ 35% horizontal cover) providing winter snowshoe hare habitat[7] (VEG S6). *[Lynx habitat priority area 4]*	**Alternative 2-** Only limited salvage harvest-related activities and incidental damage[8] to DHC would occur in true VEG S6 stands; any incidental damage to DHC from salvage activities is counted against Forest VEG S6 caps. Meet SRLA standards and guidelines by minimizing or avoiding impacts to any healthy advance regeneration and green trees contributing to overstory canopy cover to the extent feasible, through avoidance during unit layout, designated skid trails & landings, flagging or painting on the ground, or other measures. **Alternative 3-** No salvage harvest-related activities.
		Single-storied stand with DHC OR Multi-storied stand lacking DHC	Stand is **no longer** multi-storied (≥2 live layers), mature or late successional due to spruce beetle mortality (≥ 75% overstory mortality[9]), but understory trees provide DHC within the stand. OR Stand is multi-storied (≥2 live layers), mature or late successional (≥40% live canopy closure); contains an established understory providing 20-35% horizontal cover. *[Lynx habitat priority area 3]*	**Alternative 2- Salvage harvest**; Incidental damage to advance regeneration providing ≥ 20% horizontal cover is counted against LAU VEG S1/VEG S2 caps if overstory cover is reduced to 25% or less or understory cover is reduced to <20%. Meet SRLA standards and guidelines by minimizing or avoiding impacts to any healthy advance regeneration and green trees contributing to overstory canopy cover to the extent feasible, through avoidance during unit layout, designated skid trails & landings, flagging or painting on the ground, or other measures. **Alternative 3-** No salvage harvest related activities.
		Single-storied stand lacking DHC	Stand is single-storied &/or not mature or late successional; live overstory provides <25% cover and understory provides 20-35% horizontal cover. OR Stand is single-storied &/or not mature or late	**Alternative 2- Salvage harvest;** Meet SRLA standards and guidelines by minimizing or avoiding impacts to any healthy advance regeneration and green trees contributing to overstory canopy cover to the extent feasible, through avoidance during unit layout, designated skid trails & landings, flagging or painting on the ground, or other measures. **Alternatives 3- Salvage harvest**; Blocks (patches) of DHC ≥0.3 acres

[5] Refers to stands mapped as lynx habitat, based on the Forest lynx habitat map.

[6] Residual live trees are those expected to live at least 2-3 years beyond a given mortality event, such as bark beetle outbreak or wildfire.

[7] For the purposes of quantifying snowshoe hare habitat, if the horizontal cover measurement is ≥ 35%, it should be considered "Dense Horizontal Cover" (DHC) unless more site-specific information suggests a different value. If DHC occurs from the surface of the actual or average snow depth and up to approximately two (2) meters above that surface, the site should be considered to have winter snowshoe hare habitat (SRLA Implementation Guide, Page 10). For the purposes of this analysis, DHC refers to horizontal cover ≥ 35% providing winter snowshoe hare habitat.

[8] For this project, incidental damage of winter snowshoe hare habitat is estimated to affect an average of 30% of understory DHC in a given VEG S6 treatment unit while averaging ≤ 20% within the context of the immediate analysis area.

[9] Ivan, J. pers. comm.

Vegetation Zone/ Type	Desired Condition	Lynx habitat status[5]	Silvicultural Treatment(s) Options – mechanical	
			successional; live overstory provides >25% cover but understory provides <20% horizontal cover. *[Lynx habitat prior 2]*	would be protected. Stands are not anticipated to remain suitable post-harvest, counted towards VEG S1 and S2.
		Currently unsuitable	75% or more of the overstory is dead or projected to be dead in two years due to high levels of beetle infestation AND understory trees provide less than 20% horizontal cover above the snow during winter.[10] *[Lynx habitat priority area 1]*	**Alternatives 2 and 3 - Salvage harvest:** Not subject to SRLA LAU VEG S1/VEG S2 caps; minimize or avoid impacts to healthy advance regeneration to meet silvicultural objectives.
			Hazardous Fuels Treatments – all action alternatives	
Engelmann spruce – subalpine fir Spruce-mixed conifer Aspen	Ladder and surface fuels are reduced to levels that would decrease flame lengths and reduce the potential for crown fire initiation within 400 ft. of private property or a community at risk		***Silvicultural Rx:*** Thin conifers from below, up to 8" dbh, to create shaded fuel break conditions; favor aspen where it occurs by cutting understory conifers to maintain a natural fuel break. Use combinations of thinning understory conifers to an average of 25 to 150 trees per acre, pruning (limbing) residual conifers from 5 ft. or < ½ total tree height, along with hand piling activity slash and burning piles, as needed to meet objectives. Evaluate and cut hazard trees with high potential to fall and damage property.	
		Habitat is suitable; seedling/saplings provide winter hare habitat	WUI[11] (Wildland Urban Interface) counted against the Forest-wide Exemptions cap to VEG S1, VEG S2, VEG S5, or VEG S6 Non-WUI treatments counted against VEGS S5, exception 5.	
		Currently unsuitable	Not subject to SRLA LAU VEG S1/VEG S2 caps, however still subject to WUI and SRLA S5 caps	
	Ladder and surface fuels are reduced to levels that would decrease flame lengths and reduce the potential for crown fire initiation within 200 ft. of an administrative site	Habitat is suitable; seedling/saplings provide winter hare habitat	Permitted under VEG S5 and S6, exceptions 1.	
		Currently unsuitable	Permitted under VEG S5, exception 1.	

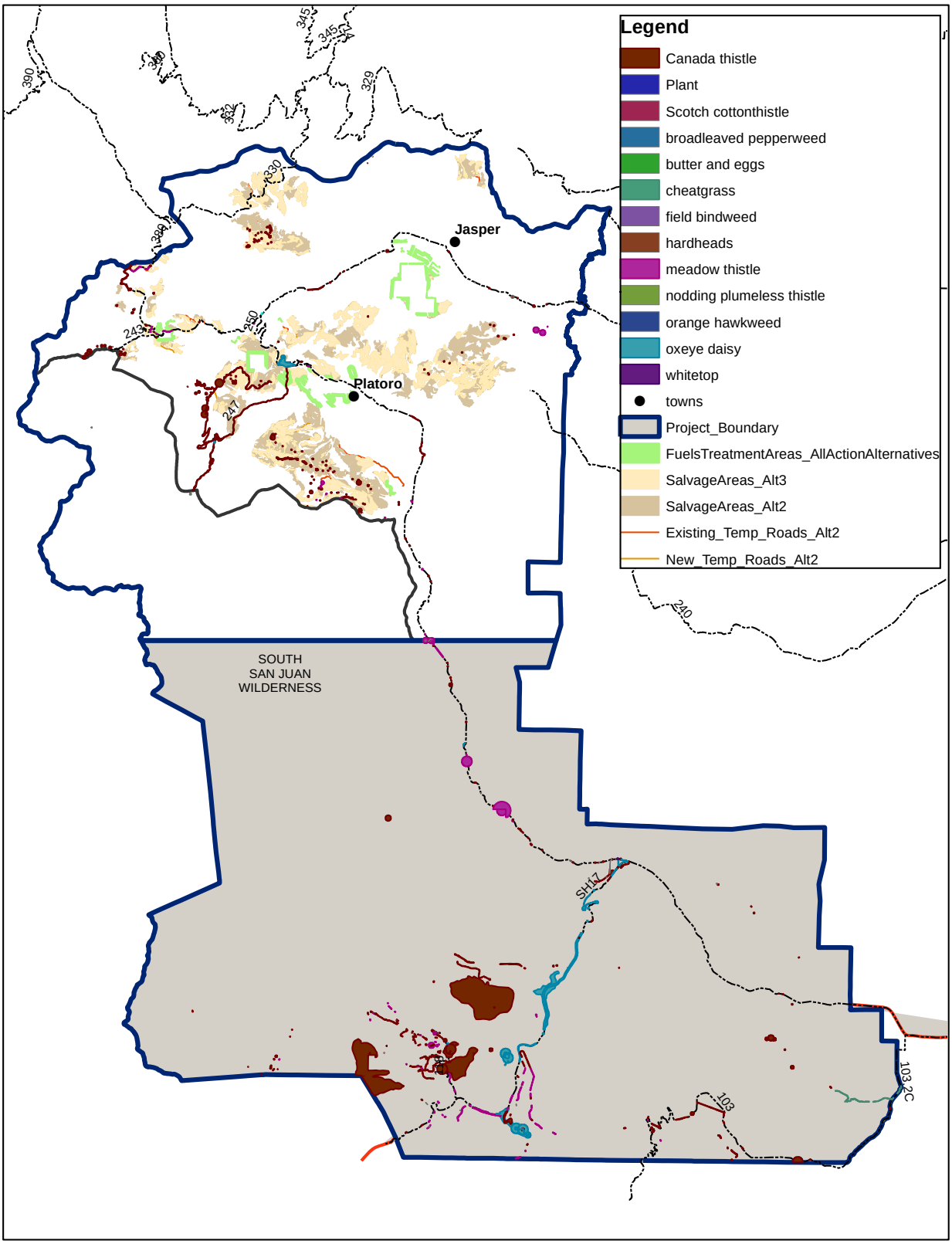
[10] Definition of unsuitable habitat (Southern Rockies Lynx Amendment (SRLA) Implementation Guide, Page 16) specifies that a stand with 0-10% overstory canopy cover and an understory where trees **generally** are not tall enough to protrude above the snow during winter is considered unsuitable. Berg et al. (2012) report snowshoe hare use in stands with 20-34% horizontal cover. However, based on preliminary information concerning red squirrel response to bark beetle mortality (Ivan, pers. comm.), the overstory density threshold for suitability in this analysis is assessed at ≥25% canopy cover.

[11] If no Community Wildfire Protection Plan is in place, the WUI is defined as the area 0.5 miles from an at risk community (group of homes with basic infrastructure and services that is within or adjacent to federal lands in which conditions are conducive to a large scale fire event (SRLA Implementation Guide: Vegetation Management, pgs. 9-10).

Appendix E – Lynx Priority Habitat Descriptions for Alternative 3

Lynx Habitat Priority Rating	Definition	Rationale
1	***Single story stands (one dead) with little or no advanced regeneration present within the stand and <25% live overstory trees (Currently unsuitable/SISS)***	These stands typically have small populations of snowshoe hare and are of little value to lynx. Habitat conditions could be improved in these stands through harvest and subsequent conifer planting. Snag and course down wood requirements are higher in these areas as these key biological legacies are important habitat characteristics for a number of species. Live overstory tree percentage here derives from the draft Salvage Guidelines outlined and from Berg et al. (2012) where few snowshoe hare pellets were found with less than 20% canopy closure, and from Ivan and Seglund (2015) describing significant declines in red squirrel occupancy in heavily impacted stands. The 0-10% canopy closure described in the SLRA Implementation Guide (IG) may underestimate the requirements of lynx and their prey in beetle-impacted stands.
2	***Single or two-story stands (one dead) with patchy regeneration, but overall forested stand does not contain DHC (may or may not be currently suitable). Stands are considered suitable if containing >25% live canopy with or without understory, or if they contain 0-25% live canopy and contain live understory trees that provide at least 20% horizontal density in winter snowshoe hare foraging habitat condition. Not likely to meet minimum timber stocking levels.***	These stands may fit what we call low-quality suitable habitat. Hare densities in these areas are low, however it may meet the minimal habitat definitions described. These areas are second in priority as they would have lower use by lynx and additional conifer planting would be beneficial. Movement corridors would be necessary and could overlap with advanced regeneration protection PDCs.
3	***Two-story stands (one dead) with >20% horizontal density in winter snowshoe hare foraging habitat condition, but not S6 (Currently suitable). Some patches may exceed 35% DHC (good quality foraging habitat).***	These stands consist of suitable lynx habitat and, given the change in conditions, are likely to make up a sizable portion of a lynx home range. They provide adequate snowshoe hare winter foraging habitat and likely meet minimum timber stocking levels due to advanced regeneration in the understory. Lynx are anticipated to persist in these stands.
4	***Multistoried stands (2+), 40% canopy and >35% DHC, currently S6 (High-quality stands, Implementation Guide Tab 3 page 23).***	These stands represent the best quality habitat given the changed conditions. They contain ample advanced regeneration and are anticipated to persist absent human alterations. Lynx currently breed in these conditions where they occur on steep northerly slopes, as shown in CPW and USFS camera stations. It is also anticipated that these areas, in sufficient quantity, make up the core of lynx home ranges.

Appendix F – Map of Known Invasive Plant Species



Appendix G – Hazardous Fuel Specifications and Guidelines

Each individual hazardous fuel treatment will require a silvicultural prescription. The following provides general specifications and guidelines tied to desired conditions within areas deemed necessary and appropriate for hazardous fuels mitigation activities in the spruce-fir zone.

Desired Future Condition (DFC): The future stand has a more open structure dominated by aspen with minor amounts of other species. The stand will continue to have dead/dying Engelmann/blue spruce that will provide snags to the stand structure but will no longer be a hazard to the property owners in terms of fire behavior. Slow recruitment of aspen and other species is maintained and encouraged to ensure the stand will be maintained well into the future. Desirable understory vegetation includes various native grasses, forbs, shrubs, and scattered trees.

Stand-level Objectives

- Maintain aspen dominance as a natural fuel break adjacent to private land by cutting all conifers <9" DBH,
- Reduce ladder fuels to limit opportunity for initiation of crown fire,
- Reduce canopy bulk density to limit potential for active crown fire activity,
- Minimize damage to residual aspen stems by cutting out aspen stems to a width of 3 to 4 feet around handpiles so they are not damaged by heat when the pile is burned, as necessary, and
- Cut dead Engelmann/blue spruce hazard trees that are within 400 feet of private boundary or 200 feet of administrative sites.

Desirable Leave Trees

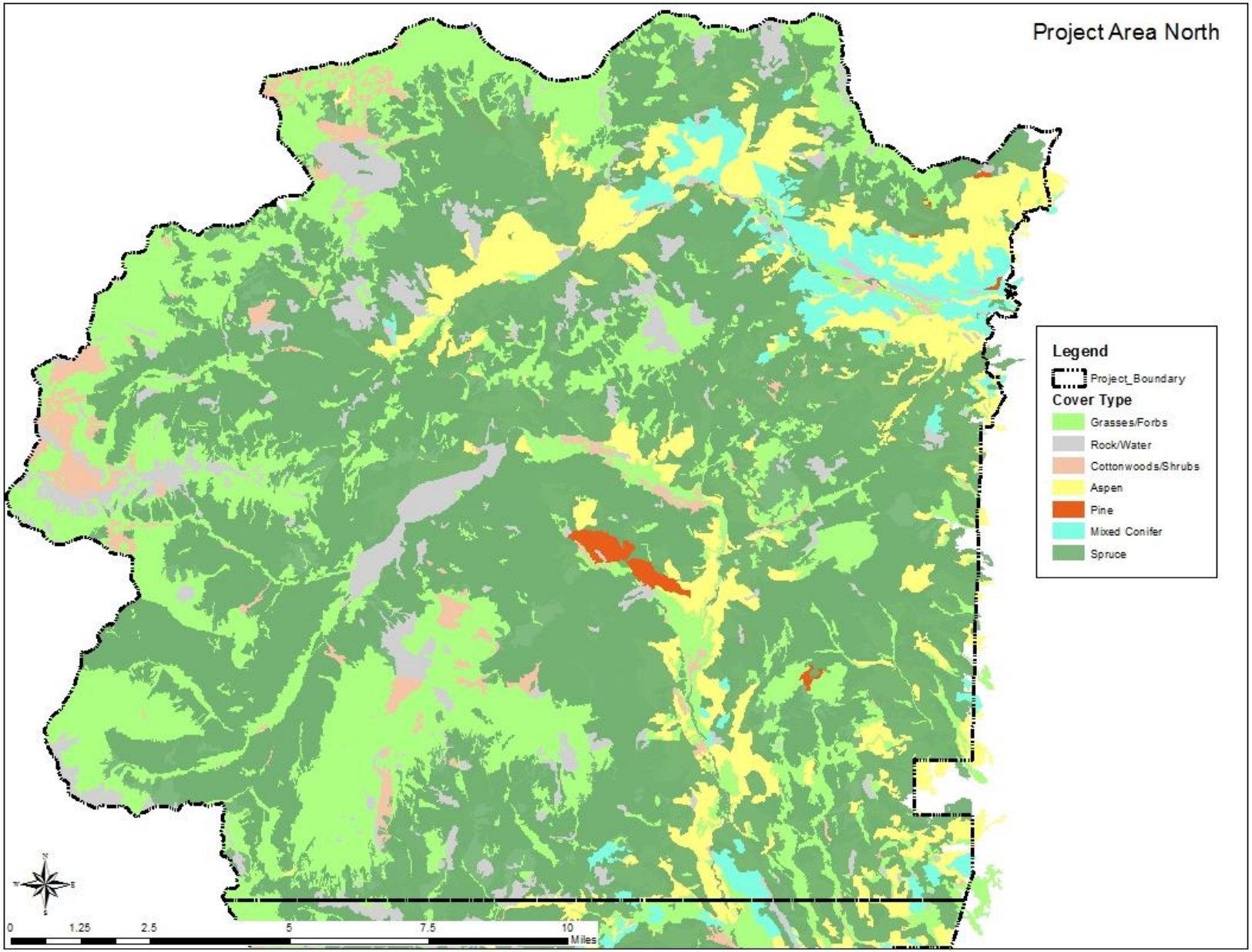
1. All aspen except those cut adjacent to handpiles to prevent stem damage.
2. All Conifers over 9.0" DBH
3. Dead Engelmann/blue spruce over 9.0" DBH more than 1.5 tree lengths from property boundary.

Thinning Objectives

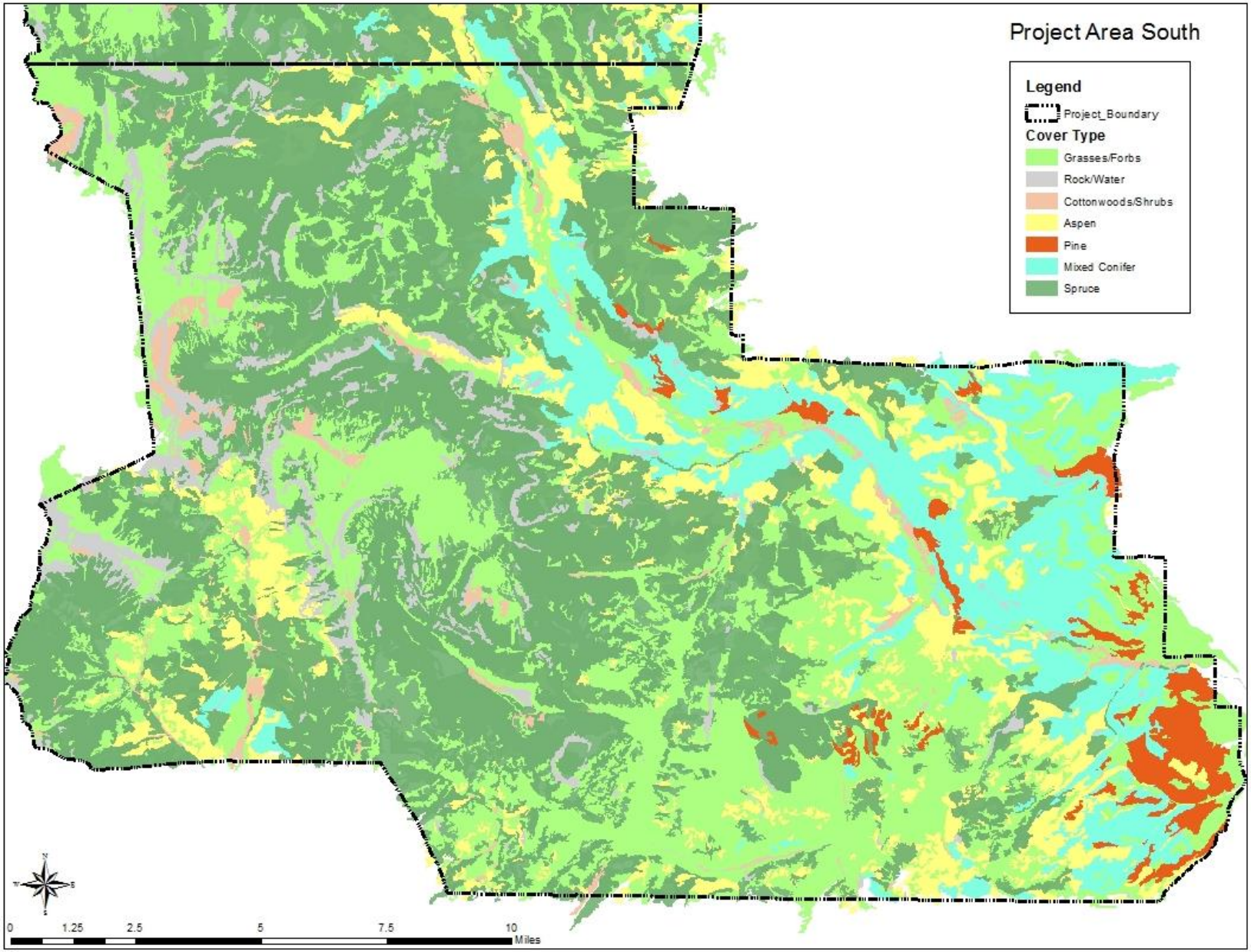
Tree cutting specifications:

1. Thin all conifers < 9.0 inches DBH (diameter breast height).
2. No conifers less than 9.0" DBH should be left.
3. Stump heights should be less than 12" in height on the uphill side and cut at less than a 30% angle from horizontal.
4. Buck tree boles that will not be piled and burned into 4' to 6' lengths and scatter to minimize the potential for additional insect activity.
5. Cut dead/dying Engelmann/blue spruce over 9.0" DBH that are less than 1.5 tree lengths from the property line; limb and buck so that boles lay flat on the ground and slash height is less than 18 inches.
6. Cut aspen that are within 3' to 4' of piles, so they won't be damaged by heat when burned.

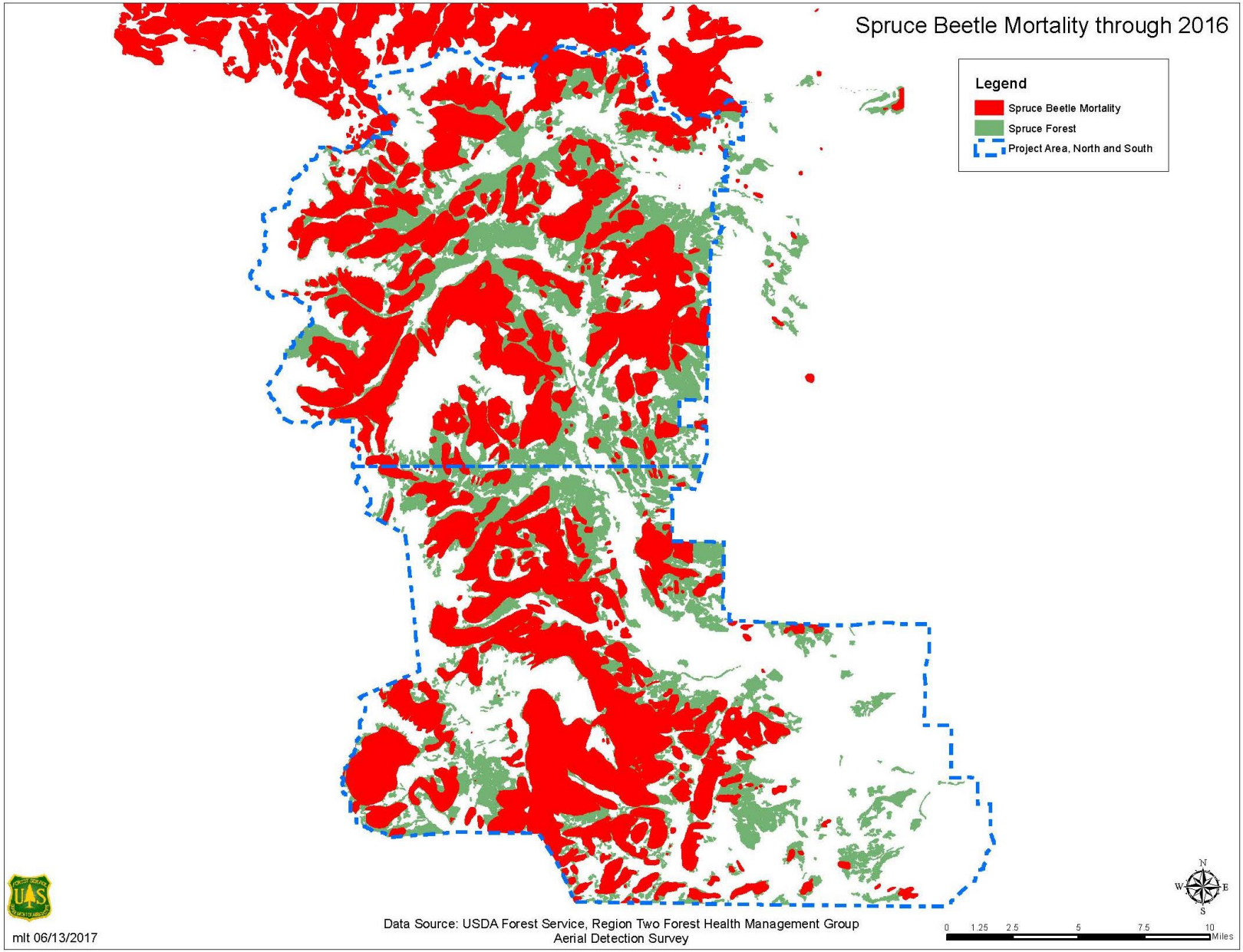
Appendix H – Vegetation and Forest Health Maps



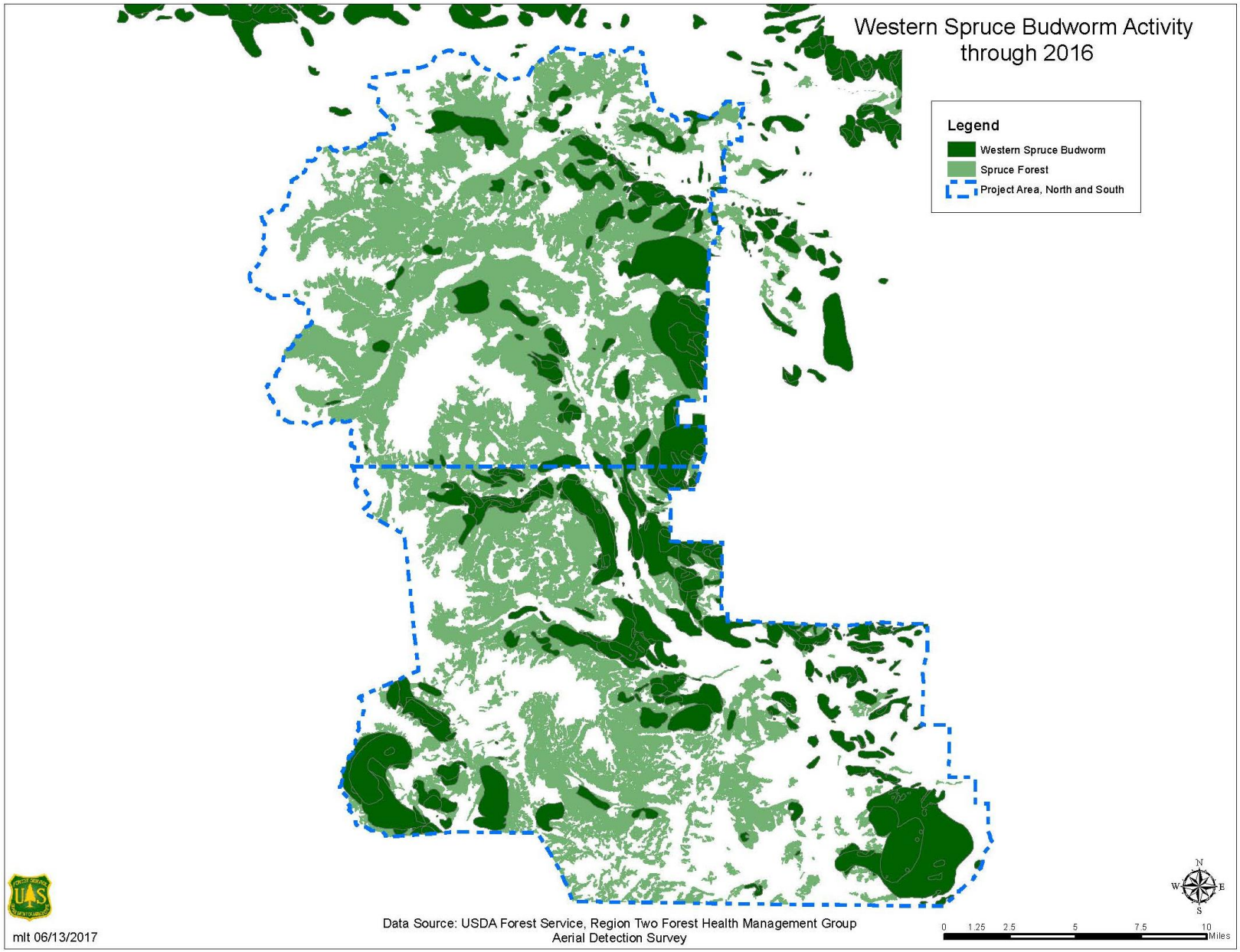
Appendix H, Figure 12- Vegetation Types within the Project Area, North



Appendix H, Figure 13- Vegetation Types within the Project Area, South



Appendix H, Figure 14- Spruce Beetle Infestation Trends, 1996 to 2016



Appendix H, Figure 15- Western Spruce Budworm Activity, 1996 to 2016

Appendix I - Past Silvicultural Activities

The following tables show past timber management activities that have occurred within the Project Area and influence the existing condition within the landscape.

Appendix I, Table 70- Past Timber Sales within the Spruce Forests of the Project Area

Year	Sale Name	Treatment Type	Units Treated	UOM	Area Affected
1946	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	39	ACRES	Cumbres Pass
1946	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	23	ACRES	Cumbres Pass
1946	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	27	ACRES	Cumbres Pass
1946	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	21	ACRES	Cumbres Pass
1946	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	45	ACRES	Cumbres Pass
1946	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	76	ACRES	Cumbres Pass
1946	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	106	ACRES	Cumbres Pass
1946	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	28	ACRES	Cumbres Pass
1946	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	4	ACRES	Cumbres Pass
1946	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	49	ACRES	Cumbres Pass
1946	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	7	ACRES	Cumbres Pass
1950	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	11	ACRES	Cumbres Pass
1950	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	67	ACRES	Cumbres Pass
1950	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	20	ACRES	Cumbres Pass
1957	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	165	ACRES	Cumbres Pass
1957	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	194	ACRES	Cumbres Pass
1957	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	194	ACRES	Cumbres Pass
1957	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	59	ACRES	Cumbres Pass
1957	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	36	ACRES	Cumbres Pass
1957	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	47	ACRES	Cumbres Pass
1957	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	40	ACRES	Cumbres Pass
1957	LEGACY MIGRATION SALE	Shelterwood Establishment Cut (with or without leave trees)	6	ACRES	Cornwall Mountain
1957	LEGACY MIGRATION SALE	Shelterwood Establishment Cut (with or without leave trees)	26	ACRES	Cumbres Pass
1957	LEGACY MIGRATION SALE	Shelterwood Establishment Cut (with or without leave trees)	17	ACRES	Cumbres Pass
1957	LEGACY MIGRATION SALE	Shelterwood Establishment Cut (with or without leave trees)	90	ACRES	Cumbres Pass

Year	Sale Name	Treatment Type	Units Treated	UOM	Area Affected
1960	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	49	ACRES	Cornwall Mountain
1960	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	20	ACRES	Cornwall Mountain
1960	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	7	ACRES	Cornwall Mountain
1960	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	41	ACRES	Cornwall Mountain
1960	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	18	ACRES	Cornwall Mountain
1962	LEGACY MIGRATION SALE	Stand Clearcut	10	ACRES	La Manga Pass
1963	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	20	ACRES	Platoro
1963	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	301	ACRES	Platoro
1963	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	101	ACRES	Platoro
1963	LEGACY MIGRATION SALE	Seed-tree Final Cut	147	ACRES	Platoro
1964	LEGACY MIGRATION SALE	Stand Clearcut	6	ACRES	Platoro
1964	LEGACY MIGRATION SALE	Overstory Removal Cut (from advanced regeneration)	20	ACRES	Osier Mountain
1964	LEGACY MIGRATION SALE	Single-tree Selection Cut	7	ACRES	Osier Mountain
1964	LEGACY MIGRATION SALE	Single-tree Selection Cut	15	ACRES	Osier Mountain
1964	LEGACY MIGRATION SALE	Single-tree Selection Cut	10	ACRES	Osier Mountain
1965	LEGACY MIGRATION SALE	Stand Clearcut	117	ACRES	Platoro
1965	LEGACY MIGRATION SALE	Stand Clearcut	138	ACRES	Platoro
1965	LEGACY MIGRATION SALE	Single-tree Selection Cut	35	ACRES	Osier Mountain
1965	LEGACY MIGRATION SALE	Single-tree Selection Cut	13	ACRES	Osier Mountain
1965	LEGACY MIGRATION SALE	Stand Clearcut	125	ACRES	Platoro
1966	LEGACY MIGRATION SALE	Stand Clearcut	13	ACRES	Cumbres Pass
1966	LEGACY MIGRATION SALE	Stand Clearcut	8	ACRES	Platoro
1966	LEGACY MIGRATION SALE	Stand Clearcut	20	ACRES	Platoro
1966	LEGACY MIGRATION SALE	Overstory Removal Cut (from advanced regeneration)	76	ACRES	Osier Mountain
1966	LEGACY MIGRATION SALE	Overstory Removal Cut (from advanced regeneration)	55	ACRES	Osier Mountain
1966	LEGACY MIGRATION SALE	Overstory Removal Cut (from advanced regeneration)	17	ACRES	Osier Mountain
1966	LEGACY MIGRATION SALE	Overstory Removal Cut (from advanced regeneration)	181	ACRES	Osier Mountain
1966	LEGACY MIGRATION SALE	Overstory Removal Cut (from advanced regeneration)	100	ACRES	Osier Mountain
1966	LEGACY MIGRATION SALE	Overstory Removal Cut (from advanced regeneration)	26	ACRES	Osier Mountain

Year	Sale Name	Treatment Type	Units Treated	UOM	Area Affected
1966	LEGACY MIGRATION SALE	Overstory Removal Cut (from advanced regeneration)	3	ACRES	Osier Mountain
1966	LEGACY MIGRATION SALE	Stand Clearcut	20	ACRES	Platoro
1967	LEGACY MIGRATION SALE	Stand Clearcut	143	ACRES	Cumbres Pass
1967	LEGACY MIGRATION SALE	Stand Clearcut	27	ACRES	Cumbres Pass
1967	LEGACY MIGRATION SALE	Stand Clearcut	2	ACRES	La Manga Pass
1967	LEGACY MIGRATION SALE	Stand Clearcut	8	ACRES	Platoro
1967	LEGACY MIGRATION SALE	Stand Clearcut	50	ACRES	Platoro
1967	LEGACY MIGRATION SALE	Stand Clearcut	4	ACRES	Platoro
1967	LEGACY MIGRATION SALE	Stand Clearcut	13	ACRES	Platoro
1967	LEGACY MIGRATION SALE	Stand Clearcut	8	ACRES	Platoro
1967	LEGACY MIGRATION SALE	Stand Clearcut	10	ACRES	Platoro
1967	LEGACY MIGRATION SALE	Stand Clearcut	10	ACRES	Platoro
1967	LEGACY MIGRATION SALE	Overstory Removal Cut (from advanced regeneration)	89	ACRES	Cumbres Pass
1967	LEGACY MIGRATION SALE	Overstory Removal Cut (from advanced regeneration)	35	ACRES	Osier Mountain
1967	LEGACY MIGRATION SALE	Overstory Removal Cut (from advanced regeneration)	11	ACRES	Osier Mountain
1967	LEGACY MIGRATION SALE	Overstory Removal Cut (from advanced regeneration)	12	ACRES	Osier Mountain
1967	LEGACY MIGRATION SALE	Overstory Removal Cut (from advanced regeneration)	21	ACRES	Osier Mountain
1967	LEGACY MIGRATION SALE	Permanent Land Clearing	5	ACRES	Chama Basin
1967	LEGACY MIGRATION SALE	Permanent Land Clearing	7	ACRES	Chama Basin
1967	LEGACY MIGRATION SALE	Permanent Land Clearing	3	ACRES	Chama Basin
1967	LEGACY MIGRATION SALE	Stand Clearcut	6	ACRES	Platoro
1967	LEGACY MIGRATION SALE	Stand Clearcut	5	ACRES	Platoro
1967	LEGACY MIGRATION SALE	Stand Clearcut	38	ACRES	Platoro
1967	LEGACY MIGRATION SALE	Stand Clearcut	50	ACRES	Platoro
1967	LEGACY MIGRATION SALE	Stand Clearcut	23	ACRES	Platoro
1968	LEGACY MIGRATION SALE	Stand Clearcut	18	ACRES	La Manga Pass
1968	LEGACY MIGRATION SALE	Stand Clearcut	38	ACRES	Platoro
1968	LEGACY MIGRATION SALE	Stand Clearcut	12	ACRES	La Manga Pass
1968	LEGACY MIGRATION SALE	Stand Clearcut	9	ACRES	Platoro

Year	Sale Name	Treatment Type	Units Treated	UOM	Area Affected
1968	LEGACY MIGRATION SALE	Stand Clearcut	16	ACRES	Platoro
1968	LEGACY MIGRATION SALE	Stand Clearcut	13	ACRES	Platoro
1968	LEGACY MIGRATION SALE	Stand Clearcut	40	ACRES	Platoro
1968	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	20	ACRES	Cumbres Pass
1968	LEGACY MIGRATION SALE	Overstory Removal Cut (from advanced regeneration)	20	ACRES	Cumbres Pass
1968	LEGACY MIGRATION SALE	Stand Clearcut	18	ACRES	La Manga Pass
1968	LEGACY MIGRATION SALE	Stand Clearcut	12	ACRES	La Manga Pass
1969	LEGACY MIGRATION SALE	Stand Clearcut	18	ACRES	Platoro
1969	LEGACY MIGRATION SALE	Stand Clearcut	15	ACRES	Platoro
1969	LEGACY MIGRATION SALE	Stand Clearcut	23	ACRES	Platoro
1969	LEGACY MIGRATION SALE	Stand Clearcut	10	ACRES	Platoro
1973	LEGACY MIGRATION SALE	Single-tree Selection Cut	6	ACRES	Osier Mountain
1973	LEGACY MIGRATION SALE	Single-tree Selection Cut	40	ACRES	Osier Mountain
1973	LEGACY MIGRATION SALE	Single-tree Selection Cut	13	ACRES	Osier Mountain
1973	LEGACY MIGRATION SALE	Single-tree Selection Cut	20	ACRES	Osier Mountain
1973	LEGACY MIGRATION SALE	Single-tree Selection Cut	26	ACRES	Osier Mountain
1973	LEGACY MIGRATION SALE	Single-tree Selection Cut	50	ACRES	Osier Mountain
1973	LEGACY MIGRATION SALE	Single-tree Selection Cut	34	ACRES	Elk Creek
1975	LEGACY MIGRATION SALE	Single-tree Selection Cut	70	ACRES	Elk Creek
1975	LEGACY MIGRATION SALE	Single-tree Selection Cut	104	ACRES	Elk Creek
1975	LEGACY MIGRATION SALE	Single-tree Selection Cut	15	ACRES	Elk Creek
1975	LEGACY MIGRATION SALE	Sanitation Cut	7	ACRES	Platoro
1975	LEGACY MIGRATION SALE	Sanitation Cut	14	ACRES	Platoro
1976	LEGACY MIGRATION SALE	Patch Clearcut	5	ACRES	Chama Basin
1976	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	5	ACRES	Cumbres Pass
1976	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	35	ACRES	Cumbres Pass
1976	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	10	ACRES	Cumbres Pass
1976	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	110	ACRES	Platoro
1976	LEGACY MIGRATION SALE	Single-tree Selection Cut	30	ACRES	Elk Creek

Year	Sale Name	Treatment Type	Units Treated	UOM	Area Affected
1976	LEGACY MIGRATION SALE	Single-tree Selection Cut	120	ACRES	Elk Creek
1976	LEGACY MIGRATION SALE	Sanitation Cut	42	ACRES	Chama Basin
1976	LEGACY MIGRATION SALE	Sanitation Cut	38	ACRES	Chama Basin
1976	LEGACY MIGRATION SALE	Sanitation Cut	28	ACRES	Chama Basin
1976	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	85	ACRES	Jasper
1976	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	152	ACRES	Jasper
1977	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	291	ACRES	Cumbres Pass
1977	LEGACY MIGRATION SALE	Sanitation Cut	31	ACRES	Chama Basin
1977	LEGACY MIGRATION SALE	Sanitation Cut	6	ACRES	Chama Basin
1977	LEGACY MIGRATION SALE	Sanitation Cut	3	ACRES	Platoro
1977	LEGACY MIGRATION SALE	Sanitation Cut	10	ACRES	Platoro
1977	LEGACY MIGRATION SALE	Sanitation Cut	3	ACRES	Platoro
1977	LEGACY MIGRATION SALE	Sanitation Cut	6	ACRES	Platoro
1977	LEGACY MIGRATION SALE	Sanitation Cut	4	ACRES	Platoro
1977	LEGACY MIGRATION SALE	Sanitation Cut	7	ACRES	Platoro
1977	LEGACY MIGRATION SALE	Sanitation Cut	6	ACRES	Platoro
1977	LEGACY MIGRATION SALE	Sanitation Cut	1	ACRES	Platoro
1977	LEGACY MIGRATION SALE	Sanitation Cut	3	ACRES	Platoro
1977	LEGACY MIGRATION SALE	Sanitation Cut	2	ACRES	Platoro
1977	LEGACY MIGRATION SALE	Sanitation Cut	4	ACRES	Platoro
1978	LEGACY MIGRATION SALE	Commercial Thin	13	ACRES	Cumbres Pass
1978	LEGACY MIGRATION SALE	Commercial Thin	7	ACRES	Cumbres Pass
1978	LEGACY MIGRATION SALE	Commercial Thin	16	ACRES	Cumbres Pass
1979	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	69	ACRES	Cumbres Pass
1979	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	69	ACRES	Cumbres Pass
1979	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	22	ACRES	Cumbres Pass
1979	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	85	ACRES	Cumbres Pass
1979	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	21	ACRES	Cumbres Pass
1979	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	10	ACRES	Cumbres Pass

Year	Sale Name	Treatment Type	Units Treated	UOM	Area Affected
1979	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	44	ACRES	Cumbres Pass
1979	LEGACY MIGRATION SALE	Commercial Thin	30	ACRES	Cumbres Pass
1979	LEGACY MIGRATION SALE	Commercial Thin	70	ACRES	Cumbres Pass
1979	LEGACY MIGRATION SALE	Sanitation Cut	255	ACRES	Cumbres Pass
1979	LEGACY MIGRATION SALE	Permanent Land Clearing	7	ACRES	Chama Basin
1979	LEGACY MIGRATION SALE	Permanent Land Clearing	1	ACRES	Chama Basin
1979	LEGACY MIGRATION SALE	Permanent Land Clearing	6	ACRES	Chama Basin
1979	LEGACY MIGRATION SALE	Permanent Land Clearing	1	ACRES	Chama Basin
1981	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	23	ACRES	Cumbres Pass
1981	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	10	ACRES	Cumbres Pass
1981	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	180	ACRES	Cumbres Pass
1981	LEGACY MIGRATION SALE	Sanitation Cut	100	ACRES	Cumbres Pass
1982	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	3	ACRES	Cumbres Pass
1982	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	57	ACRES	Cornwall Mountain
1982	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	17	ACRES	Cornwall Mountain
1982	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	26	ACRES	Cornwall Mountain
1982	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	36	ACRES	Cornwall Mountain
1982	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	17	ACRES	Cornwall Mountain
1982	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	103	ACRES	Cornwall Mountain
1982	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	33	ACRES	Cornwall Mountain
1982	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	27	ACRES	Cornwall Mountain
1982	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	6	ACRES	Cornwall Mountain
1982	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	9	ACRES	Cornwall Mountain
1982	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	103	ACRES	Cornwall Mountain
1982	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	7	ACRES	Cornwall Mountain
1983	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	45	ACRES	Cumbres Pass
1983	LEGACY MIGRATION SALE	Single-tree Selection Cut	60	ACRES	Fox Creek
1984	LEGACY MIGRATION SALE	Single-tree Selection Cut	10	ACRES	La Manga Pass
1984	LEGACY MIGRATION SALE	Single-tree Selection Cut	19	ACRES	La Manga Pass

Year	Sale Name	Treatment Type	Units Treated	UOM	Area Affected
1984	LEGACY MIGRATION SALE	Single-tree Selection Cut	24	ACRES	La Manga Pass
1984	LEGACY MIGRATION SALE	Single-tree Selection Cut	15	ACRES	La Manga Pass
1984	LEGACY MIGRATION SALE	Single-tree Selection Cut	124	ACRES	La Manga Pass
1984	LEGACY MIGRATION SALE	Single-tree Selection Cut	38	ACRES	La Manga Pass
1984	LEGACY MIGRATION SALE	Single-tree Selection Cut	30	ACRES	La Manga Pass
1984	LEGACY MIGRATION SALE	Single-tree Selection Cut	45	ACRES	La Manga Pass
1984	LEGACY MIGRATION SALE	Single-tree Selection Cut	25	ACRES	La Manga Pass
1984	LEGACY MIGRATION SALE	Single-tree Selection Cut	48	ACRES	La Manga Pass
1984	LEGACY MIGRATION SALE	Single-tree Selection Cut	136	ACRES	La Manga Pass
1984	LEGACY MIGRATION SALE	Single-tree Selection Cut	120	ACRES	La Manga Pass
1984	LEGACY MIGRATION SALE	Single-tree Selection Cut	26	ACRES	La Manga Pass
1985	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	10	ACRES	Chama Basin
1985	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	89	ACRES	Chama Basin
1985	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	96	ACRES	Chama Basin
1985	LEGACY MIGRATION SALE	Sanitation Cut	85	ACRES	Jasper
1985	LEGACY MIGRATION SALE	Sanitation Cut	152	ACRES	Jasper
1986	LEGACY MIGRATION SALE	Single-tree Selection Cut	46	ACRES	Osier Mountain
1986	LEGACY MIGRATION SALE	Single-tree Selection Cut	105	ACRES	Osier Mountain
1986	LEGACY MIGRATION SALE	Single-tree Selection Cut	37	ACRES	Osier Mountain
1986	LEGACY MIGRATION SALE	Single-tree Selection Cut	70	ACRES	Osier Mountain
1986	LEGACY MIGRATION SALE	Single-tree Selection Cut	42	ACRES	Osier Mountain
1986	LEGACY MIGRATION SALE	Single-tree Selection Cut	66	ACRES	Osier Mountain
1986	LEGACY MIGRATION SALE	Single-tree Selection Cut	132	ACRES	Osier Mountain
1986	LEGACY MIGRATION SALE	Stand Clearcut	10	ACRES	Platoro
1987	LEGACY MIGRATION SALE	Patch Clearcut	5	ACRES	Osier Mountain
1987	LEGACY MIGRATION SALE	Patch Clearcut	10	ACRES	Osier Mountain
1987	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	5	ACRES	Platoro
1987	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	12	ACRES	Platoro
1987	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	36	ACRES	Platoro

Year	Sale Name	Treatment Type	Units Treated	UOM	Area Affected
1987	LEGACY MIGRATION SALE	Single-tree Selection Cut	76	ACRES	Osier Mountain
1987	LEGACY MIGRATION SALE	Single-tree Selection Cut	34	ACRES	Osier Mountain
1987	LEGACY MIGRATION SALE	Single-tree Selection Cut	59	ACRES	Osier Mountain
1987	LEGACY MIGRATION SALE	Single-tree Selection Cut	17	ACRES	Osier Mountain
1987	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	23	ACRES	Summitville
1987	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	27	ACRES	Summitville
1987	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	3	ACRES	Summitville
1987	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	71	ACRES	Summitville
1987	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	7	ACRES	Summitville
1987	LEGACY MIGRATION SALE	Seed-tree	38	ACRES	Summitville
1987	LEGACY MIGRATION SALE	Shelterwood Establishment Cut (with or without leave trees)	76	ACRES	Summitville
1987	LEGACY MIGRATION SALE	Shelterwood Establishment Cut (with or without leave trees)	95	ACRES	Summitville
1987	LEGACY MIGRATION SALE	Shelterwood Establishment Cut (with or without leave trees)	99	ACRES	Summitville
1987	LEGACY MIGRATION SALE	Shelterwood Establishment Cut (with or without leave trees)	8	ACRES	Summitville
1987	LEGACY MIGRATION SALE	Improvement Cut	84	ACRES	Summitville
1987	LEGACY MIGRATION SALE	Seed-tree Final Cut	45	ACRES	Cumbres Pass
1987	LEGACY MIGRATION SALE	Shelterwood Establishment Cut (with or without leave trees)	83	ACRES	Summitville
1987	LEGACY MIGRATION SALE	Shelterwood Establishment Cut (with or without leave trees)	82	ACRES	Summitville
1987	LEGACY MIGRATION SALE	Shelterwood Establishment Cut (with or without leave trees)	100	ACRES	Summitville
1987	LEGACY MIGRATION SALE	Shelterwood Establishment Cut (with or without leave trees)	14	ACRES	Summitville
1987	LEGACY MIGRATION SALE	Shelterwood Establishment Cut (with or without leave trees)	125	ACRES	Summitville
1987	LEGACY MIGRATION SALE	Shelterwood Establishment Cut (with or without leave trees)	102	ACRES	Summitville
1987	LEGACY MIGRATION SALE	Shelterwood Establishment Cut (with or without leave trees)	85	ACRES	Summitville
1988	LEGACY MIGRATION SALE	Seed-tree Preparatory Cut	57	ACRES	Cornwall Mountain
1988	LEGACY MIGRATION SALE	Seed-tree Preparatory Cut	27	ACRES	Cornwall Mountain
1988	LEGACY MIGRATION SALE	Seed-tree Preparatory Cut	6	ACRES	Cornwall Mountain
1988	LEGACY MIGRATION SALE	Seed-tree Preparatory Cut	17	ACRES	Cornwall Mountain
1988	LEGACY MIGRATION SALE	Seed-tree Preparatory Cut	17	ACRES	Cornwall Mountain
1988	LEGACY MIGRATION SALE	Seed-tree Preparatory Cut	9	ACRES	Cornwall Mountain

Year	Sale Name	Treatment Type	Units Treated	UOM	Area Affected
1988	LEGACY MIGRATION SALE	Seed-tree Preparatory Cut	21	ACRES	Cornwall Mountain
1988	LEGACY MIGRATION SALE	Seed-tree Preparatory Cut	7	ACRES	Cornwall Mountain
1988	LEGACY MIGRATION SALE	Seed-tree Preparatory Cut	36	ACRES	Cornwall Mountain
1988	LEGACY MIGRATION SALE	Seed-tree Preparatory Cut	33	ACRES	Cornwall Mountain
1988	LEGACY MIGRATION SALE	Seed-tree Preparatory Cut	103	ACRES	Cornwall Mountain
1988	LEGACY MIGRATION SALE	Seed-tree Preparatory Cut	26	ACRES	Cornwall Mountain
1988	LEGACY MIGRATION SALE	Seed-tree Preparatory Cut	103	ACRES	Cornwall Mountain
1988	LEGACY MIGRATION SALE	Patch Clearcut	20	ACRES	Fox Creek
1989	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	110	ACRES	Platoro
1989	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	17	ACRES	La Manga Pass
1989	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	48	ACRES	La Manga Pass
1989	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	43	ACRES	La Manga Pass
1989	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	20	ACRES	Cornwall Mountain
1989	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	21	ACRES	Cornwall Mountain
1989	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	85	ACRES	La Manga Pass
1989	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	7	ACRES	La Manga Pass
1989	LEGACY MIGRATION SALE	Shelterwood Establishment Cut (with or without leave trees)	60	ACRES	Cumbres Pass
1990	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	3	ACRES	Platoro
1990	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	7	ACRES	Platoro
1990	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	57	ACRES	Platoro
1990	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	20	ACRES	Platoro
1990	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	33	ACRES	Platoro
1990	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	14	ACRES	Platoro
1990	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	11	ACRES	Platoro
1990	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	3	ACRES	Platoro
1990	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	6	ACRES	Platoro
1990	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	9	ACRES	Platoro
1990	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	6	ACRES	Platoro
1990	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	3	ACRES	Platoro

Year	Sale Name	Treatment Type	Units Treated	UOM	Area Affected
1990	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	4	ACRES	Platoro
1990	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	10	ACRES	Platoro
1990	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	7	ACRES	Platoro
1990	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	6	ACRES	Platoro
1991	LEGACY MIGRATION SALE	Patch Clearcut	5	ACRES	La Manga Pass
1991	LEGACY MIGRATION SALE	Shelterwood Establishment Cut (with or without leave trees)	66	ACRES	Cumbres Pass
1991	LEGACY MIGRATION SALE	Shelterwood Establishment Cut (with or without leave trees)	88	ACRES	Cumbres Pass
1991	LEGACY MIGRATION SALE	Patch Clearcut	6	ACRES	La Manga Pass
1991	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	71	ACRES	Cumbres Pass
1991	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	5	ACRES	La Manga Pass
1991	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	45	ACRES	La Manga Pass
1991	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	52	ACRES	La Manga Pass
1991	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	7	ACRES	La Manga Pass
1991	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	40	ACRES	La Manga Pass
1991	LEGACY MIGRATION SALE	Sanitation Cut	122	ACRES	La Manga Pass
1992	LEGACY MIGRATION SALE	Shelterwood Establishment Cut (with or without leave trees)	63	ACRES	Cumbres Pass
1992	LEGACY MIGRATION SALE	Patch Clearcut	2	ACRES	La Manga Pass
1992	LEGACY MIGRATION SALE	Patch Clearcut	9	ACRES	La Manga Pass
1992	LEGACY MIGRATION SALE	Patch Clearcut	4	ACRES	La Manga Pass
1992	LEGACY MIGRATION SALE	Patch Clearcut	7	ACRES	La Manga Pass
1992	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	4	ACRES	Fox Creek
1992	LEGACY MIGRATION SALE	Overstory Removal Cut (from advanced regeneration)	24	ACRES	Fox Creek
1992	LEGACY MIGRATION SALE	Patch Clearcut	4	ACRES	La Manga Pass
1992	LEGACY MIGRATION SALE	Patch Clearcut	6	ACRES	La Manga Pass
1992	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	86	ACRES	Cumbres Pass
1992	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	12	ACRES	La Manga Pass
1992	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	7	ACRES	La Manga Pass
1992	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	5	ACRES	La Manga Pass
1992	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	38	ACRES	La Manga Pass

Year	Sale Name	Treatment Type	Units Treated	UOM	Area Affected
1992	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	9	ACRES	La Manga Pass
1992	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	16	ACRES	La Manga Pass
1992	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	49	ACRES	La Manga Pass
1992	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	69	ACRES	La Manga Pass
1993	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	38	ACRES	Cumbres Pass
1993	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	5	ACRES	Cumbres Pass
1993	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	43	ACRES	Cumbres Pass
1993	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	45	ACRES	Cumbres Pass
1993	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	34	ACRES	La Manga Pass
1993	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	60	ACRES	La Manga Pass
1993	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	19	ACRES	Jasper
1993	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	14	ACRES	Jasper
1993	LEGACY MIGRATION SALE	Shelterwood Establishment Cut (with or without leave trees)	38	ACRES	Jasper
1993	LEGACY MIGRATION SALE	Shelterwood Establishment Cut (with or without leave trees)	47	ACRES	Jasper
1993	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	66	ACRES	La Manga Pass
1993	LEGACY MIGRATION SALE	Patch Clearcut	2	ACRES	La Manga Pass
1993	LEGACY MIGRATION SALE	Patch Clearcut	9	ACRES	La Manga Pass
1993	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	53	ACRES	La Manga Pass
1993	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	30	ACRES	La Manga Pass
1993	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	30	ACRES	La Manga Pass
1993	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	49	ACRES	La Manga Pass
1994	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	15	ACRES	Jasper
1994	LEGACY MIGRATION SALE	Shelterwood Establishment Cut (with or without leave trees)	55	ACRES	Jasper
1994	LEGACY MIGRATION SALE	Shelterwood Establishment Cut (with or without leave trees)	59	ACRES	Jasper
1994	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	58	ACRES	Cumbres Pass
1994	LEGACY MIGRATION SALE	Patch Clearcut	20	ACRES	Osier Mountain
1994	LEGACY MIGRATION SALE	Patch Clearcut	5	ACRES	La Manga Pass
1994	LEGACY MIGRATION SALE	Patch Clearcut	9	ACRES	La Manga Pass
1994	LEGACY MIGRATION SALE	Patch Clearcut	14	ACRES	La Manga Pass

Year	Sale Name	Treatment Type	Units Treated	UOM	Area Affected
1994	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	50	ACRES	Cumbres Pass
1994	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	121	ACRES	La Manga Pass
1994	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	39	ACRES	La Manga Pass
1994	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	59	ACRES	La Manga Pass
1994	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	24	ACRES	Red Mountain
1994	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	144	ACRES	Platoro
1994	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	56	ACRES	Red Mountain
1994	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	119	ACRES	Platoro
1994	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	11	ACRES	Platoro
1994	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	19	ACRES	Red Mountain
1995	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	82	ACRES	Cumbres Pass
1995	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	24	ACRES	Red Mountain
1995	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	49	ACRES	Red Mountain
1995	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	41	ACRES	Red Mountain
1995	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	21	ACRES	Red Mountain
1995	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	12	ACRES	Red Mountain
1995	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	13	ACRES	Red Mountain
1995	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	7	ACRES	Red Mountain
1995	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	8	ACRES	Red Mountain
1995	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	24	ACRES	Red Mountain
1995	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	58	ACRES	Red Mountain
1995	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	38	ACRES	Red Mountain
1995	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	10	ACRES	Red Mountain
1995	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	34	ACRES	Red Mountain
1995	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	60	ACRES	Red Mountain
1995	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	10	ACRES	Red Mountain
1995	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	82	ACRES	Red Mountain
1995	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	8	ACRES	Red Mountain
1995	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	18	ACRES	La Manga Pass

Year	Sale Name	Treatment Type	Units Treated	UOM	Area Affected
1995	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	30	ACRES	La Manga Pass
1995	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	29	ACRES	La Manga Pass
1995	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	16	ACRES	La Manga Pass
1995	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	5	ACRES	Red Mountain
1995	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	73	ACRES	Red Mountain
1995	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	39	ACRES	Red Mountain
1995	LEGACY MIGRATION SALE	Patch Clearcut	4	ACRES	La Manga Pass
1995	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	42	ACRES	La Manga Pass
1995	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	48	ACRES	La Manga Pass
1995	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	63	ACRES	La Manga Pass
1995	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	49	ACRES	La Manga Pass
1995	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	80	ACRES	La Manga Pass
1995	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	33	ACRES	La Manga Pass
1995	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	10	ACRES	La Manga Pass
1995	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	9	ACRES	La Manga Pass
1996	LEGACY MIGRATION SALE	Patch Clearcut	7	ACRES	La Manga Pass
1996	LEGACY MIGRATION SALE	Patch Clearcut	3	ACRES	La Manga Pass
1996	LEGACY MIGRATION SALE	Patch Clearcut	4	ACRES	La Manga Pass
1996	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	34	ACRES	La Manga Pass
1996	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	6	ACRES	Red Mountain
1996	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	5	ACRES	Red Mountain
2000	LEGACY MIGRATION SALE	Seed-tree Seed Cut (with and without leave trees)	3	ACRES	Platoro
2000	LEGACY MIGRATION SALE	Seed-tree Seed Cut (with and without leave trees)	7	ACRES	Platoro
2000	LEGACY MIGRATION SALE	Seed-tree Seed Cut (with and without leave trees)	57	ACRES	Platoro
2000	LEGACY MIGRATION SALE	Seed-tree Seed Cut (with and without leave trees)	20	ACRES	Platoro
2000	LEGACY MIGRATION SALE	Seed-tree Seed Cut (with and without leave trees)	33	ACRES	Platoro
2000	LEGACY MIGRATION SALE	Seed-tree Seed Cut (with and without leave trees)	14	ACRES	Platoro
2000	LEGACY MIGRATION SALE	Seed-tree Seed Cut (with and without leave trees)	11	ACRES	Platoro
2000	LEGACY MIGRATION SALE	Seed-tree Seed Cut (with and without leave trees)	3	ACRES	Platoro

Year	Sale Name	Treatment Type	Units Treated	UOM	Area Affected
2000	LEGACY MIGRATION SALE	Seed-tree Seed Cut (with and without leave trees)	6	ACRES	Platoro
2000	LEGACY MIGRATION SALE	Seed-tree Seed Cut (with and without leave trees)	9	ACRES	Platoro
2000	LEGACY MIGRATION SALE	Seed-tree Seed Cut (with and without leave trees)	6	ACRES	Platoro
2000	LEGACY MIGRATION SALE	Seed-tree Seed Cut (with and without leave trees)	3	ACRES	Platoro
2000	LEGACY MIGRATION SALE	Seed-tree Seed Cut (with and without leave trees)	4	ACRES	Platoro
2000	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	5	ACRES	Red Mountain
2000	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	52	ACRES	Red Mountain
2000	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	16	ACRES	Red Mountain
2000	LEGACY MIGRATION SALE	Shelterwood Preparatory Cut	18	ACRES	Red Mountain
2000	LEGACY MIGRATION SALE	Seed-tree Seed Cut (with and without leave trees)	10	ACRES	Platoro
2000	LEGACY MIGRATION SALE	Seed-tree Seed Cut (with and without leave trees)	7	ACRES	Platoro
2000	LEGACY MIGRATION SALE	Seed-tree Seed Cut (with and without leave trees)	6	ACRES	Platoro
2005	NEFF MOUNTAIN BEETLE SALVAGE	Sanitation Cut	88	ACRES	Cumbres Pass
2005	NEFF MOUNTAIN BEETLE SALVAGE	Sanitation Cut	16	ACRES	Cumbres Pass
2005	GROUSE CREEK SALVAGE TIMBER SALE	Sanitation Cut	166	ACRES	La Manga Pass
2005	GROUSE CREEK SALVAGE TIMBER SALE	Sanitation Cut	157	ACRES	La Manga Pass
2005	GROUSE CREEK SALVAGE TIMBER SALE	Sanitation Cut	86	ACRES	La Manga Pass
2005	GROUSE CREEK SALVAGE TIMBER SALE	Sanitation Cut	84	ACRES	La Manga Pass
2005	GROUSE CREEK SALVAGE TIMBER SALE	Sanitation Cut	167	ACRES	La Manga Pass
2005	GROUSE CREEK SALVAGE TIMBER SALE	Sanitation Cut	150	ACRES	La Manga Pass
2005	SPRUCE HOLE BEETLE SALVAGE	Sanitation Cut	77	ACRES	La Manga Pass
2006	WOLF BEETLE SALVAGE	Sanitation Cut	97	ACRES	Cumbres Pass
2006	WOLF BEETLE SALVAGE	Sanitation Cut	75	ACRES	Cumbres Pass
2006	WOLF BEETLE SALVAGE	Sanitation Cut	95	ACRES	Cumbres Pass
2006	WOLF BEETLE SALVAGE	Sanitation Cut	20	ACRES	Cumbres Pass
2006	WOLF BEETLE SALVAGE	Sanitation Cut	1	ACRES	Cumbres Pass
2006	LA MANGA BEETLE SALVAGE TIMBER SALE	Sanitation Cut	140	ACRES	La Manga Pass
2006	LA MANGA BEETLE SALVAGE TIMBER SALE	Sanitation Cut	5	ACRES	La Manga Pass
2006	WOLF BEETLE SALVAGE	Sanitation Cut	1	ACRES	Cumbres Pass

Year	Sale Name	Treatment Type	Units Treated	UOM	Area Affected
2006	GROUSE II SALVAGE	Sanitation Cut	119	ACRES	La Manga Pass
2006	GROUSE II SALVAGE	Sanitation Cut	27	ACRES	La Manga Pass
2006	GROUSE II SALVAGE	Sanitation Cut	88	ACRES	La Manga Pass
2008	CERRO ROJO SALVAGE TIMBER SALE	Sanitation Cut	20	ACRES	Cornwall Mountain
2008	CERRO ROJO SALVAGE TIMBER SALE	Sanitation Cut	22	ACRES	Cornwall Mountain
2008	CERRO ROJO SALVAGE TIMBER SALE	Sanitation Cut	2	ACRES	Cornwall Mountain
2008	CERRO ROJO SALVAGE TIMBER SALE	Sanitation Cut	17	ACRES	Cornwall Mountain
2008	CERRO ROJO SALVAGE TIMBER SALE	Sanitation Cut	10	ACRES	Cornwall Mountain
2008	CERRO ROJO SALVAGE TIMBER SALE	Sanitation Cut	23	ACRES	Cornwall Mountain
2008	CERRO ROJO SALVAGE TIMBER SALE	Sanitation Cut	4	ACRES	Cornwall Mountain
2008	CERRO ROJO SALVAGE TIMBER SALE	Sanitation Cut	1	ACRES	Cornwall Mountain
2008	CERRO ROJO SALVAGE TIMBER SALE	Sanitation Cut	4	ACRES	Cornwall Mountain
2008	CERRO ROJO SALVAGE TIMBER SALE	Sanitation Cut	3	ACRES	Cornwall Mountain
2008	CERRO ROJO SALVAGE TIMBER SALE	Sanitation Cut	3	ACRES	Cornwall Mountain
2008	CERRO ROJO SALVAGE TIMBER SALE	Sanitation Cut	22	ACRES	Cornwall Mountain
2008	NEFF II SALVAGE	Sanitation Cut	75	ACRES	Cumbres Pass
2008	NEFF II SALVAGE	Sanitation Cut	23	ACRES	Cumbres Pass
2009	GROUSE III SALVAGE	Salvage Cut	51	ACRES	La Manga Pass
2009	GROUSE III SALVAGE	Salvage Cut	61	ACRES	La Manga Pass
2009	GROUSE III SALVAGE	Salvage Cut	12	ACRES	La Manga Pass
2009	CERRO ROJO SALVAGE TIMBER SALE	Sanitation Cut	67	ACRES	Red Mountain
2009	CERRO ROJO SALVAGE TIMBER SALE	Sanitation Cut	6	ACRES	Red Mountain
2009	CERRO ROJO SALVAGE TIMBER SALE	Sanitation Cut	12	ACRES	Red Mountain
2009	CERRO ROJO SALVAGE TIMBER SALE	Sanitation Cut	10	ACRES	Red Mountain
2009	CERRO ROJO SALVAGE TIMBER SALE	Sanitation Cut	45	ACRES	Red Mountain
2009	CERRO ROJO SALVAGE TIMBER SALE	Sanitation Cut	1	ACRES	Red Mountain
2009	CERRO ROJO SALVAGE TIMBER SALE	Sanitation Cut	7	ACRES	Red Mountain
2011	EL GATO SALVAGE	Salvage Cut	85	ACRES	Cumbres Pass
2011	EL GATO SALVAGE	Salvage Cut	116	ACRES	Cumbres Pass

Year	Sale Name	Treatment Type	Units Treated	UOM	Area Affected
2011	EL GATO SALVAGE	Salvage Cut	80	ACRES	Cumbres Pass
2011	EL GATO SALVAGE	Salvage Cut	123	ACRES	Cumbres Pass
2011	EL GATO SALVAGE	Salvage Cut	56	ACRES	Cumbres Pass
2011	EL GATO SALVAGE	Salvage Cut	110	ACRES	Cumbres Pass
2011	EL GATO SALVAGE	Salvage Cut	58	ACRES	Cumbres Pass
2011	TM CAMPGROUND SALVAGE	Salvage Cut; assigned as Stand Clearcut (w/ leave trees)	4	ACRES	Cumbres Pass
2011	TM CAMPGROUND SALVAGE	Salvage Cut; assigned as Stand Clearcut (w/ leave trees)	23	ACRES	Cumbres Pass
2011	TM CAMPGROUND SALVAGE	Salvage Cut; assigned as Stand Clearcut (w/ leave trees)	17	ACRES	Cumbres Pass
2012	SNOWSHOE SALVAGE	Salvage Cut	45	ACRES	Cumbres Pass
2012	SPRUCE PARK SALVAGE	Salvage Cut	30	ACRES	Cumbres Pass
2012	SPRUCE PARK SALVAGE	Salvage Cut	43	ACRES	Cumbres Pass
2012	SPRUCE PARK SALVAGE	Salvage Cut	14	ACRES	Cumbres Pass
2012	SPRUCE PARK SALVAGE	Salvage Cut	43	ACRES	Cumbres Pass
2012	SPRUCE PARK SALVAGE	Salvage Cut	36	ACRES	Cumbres Pass
2012	SPRUCE PARK SALVAGE	Salvage Cut	8	ACRES	Cumbres Pass
2012	SPRUCE PARK SALVAGE	Salvage Cut	2	ACRES	Cumbres Pass
2012	SPRUCE PARK SALVAGE	Salvage Cut	0	ACRES	Cumbres Pass
2012	SPRUCE PARK SALVAGE	Salvage Cut	2	ACRES	Cumbres Pass
2012	SPRUCE PARK SALVAGE	Salvage Cut	8	ACRES	Cumbres Pass
2012	SPRUCE PARK SALVAGE	Salvage Cut	35	ACRES	Cumbres Pass
2012	SPRUCE PARK SALVAGE	Salvage Cut	1	ACRES	Cumbres Pass
2013	BOOMERANG SALVAGE	Salvage Cut; assigned as Stand Clearcut (w/ leave trees)	143	ACRES	Cumbres Pass
2014	CHIHUAHUA SALVAGE	Salvage Cut	13	ACRES	Cumbres Pass
2014	JASPER CREEK SALVAGE	Salvage Cut; assigned as Overstory Removal Cut (from advanced regeneration)	2	ACRES	Jasper
2014	JASPER CREEK SALVAGE	Salvage Cut; assigned as Overstory Removal Cut (from advanced regeneration)	16	ACRES	Jasper
2014	JASPER CREEK SALVAGE	Salvage Cut; assigned as Two-aged Shelterwood Establishment and Removal Cut (w/ res)	101	ACRES	Jasper
2014	JASPER CREEK SALVAGE	Salvage Cut; assigned as Two-aged Shelterwood Establishment and Removal Cut (w/ res)	57	ACRES	Jasper
2014	JASPER CREEK SALVAGE	Salvage Cut; assigned as Two-aged Shelterwood Establishment and Removal Cut (w/ res)	28	ACRES	Jasper
2015	RESERVOIR SALVAGE	Salvage Cut; assigned as Two-aged Shelterwood Establishment and Removal Cut (w/ res)	16	ACRES	Cumbres Pass

Year	Sale Name	Treatment Type	Units Treated	UOM	Area Affected
2015	RESERVOIR SALVAGE	Salvage Cut; assigned as Two-aged Shelterwood Establishment and Removal Cut (w/ res)	30	ACRES	Cumbres Pass
2015	RESERVOIR SALVAGE	Salvage Cut; assigned as Two-aged Shelterwood Establishment and Removal Cut (w/ res)	56	ACRES	Cumbres Pass
2015	RESERVOIR SALVAGE	Salvage Cut; assigned as Two-aged Shelterwood Establishment and Removal Cut (w/ res)	19	ACRES	Cumbres Pass
2015	RESERVOIR SALVAGE	Salvage Cut; assigned as Two-aged Shelterwood Establishment and Removal Cut (w/ res)	7	ACRES	Cumbres Pass
2015	RESERVOIR SALVAGE	Salvage Cut; assigned as Two-aged Shelterwood Establishment and Removal Cut (w/ res)	18	ACRES	Cumbres Pass
2015	RESERVOIR SALVAGE	Salvage Cut; assigned as Two-aged Shelterwood Establishment and Removal Cut (w/ res)	12	ACRES	Cumbres Pass
2015	RESERVOIR SALVAGE	Salvage Cut; assigned as Two-aged Shelterwood Establishment and Removal Cut (w/ res)	40	ACRES	Cumbres Pass
2015	LOBO SALVAGE	Salvage Cut; assigned as Overstory Removal Cut (from advanced regeneration)	92	ACRES	Cumbres Pass
2015	COBRA SALVAGE	Salvage Cut; assigned as Overstory Removal Cut (from advanced regeneration)	43	ACRES	Cumbres Pass
2015	COBRA SALVAGE	Salvage Cut; assigned as Overstory Removal Cut (from advanced regeneration)	21	ACRES	Cumbres Pass
2015	RENDEZVOUS BEETLE SALVAGE	Salvage Cut; assigned as Overstory Removal Cut (from advanced regeneration)	14	ACRES	Cumbres Pass
2015	RENDEZVOUS BEETLE SALVAGE	Salvage Cut; assigned as Two-aged Shelterwood Establishment and Removal Cut (w/ res)	117	ACRES	Cumbres Pass
2015	RENDEZVOUS BEETLE SALVAGE	Salvage Cut; assigned as Two-aged Shelterwood Establishment and Removal Cut (w/ res)	26	ACRES	Cumbres Pass
2015	RENDEZVOUS BEETLE SALVAGE	Salvage Cut; assigned as Two-aged Shelterwood Establishment and Removal Cut (w/ res)	9	ACRES	Cumbres Pass
2015	RENDEZVOUS BEETLE SALVAGE	Salvage Cut; assigned as Two-aged Shelterwood Establishment and Removal Cut (w/ res)	23	ACRES	Cumbres Pass
2015	RENDEZVOUS BEETLE SALVAGE	Salvage Cut; assigned as Two-aged Shelterwood Establishment and Removal Cut (w/ res)	52	ACRES	Cumbres Pass
2015	RENDEZVOUS BEETLE SALVAGE	Salvage Cut; assigned as Two-aged Shelterwood Establishment and Removal Cut (w/ res)	9	ACRES	Cumbres Pass
2016	MONARCH BEETLE SALVAGE	Salvage Cut; assigned as Overstory Removal Cut (from advanced regeneration)	33	ACRES	Cumbres Pass
2016	MONARCH BEETLE SALVAGE	Salvage Cut; assigned as Overstory Removal Cut (from advanced regeneration)	104	ACRES	Cumbres Pass
2016	MONARCH BEETLE SALVAGE	Salvage Cut; assigned as Overstory Removal Cut (from advanced regeneration)	21	ACRES	Cumbres Pass
2016	MONARCH BEETLE SALVAGE	Salvage Cut; assigned as Overstory Removal Cut (from advanced regeneration)	76	ACRES	Cumbres Pass
2016	MONARCH BEETLE SALVAGE	Salvage Cut; assigned as Overstory Removal Cut (from advanced regeneration)	20	ACRES	Cumbres Pass
2016	MONARCH BEETLE SALVAGE	Salvage Cut; assigned as Overstory Removal Cut (from advanced regeneration)	27	ACRES	Cumbres Pass
2016	MONARCH BEETLE SALVAGE	Salvage Cut; assigned as Overstory Removal Cut (from advanced regeneration)	3	ACRES	Cumbres Pass
2016	NO NAME BEETLE SALVAGE	Salvage Cut; assigned as Two-aged Shelterwood Establishment and Removal Cut (w/ res)	84	ACRES	La Manga Pass
2016	NO NAME BEETLE SALVAGE	Salvage Cut; assigned as Two-aged Shelterwood Establishment and Removal Cut (w/ res)	98	ACRES	La Manga Pass
2016	WHISTLE PIG BEETLE SALVAGE	Salvage Cut; assigned as Overstory Removal Cut (from advanced regeneration)	65	ACRES	Cumbres Pass
2017	YURT BEETLE SALVAGE	Salvage Cut; assigned as Two-aged Shelterwood Establishment and Removal Cut (w/ res)	9	ACRES	La Manga Pass
2017	YURT BEETLE SALVAGE	Salvage Cut; assigned as Two-aged Shelterwood Establishment and Removal Cut (w/ res)	39	ACRES	La Manga Pass

Year	Sale Name	Treatment Type	Units Treated	UOM	Area Affected
2017	YURT BEETLE SALVAGE	Salvage Cut; assigned as Two-aged Shelterwood Establishment and Removal Cut (w/ res)	13	ACRES	La Manga Pass
2017	HOG NOSE BEETLE SALVAGE	Salvage Cut; assigned as Overstory Removal Cut (from advanced regeneration)	25	ACRES	Cumbres Pass
2017	HOG NOSE BEETLE SALVAGE	Salvage Cut; assigned as Overstory Removal Cut (from advanced regeneration)	59	ACRES	Cumbres Pass
2017	HOG NOSE BEETLE SALVAGE	Salvage Cut; assigned as Overstory Removal Cut (from advanced regeneration)	54	ACRES	Cumbres Pass
2017	HOG NOSE BEETLE SALVAGE	Salvage Cut; assigned as Overstory Removal Cut (from advanced regeneration)	38	ACRES	Cumbres Pass
2017	HOG NOSE BEETLE SALVAGE	Salvage Cut; assigned as Overstory Removal Cut (from advanced regeneration)	20	ACRES	Cumbres Pass
2017	HOG NOSE BEETLE SALVAGE	Salvage Cut; assigned as Overstory Removal Cut (from advanced regeneration)	26	ACRES	Cumbres Pass
2017	HOG NOSE BEETLE SALVAGE	Salvage Cut; assigned as Overstory Removal Cut (from advanced regeneration)	42	ACRES	Cumbres Pass
2017	HOG NOSE BEETLE SALVAGE	Salvage Cut; assigned as Overstory Removal Cut (from advanced regeneration)	38	ACRES	Cumbres Pass
2017	COW CAMP BEETLE SALVAGE	Salvage Cut; assigned as Overstory Removal Cut (from advanced regeneration)	95	ACRES	La Manga Pass
2017	COW CAMP BEETLE SALVAGE	Salvage Cut; assigned as Overstory Removal Cut (from advanced regeneration)	29	ACRES	La Manga Pass
2017	COW CAMP BEETLE SALVAGE	Salvage Cut; assigned as Overstory Removal Cut (from advanced regeneration)	9	ACRES	La Manga Pass

Appendix I, Table 71- Other Silvicultural Treatments within the Spruce Forests of the Project Area

Year	Treatment Type	Units Treated	UOM	Area Affected
1927	Plant Trees	6	ACRES	Cumbres Pass
1928	Plant Trees	5	ACRES	Cumbres Pass
1929	Plant Trees	6	ACRES	Cumbres Pass
1930	Plant Trees	4	ACRES	Cumbres Pass
1931	Plant Trees	3	ACRES	Cumbres Pass
1931	Plant Trees	1	ACRES	Cumbres Pass
1933	Plant Trees	1	ACRES	Cumbres Pass
1936	Plant Trees	9	ACRES	Cumbres Pass
1940	Plant Trees	29	ACRES	Cumbres Pass
1941	Plant Trees	7	ACRES	Cumbres Pass
1941	Plant Trees	14	ACRES	Cumbres Pass
1958	Seed (Trees)	3	ACRES	Platoro Area
1962	Plant Trees	11	ACRES	Osier Mountain
1962	Plant Trees	3	ACRES	Osier Mountain
1962	Plant Trees	38	ACRES	Osier Mountain
1962	Plant Trees	41	ACRES	Osier Mountain
1963	Plant Trees	40	ACRES	Osier Mountain
1963	Plant Trees	79	ACRES	Osier Mountain
1963	Plant Trees	40	ACRES	Osier Mountain
1963	Plant Trees	20	ACRES	Osier Mountain
1963	Fill-in or Replant Trees	41	ACRES	Osier Mountain

Year	Treatment Type	Units Treated	UOM	Area Affected
1964	Plant Trees	5	ACRES	Osier Mountain
1964	Plant Trees	25	ACRES	Osier Mountain
1964	Plant Trees	28	ACRES	Osier Mountain
1964	Plant Trees	3	ACRES	Osier Mountain
1964	Plant Trees	3	ACRES	Osier Mountain
1964	Plant Trees	15	ACRES	Osier Mountain
1964	Plant Trees	50	ACRES	Osier Mountain
1964	Plant Trees	30	ACRES	Osier Mountain
1964	Plant Trees	20	ACRES	Osier Mountain
1964	Plant Trees	7	ACRES	Osier Mountain
1965	Plant Trees	200	ACRES	Osier Mountain
1965	Plant Trees	5	ACRES	Osier Mountain
1965	Plant Trees	5	ACRES	Osier Mountain
1965	Plant Trees	70	ACRES	Osier Mountain
1965	Plant Trees	20	ACRES	Osier Mountain
1965	Plant Trees	30	ACRES	Osier Mountain
1965	Plant Trees	5	ACRES	Osier Mountain
1965	Plant Trees	5	ACRES	Osier Mountain
1965	Plant Trees	25	ACRES	Osier Mountain
1965	Plant Trees	20	ACRES	Osier Mountain
1965	Fill-in or Replant Trees	50	ACRES	Osier Mountain
1965	Precommercial Thin	10	ACRES	Osier Mountain
1966	Plant Trees	100	ACRES	Osier Mountain
1966	Tree Release and Weed	20	ACRES	Osier Mountain
1967	Plant Trees	5	ACRES	Osier Mountain
1967	Plant Trees	5	ACRES	Osier Mountain
1967	Plant Trees	5	ACRES	Osier Mountain
1967	Plant Trees	25	ACRES	Osier Mountain
1967	Plant Trees	15	ACRES	Osier Mountain
1967	Plant Trees	15	ACRES	Osier Mountain
1967	Plant Trees	5	ACRES	Osier Mountain
1967	Plant Trees	10	ACRES	Osier Mountain
1967	Plant Trees	15	ACRES	Osier Mountain
1967	Plant Trees	50	ACRES	Platoro Area
1967	Plant Trees	50	ACRES	Platoro Area
1967	Fill-in or Replant Trees	60	ACRES	Osier Mountain
1967	Precommercial Thin	10	ACRES	Osier Mountain
1967	Precommercial Thin	40	ACRES	Osier Mountain
1968	Seed (Trees)	50	ACRES	Red Mountain
1968	Seed (Trees)	22	ACRES	Red Mountain
1968	Plant Trees	12	ACRES	Platoro Area
1968	Precommercial Thin	55	ACRES	Osier Mountain
1968	Precommercial Thin	41	ACRES	Osier Mountain

Year	Treatment Type	Units Treated	UOM	Area Affected
1969	Plant Trees	14	ACRES	Cumbres Pass
1969	Plant Trees	12	ACRES	Osier Mountain
1969	Fill-in or Replant Trees	50	ACRES	Platoro Area
1969	Fill-in or Replant Trees	35	ACRES	Platoro Area
1969	Fill-in or Replant Trees	50	ACRES	Platoro Area
1969	Fill-in or Replant Trees	90	ACRES	Platoro Area
1969	Fill-in or Replant Trees	12	ACRES	Platoro Area
1969	Precommercial Thin	15	ACRES	Fox Creek
1970	Plant Trees	110	ACRES	Cumbres Pass
1970	Plant Trees	50	ACRES	Cumbres Pass
1970	Plant Trees	90	ACRES	Osier Mountain
1970	Plant Trees	40	ACRES	Osier Mountain
1970	Plant Trees	10	ACRES	Osier Mountain
1970	Precommercial Thin	10	ACRES	Osier Mountain
1970	Precommercial Thin	30	ACRES	Fox Creek
1971	Plant Trees	160	ACRES	Osier Mountain
1971	Plant Trees	20	ACRES	Osier Mountain
1971	Plant Trees	20	ACRES	La Manga Pass
1971	Precommercial Thin	5	ACRES	Osier Mountain
1971	Precommercial Thin	31	ACRES	Osier Mountain
1971	Precommercial Thin	40	ACRES	Osier Mountain
1972	Plant Trees	200	ACRES	Osier Mountain
1972	Precommercial Thin	25	ACRES	Osier Mountain
1972	Precommercial Thin	7	ACRES	Osier Mountain
1972	Precommercial Thin	50	ACRES	Osier Mountain
1972	Precommercial Thin	12	ACRES	Platoro Area
1973	Plant Trees	30	ACRES	Osier Mountain
1973	Plant Trees	70	ACRES	Osier Mountain
1973	Plant Trees	100	ACRES	Osier Mountain
1973	Precommercial Thin	20	ACRES	Osier Mountain
1973	Precommercial Thin	44	ACRES	Osier Mountain
1973	Precommercial Thin	70	ACRES	Osier Mountain
1973	Precommercial Thin	64	ACRES	Elk Creek
1973	Precommercial Thin	13	ACRES	Platoro Area
1973	Precommercial Thin	15	ACRES	Platoro Area
1974	Plant Trees	200	ACRES	Osier Mountain
1974	Precommercial Thin	50	ACRES	Osier Mountain
1974	Precommercial Thin	20	ACRES	Fox Creek
1974	Precommercial Thin	138	ACRES	Elk Creek
1974	Precommercial Thin	35	ACRES	Elk Creek
1974	Precommercial Thin	20	ACRES	Platoro Area
1975	Plant Trees	100	ACRES	Osier Mountain
1975	Tree Release and Weed	17	ACRES	Red Mountain

Year	Treatment Type	Units Treated	UOM	Area Affected
1975	Tree Release and Weed	20	ACRES	Red Mountain
1975	Tree Release and Weed	28	ACRES	Red Mountain
1975	Tree Release and Weed	5	ACRES	Red Mountain
1975	Tree Release and Weed	6	ACRES	Red Mountain
1975	Tree Release and Weed	6	ACRES	Red Mountain
1975	Tree Release and Weed	2	ACRES	Red Mountain
1975	Tree Release and Weed	20	ACRES	Red Mountain
1975	Precommercial Thin	33	ACRES	Fox Creek
1975	Precommercial Thin	50	ACRES	Fox Creek
1975	Precommercial Thin	9	ACRES	Osier Mountain
1975	Precommercial Thin	13	ACRES	Osier Mountain
1975	Precommercial Thin	57	ACRES	Osier Mountain
1975	Precommercial Thin	20	ACRES	Osier Mountain
1975	Precommercial Thin	20	ACRES	Osier Mountain
1975	Precommercial Thin	20	ACRES	Osier Mountain
1975	Precommercial Thin	10	ACRES	Osier Mountain
1975	Precommercial Thin	10	ACRES	Osier Mountain
1975	Precommercial Thin	12	ACRES	Osier Mountain
1975	Precommercial Thin	73	ACRES	Red Mountain
1975	Precommercial Thin	5	ACRES	Red Mountain
1975	Precommercial Thin	10	ACRES	Red Mountain
1975	Precommercial Thin	39	ACRES	Red Mountain
1975	Precommercial Thin	9	ACRES	Red Mountain
1975	Precommercial Thin	3	ACRES	Red Mountain
1976	Plant Trees	6	ACRES	Platoro Area
1976	Plant Trees	50	ACRES	Platoro Area
1976	Plant Trees	5	ACRES	Platoro Area
1976	Precommercial Thin	22	ACRES	Elk Creek
1976	Precommercial Thin	128	ACRES	Elk Creek
1977	Plant Trees	120	ACRES	Osier Mountain
1979	Plant Trees	72	ACRES	Osier Mountain
1979	Plant Trees	100	ACRES	Osier Mountain
1979	Plant Trees	20	ACRES	Platoro Area
1979	Plant Trees	10	ACRES	Platoro Area
1979	Plant Trees	90	ACRES	Platoro Area
1979	Plant Trees	49	ACRES	Platoro Area
1979	Plant Trees	85	ACRES	Platoro Area
1980	Plant Trees	11	ACRES	Cumbres Pass
1980	Plant Trees	400	ACRES	Osier Mountain
1980	Plant Trees	36	ACRES	Platoro Area
1981	Plant Trees	1	ACRES	Cumbres Pass
1981	Plant Trees	289	ACRES	Osier Mountain
1982	Plant Trees	200	ACRES	Osier Mountain

Year	Treatment Type	Units Treated	UOM	Area Affected
1982	Plant Trees	200	ACRES	Osier Mountain
1982	Plant Trees	25	ACRES	Osier Mountain
1982	Plant Trees	30	ACRES	Osier Mountain
1982	Plant Trees	15	ACRES	Platoro Area
1982	Plant Trees	10	ACRES	Platoro Area
1982	Plant Trees	7	ACRES	Platoro Area
1982	Plant Trees	5	ACRES	Platoro Area
1982	Fill-in or Replant Trees	400	ACRES	Osier Mountain
1982	Plant Trees	10	ACRES	Platoro Area
1982	Plant Trees	3	ACRES	Platoro Area
1982	Plant Trees	48	ACRES	Platoro Area
1982	Plant Trees	6	ACRES	Platoro Area
1982	Plant Trees	5	ACRES	Platoro Area
1982	Plant Trees	15	ACRES	Elwood Pass
1982	Plant Trees	8	ACRES	Elwood Pass
1982	Plant Trees	50	ACRES	Elwood Pass
1982	Plant Trees	73	ACRES	Elwood Pass
1982	Plant Trees	8	ACRES	Elwood Pass
1982	Plant Trees	6	ACRES	Elwood Pass
1982	Plant Trees	20	ACRES	Elwood Pass
1982	Plant Trees	14	ACRES	Platoro Area
1982	Fill-in or Replant Trees	3	ACRES	Platoro Area
1982	Fill-in or Replant Trees	42	ACRES	Platoro Area
1982	Fill-in or Replant Trees	6	ACRES	Platoro Area
1982	Fill-in or Replant Trees	5	ACRES	Platoro Area
1982	Fill-in or Replant Trees	353	ACRES	Platoro Area
1982	Fill-in or Replant Trees	9	ACRES	Platoro Area
1983	Tree Release and Weed	50	ACRES	Summitville
1984	Tree Release and Weed	50	ACRES	Cornwall Mountain
1985	Plant Trees	70	ACRES	Osier Mountain
1985	Fill-in or Replant Trees	40	ACRES	Osier Mountain
1985	Fill-in or Replant Trees	50	ACRES	Osier Mountain
1985	Tree Release and Weed	10	ACRES	Cornwall Mountain
1985	Tree Release and Weed	7	ACRES	Cornwall Mountain
1985	Site Preparation for Natural Regeneration - Other	15	ACRES	Osier Mountain
1985	Site Preparation for Natural Regeneration - Other	33	ACRES	Osier Mountain
1985	Precommercial Thin	3	ACRES	Red Mountain
1986	Yarding - Removal of Fuels by Carrying or Dragging	102	ACRES	Cumbres Pass
1986	Yarding - Removal of Fuels by Carrying or Dragging	50	ACRES	Cumbres Pass
1986	Yarding - Removal of Fuels by Carrying or Dragging	5	ACRES	Cumbres Pass
1986	Yarding - Removal of Fuels by Carrying or Dragging	100	ACRES	Cumbres Pass
1986	Yarding - Removal of Fuels by Carrying or Dragging	100	ACRES	Cumbres Pass
1986	Yarding - Removal of Fuels by Carrying or Dragging	72	ACRES	Osier Mountain

Year	Treatment Type	Units Treated	UOM	Area Affected
1986	Yarding - Removal of Fuels by Carrying or Dragging	10	ACRES	La Manga Pass
1986	Yarding - Removal of Fuels by Carrying or Dragging	2	ACRES	La Manga Pass
1986	Precommercial Thin	21	ACRES	La Manga Pass
1986	Precommercial Thin	25	ACRES	La Manga Pass
1986	Precommercial Thin	22	ACRES	Cornwall Mountain
1987	Precommercial Thin	25	ACRES	La Manga Pass
1987	Tree Release and Weed	37	ACRES	Summitville
1987	Tree Release and Weed	45	ACRES	Summitville
1987	Precommercial Thin	6	ACRES	La Manga Pass
1987	Site Preparation for Natural Regeneration - Other	12	ACRES	Summitville
1987	Site Preparation for Natural Regeneration - Other	24	ACRES	Summitville
1987	Site Preparation for Natural Regeneration - Other	30	ACRES	Summitville
1987	Site Preparation for Natural Regeneration - Other	31	ACRES	Summitville
1987	Tree Release and Weed	18	ACRES	Summitville
1987	Tree Release and Weed	47	ACRES	Summitville
1987	Tree Release and Weed	16	ACRES	Summitville
1987	Precommercial Thin	4	ACRES	La Manga Pass
1988	Tree Release and Weed	20	ACRES	Fox Creek
1988	Precommercial Thin	1	ACRES	Cumbres Pass
1988	Precommercial Thin	7	ACRES	Cumbres Pass
1988	Tree Release and Weed	90	ACRES	Cumbres Pass
1988	Precommercial Thin	23	ACRES	Cumbres Pass
1988	Precommercial Thin	4	ACRES	Cumbres Pass
1988	Precommercial Thin	36	ACRES	Cumbres Pass
1988	Tree Release and Weed	18	ACRES	Cornwall Mountain
1989	Tree Release and Weed	15	ACRES	Fox Creek
1989	Tree Release and Weed	2	ACRES	Fox Creek
1989	Tree Release and Weed	10	ACRES	Fox Creek
1989	Tree Release and Weed	32	ACRES	Fox Creek
1989	Tree Release and Weed	15	ACRES	Fox Creek
1989	Tree Release and Weed	21	ACRES	Fox Creek
1989	Precommercial Thin	7	ACRES	Cornwall Mountain
1990	Burning of Piled Material	5	ACRES	Cumbres Pass
1990	Burning of Piled Material	3	ACRES	Cumbres Pass
1990	Burning of Piled Material	3	ACRES	La Manga Pass
1991	Yarding - Removal of Fuels by Carrying or Dragging	46	ACRES	Cornwall Mountain
1991	Yarding - Removal of Fuels by Carrying or Dragging	92	ACRES	Cornwall Mountain
1991	Yarding - Removal of Fuels by Carrying or Dragging	155	ACRES	Cornwall Mountain
1991	Yarding - Removal of Fuels by Carrying or Dragging	49	ACRES	Cornwall Mountain
1991	Yarding - Removal of Fuels by Carrying or Dragging	22	ACRES	Cornwall Mountain
1991	Yarding - Removal of Fuels by Carrying or Dragging	20	ACRES	Osier Mountain
1991	Yarding - Removal of Fuels by Carrying or Dragging	122	ACRES	Cumbres Pass
1991	Yarding - Removal of Fuels by Carrying or Dragging	9	ACRES	La Manga Pass

Year	Treatment Type	Units Treated	UOM	Area Affected
1991	Yarding - Removal of Fuels by Carrying or Dragging	3	ACRES	La Manga Pass
1991	Yarding - Removal of Fuels by Carrying or Dragging	1	ACRES	La Manga Pass
1991	Yarding - Removal of Fuels by Carrying or Dragging	31	ACRES	Cornwall Mountain
1991	Yarding - Removal of Fuels by Carrying or Dragging	8	ACRES	Cornwall Mountain
1991	Yarding - Removal of Fuels by Carrying or Dragging	72	ACRES	Cornwall Mountain
1991	Burning of Piled Material	5	ACRES	La Manga Pass
1992	Burning of Piled Material	25	ACRES	Cumbres Pass
1992	Burning of Piled Material	20	ACRES	La Manga Pass
1992	Burning of Piled Material	20	ACRES	La Manga Pass
1992	Burning of Piled Material	10	ACRES	Cornwall Mountain
1992	Burning of Piled Material	20	ACRES	Cornwall Mountain
1992	Yarding - Removal of Fuels by Carrying or Dragging	15	ACRES	Cumbres Pass
1992	Yarding - Removal of Fuels by Carrying or Dragging	5	ACRES	Cumbres Pass
1992	Yarding - Removal of Fuels by Carrying or Dragging	5	ACRES	Cornwall Mountain
1992	Yarding - Removal of Fuels by Carrying or Dragging	5	ACRES	Cornwall Mountain
1992	Yarding - Removal of Fuels by Carrying or Dragging	10	ACRES	Cornwall Mountain
1993	Yarding - Removal of Fuels by Carrying or Dragging	5	ACRES	Cumbres Pass
1993	Yarding - Removal of Fuels by Carrying or Dragging	6	ACRES	Cumbres Pass
1993	Yarding - Removal of Fuels by Carrying or Dragging	7	ACRES	Cumbres Pass
1993	Yarding - Removal of Fuels by Carrying or Dragging	6	ACRES	La Manga Pass
1993	Yarding - Removal of Fuels by Carrying or Dragging	5	ACRES	La Manga Pass
1993	Yarding - Removal of Fuels by Carrying or Dragging	18	ACRES	Cornwall Mountain
1994	Burning of Piled Material	4	ACRES	Cumbres Pass
1994	Plant Trees	10	ACRES	Cumbres Pass
1994	Yarding - Removal of Fuels by Carrying or Dragging	10	ACRES	Cornwall Mountain
1994	Yarding - Removal of Fuels by Carrying or Dragging	5	ACRES	La Manga Pass
1994	Yarding - Removal of Fuels by Carrying or Dragging	4	ACRES	La Manga Pass
1994	Yarding - Removal of Fuels by Carrying or Dragging	10	ACRES	Cornwall Mountain
1994	Burning of Piled Material	2	ACRES	Cumbres Pass
1994	Burning of Piled Material	5	ACRES	La Manga Pass
1994	Burning of Piled Material	6	ACRES	La Manga Pass
1994	Burning of Piled Material	3	ACRES	Platoro Area
1996	Yarding - Removal of Fuels by Carrying or Dragging	2	ACRES	La Manga Pass
1996	Yarding - Removal of Fuels by Carrying or Dragging	5	ACRES	La Manga Pass
1996	Yarding - Removal of Fuels by Carrying or Dragging	5	ACRES	La Manga Pass
1996	Yarding - Removal of Fuels by Carrying or Dragging	2	ACRES	La Manga Pass
1999	Fill-in or Replant Trees	4	ACRES	Cumbres Pass
1999	Fill-in or Replant Trees	4	ACRES	La Manga Pass
1999	Fill-in or Replant Trees	9	ACRES	La Manga Pass
1999	Fill-in or Replant Trees	9	ACRES	La Manga Pass
1999	Fill-in or Replant Trees	4	ACRES	La Manga Pass
1999	Fill-in or Replant Trees	2	ACRES	La Manga Pass
1999	Fill-in or Replant Trees	9	ACRES	La Manga Pass

Year	Treatment Type	Units Treated	UOM	Area Affected
1999	Broadcast Burning - Covers a majority of the unit	50	ACRES	La Manga Pass
1999	Broadcast Burning - Covers a majority of the unit	30	ACRES	La Manga Pass
1999	Broadcast Burning - Covers a majority of the unit	20	ACRES	La Manga Pass
1999	Burning of Piled Material	1	ACRES	Platoro Area
2000	Fill-in or Replant Trees	3	ACRES	Cumbres Pass
2000	Fill-in or Replant Trees	5	ACRES	La Manga Pass
2000	Fill-in or Replant Trees	2	ACRES	La Manga Pass
2000	Fill-in or Replant Trees	3	ACRES	La Manga Pass
2000	Fill-in or Replant Trees	14	ACRES	La Manga Pass
2000	Fill-in or Replant Trees	5	ACRES	La Manga Pass
2000	Burning of Piled Material	1	ACRES	Platoro Area
2000	Burning of Piled Material	1	ACRES	Platoro Area
2000	Fill-in or Replant Trees	6	ACRES	Cumbres Pass
2000	Fill-in or Replant Trees	3	ACRES	Cumbres Pass
2000	Fill-in or Replant Trees	6	ACRES	Cumbres Pass
2000	Fill-in or Replant Trees	2	ACRES	Cumbres Pass
2000	Fill-in or Replant Trees	3	ACRES	Cumbres Pass
2000	Fill-in or Replant Trees	4	ACRES	Fox Creek
2000	Fill-in or Replant Trees	7	ACRES	La Manga Pass
2000	Fill-in or Replant Trees	4	ACRES	La Manga Pass
2000	Fill-in or Replant Trees	6	ACRES	La Manga Pass
2000	Fill-in or Replant Trees	7	ACRES	La Manga Pass
2000	Site Preparation for Natural Regeneration - Other	25	ACRES	Platoro Area
2000	Site Preparation for Natural Regeneration - Other	25	ACRES	Platoro Area
2000	Tree Release and Weed	12	ACRES	Platoro Area
2000	Tree Release and Weed	13	ACRES	Platoro Area
2000	Precommercial Thin	4	ACRES	Fox Creek
2002	Broadcast Burning - Covers a majority of the unit	100	ACRES	La Manga Pass
2002	Burning of Piled Material	88	ACRES	Cumbres Pass
2002	Burning of Piled Material	101	ACRES	Cumbres Pass
2002	Burning of Piled Material	82	ACRES	Cumbres Pass
2002	Burning of Piled Material	45	ACRES	Cumbres Pass
2002	Burning of Piled Material	45	ACRES	La Manga Pass
2002	Burning of Piled Material	66	ACRES	La Manga Pass
2002	Burning of Piled Material	85	ACRES	La Manga Pass
2002	Burning of Piled Material	43	ACRES	La Manga Pass
2002	Burning of Piled Material	52	ACRES	La Manga Pass
2002	Burning of Piled Material	17	ACRES	La Manga Pass
2002	Burning of Piled Material	7	ACRES	La Manga Pass
2002	Burning of Piled Material	7	ACRES	La Manga Pass
2002	Burning of Piled Material	16	ACRES	La Manga Pass
2003	Burning of Piled Material	86	ACRES	Cumbres Pass
2003	Burning of Piled Material	38	ACRES	La Manga Pass

Year	Treatment Type	Units Treated	UOM	Area Affected
2007	Burning of Piled Material	1	ACRES	Cumbres Pass
2012	Burning of Piled Material	7.5	ACRES	Cumbres Pass
2013	Rearrangement of Fuels	4	ACRES	Cumbres Pass
2013	Rearrangement of Fuels	23	ACRES	Cumbres Pass
2013	Rearrangement of Fuels	17	ACRES	Cumbres Pass
2014	Burning of Piled Material	3.5	ACRES	Cumbres Pass
2015	Plant Trees	75	ACRES	Cumbres Pass
2015	Plant Trees	4	ACRES	Cumbres Pass
2015	Plant Trees	23	ACRES	Cumbres Pass
2015	Plant Trees	17	ACRES	Cumbres Pass
2015	Plant Trees	24.1	ACRES	Cumbres Pass
2015	Plant Trees	3.2	ACRES	Cumbres Pass
2015	Plant Trees	29	ACRES	Cumbres Pass
2015	Plant Trees	42.9	ACRES	Cumbres Pass
2015	Plant Trees	10.8	ACRES	Cumbres Pass
2015	Plant Trees	11.7	ACRES	Cumbres Pass
2015	Plant Trees	0.9	ACRES	Cumbres Pass
/2015	Plant Trees	2.3	ACRES	Cumbres Pass
2015	Plant Trees	3.4	ACRES	Cumbres Pass
2015	Plant Trees	1.4	ACRES	Cumbres Pass
2015	Plant Trees	44.8	ACRES	Cumbres Pass
2016	Plant Trees	29.6	ACRES	Cumbres Pass
2016	Plant Trees	17.5	ACRES	Jasper
2016	Plant Trees	4.3	ACRES	Jasper
2016	Rearrangement of Fuels	100.6	ACRES	Jasper

Appendix J – Recreation Opportunity Spectrum Classes

Defining recreation opportunities is used as a tool to help recreation managers create and maintain the appropriate recreation experiences that suits various types of land and visitors. The ROS continuum characterizes recreation opportunities in terms of setting, activity, and experience. The spectrum contains six classes: primitive, semi-primitive non-motorized, semi-primitive motorized, roaded natural, rural, modern urban.

ROS	Class Descriptions
Primitive	Opportunity for isolation from man-made sights, sounds, and management controls in an unmodified natural environment. Only facilities essential for resource protection are available. A high degree of challenge and risk are present. Visitors use outdoor skills and have minimal contact with other users or groups. Motorized use is prohibited.
Semi-primitive non-motorized	Some opportunity for isolation from man-made sights, sounds, and management controls in a predominantly unmodified environment. Opportunity to have a high degree of interaction with the natural environment, to have moderate challenge and risk and to use outdoor skills. Concentration of visitors is low, but evidence of users is often present. On-site managerial controls are subtle. Facilities are provided for resource protection and the safety of users. Motorized use is prohibited.
Semi-primitive motorized	Some opportunity for isolation from man-made sights, sounds, and management controls in a predominantly unmodified environment. Opportunity to have a high degree of interaction with the natural environment, to have moderate challenge and risk and to use outdoor skills. Concentration of visitors is low, but evidence of other area users is present. On-site managerial controls are subtle. Facilities are provided for resource protection and the safety of users. Motorized use is permitted.
Roaded Natural	Mostly equal opportunities to affiliate with other groups or be isolated from sights and sounds of man. The landscape is generally natural with modifications moderately evident. Concentration of users is low to moderate, but facilities for group activities may be present. Challenge and risk opportunities are generally not important in this class. Opportunities for both motorized and non-motorized activities are present. Construction standards and facility design incorporate conventional motorized uses.
Roaded Modified	Similar to the Roaded Natural setting, except this area has been heavily modified (roads or recreation facilities). This class still offers opportunity to have a high degree of interaction with the natural environment and to have moderate challenge and risk and to use outdoor skills.
Rural	Area is characterized by a substantially modified natural environment. Opportunities to affiliate with others are prevalent. The convenience of recreation sites and opportunities are more important than a natural landscape or setting. Sights and sounds of man are readily evident, and the concentration of users is often moderate to high. Developed sites, roads, and trails are designed for moderate to high uses.
Urban	Area is characterized by a substantially urbanized environment, although the background may have natural-appealing elements. High levels of human activity and concentrated development, including recreation opportunities are prevalent. Developed sites, roads and other recreation opportunities are designed for high use.